Dental care as a risk factor for transfusion transmittable infections in blood donors: systematic review and meta-analysis

Dr. Augusta Darius, KU Leuven

Promotor: Prof. Dr. Ir. Emmy De Buck
Supervisor: Dr. Vere Borra

Master of Family Medicine
Masterproef Huisartsgeneeskunde

This dissertation is an exam document. Possibly assessed errors were not corrected after the defense. In publications, references to this dissertation may only be made with written permission of the supervisor(s) mentioned on the title page.

Dit proefschrift is een examendocument dat na verdediging niet werd gecorrigeerd voor eventueel vastgestelde fouten. In publicaties mag naar dit werk gerefereerd worden, mits schriftelijke toelating van de promotor(en) die met naam vermeld zijn op de titelpagina.

Dental care as a risk factor for transfusion transmittable infections in blood donors: systematic review and meta-analysis

Dr. Augusta Darius, KU Leuven

Promotor: Prof. Dr. Ir. Emmy De Buck
Supervisor: Dr. Vere Borra

Master of Family Medicine
Masterproef Huisartsgeneeskunde

Table of contents

TABLE OF CONTENTS 4

LIST OF ABBREVIATIONS 5

ABSTRACT 6

INTRODUCTION 7

GENERAL INTRODUCTION 7

BLOOD DONATION IN GENERAL PRACTICE 7

BLOOD DONATION 7

Importance 7

Donor eligibility criteria 7

Evidence Based Medicine (EBM) and Evidence Based Practice (EBP) 8

Transfusion transmitted infections (TTI's) – adversary of blood donation 9

Dental care and blood safety 10

Objective 10

MATERIALS AND METHODS 10

PICO – question 10

Search strategy and study selection 10

Selection criteria 11

Data extraction and quality assessment 11

Meta-analysis 12

RESULTS 12

Study identification and selection 12

Study characteristics 14

Study results 15

Quality of evidence 17

DISCUSSION 18

REFERENCES: 20

APPENDICES 22

Appendix 1: Complete search strategies 22

Appendix 2: List of excluded studies from phase 1 25

Appendix 3: List of excluded studies of phase 2 31

Appendix 4: Study characteristics of included studies 40

Appendix 5: Individual study data 45

Appendix 6: Quality assessment of the studies 47

List of abbreviations

AGREE	Appraisal of Guidelines for Research and Evaluation
aOR	Adjusted Odd's Ratio
CEBAM	Centre for Evidence-Based Medicine
CEBaP	Centre for Evidence-Based Practice
CI	Confidence Interval
CPE	Carbapenem-Resistant Enterobacteriaceae
EBM	Evidence-Based Medicine
EBP	Evidence-Based Practice
ESBL	Extended-Spectrum Beta-Lactamase
GP	General Practitioner
GRADE	Grades of Recommendation, Assessment, Development and Evaluation
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HTLV-1	Human T-lymphotropic Virus 1
MA	Meta-Analysis
MeSH	Medical Subject Heading
mOR	Multivariate Odd's Ratio
MRSA	Methicillin-resistant Staphylococcus Aureus
OR	Odd's Ratio
PICO	Population - Intervention - Comparison - Outcome
SD	Standard Deviation
SR	Systematic Review
TTI	Transfusion Transmitted Infection

Abstract

Background: Safe blood donation and transfusion are hallmark to modern healthcare. Dental treatment is a known risk factor to acquire TTI's, therefore possibly threatening the safety of blood supply. Nowadays the deferral policy after dental treatment is based on the precautionary principle. It is our aim to give an overview of the current scientific evidence concerning the risk of TTI's after dental treatment.
Materials & methods: A systematic review of the available literature was performed by searching four databases (Medline, Cochrane, Embase, Web Of Science). Screening was independently performed by two reviewers. The quality of evidence was evaluated using the GRADE principle. A meta-analysis was performed in order to assess the overall effect of association between dental treatment and TTI markers.
Results: A total of 18 systematic reviews have been identified from which 14 individual studies have been included. 6 Additional observational studies were included. Meta-analysis showed a statistically significant increased risk of HBV after dental treatment. For dental cleaning, an increased risk for HBV could not be demonstrated. For HCV, meta-analysis demonstrated an increased risk after tooth extraction. However, for dental treatment and dental cleaning there was conflicting evidence. Concerning HIV and HTLV-1, no significant effect could be demonstrated after dental treatment. All evidence provided was of very low quality due to low number of events and/or large variability of results.
Discussion: Studies of high-quality concerning the risk of TTI after dental care in blood donors are scarce. An association of HBV after dental treatment and HCV after tooth extraction was demonstrated but evidence is of very low quality. There seems to be a greater correlation with an increased invasiveness of dental treatment. This study corroborates the current precautionary-principle based deferral of blood donors after dental treatment. However, more high-quality studies on this topic are needed.

Achtergrond: Veilige bloeddonatie en transfusie zijn van groot belang voor de moderne geneeskunde. Een tandartsbezoek is een gekende risicofactor voor bloedoverdraagbare infecties. Momenteel is het tijdelijk weigeren van bloeddonoren na een tandartsbezoek gebaseerd op het veiligheidsprincipe. Het doel van deze studie is om een overzicht te geven van de huidige wetenschappelijke kennis omtrent het risico op infectie in het bloed na een tandartsbezoek.
Materialen & methoden: Er werd een systematische review van de beschikbare literatuur uitgevoerd door vier databases te onderzoeken (Medline, Cochrane, Embase, Web Of Science). Alle studies werden onafhankelijk door twee onderzoekers gescreend. De kwaliteit werd beoordeeld volgens het GRADE principe. Er werd ook een meta-analyse uitgevoerd om het effect tussen tandartsbezoek en serologische markers van infectie in het bloed te onderzoeken.
Resultaten: Er werden 18 systematische reviews geïdentificeerd waaruit 14 individuele studies werden geselecteerd. Er werden 6 bijkomende observationele studies geïncludeerd. Via meta-analyse werd er een significante stijging van het risico op HBV infectie na tandartsbezoek gevonden. Voor tandreiniging werd er geen toegenomen risico op HBV infectie gevonden. Voor HCV toonde meta-analyse een stijging van het risico na het trekken van een tand terwijl er voor tandartsbezoek en tandreiniging tegenstrijdig bewijs is. Voor HIV en HTLV-1 werd er geen significant effect gevonden na tandartsbezoek. De bevindingen zijn van zeer lage kwaliteit wegens een laag aantal events en/of een grote variabiliteit in resultaten.
Conclusie: Er zijn weinig studies van hoge kwaliteit beschikbaar over infecties in het bloed bij bloeddonoren na een tandartsbezoek. Er werd een associatie gevonden tussen HBV en tandartsbezoek, en HCV en een tand laten trekken, maar het bewijs is van zeer lage kwaliteit. Er lijkt wel een verband te zijn tussen de toename van invasiviteit van behandeling bij de tandarts en het risico op infectie in het bloed. Deze studie onderbouwt het huidige principe van tijdelijke weigering van bloeddonoren na tandartsbezoek. Echter, studies van hoge kwaliteit omtrent dit thema zijn nodig om deze beslissing grondig wetenschappelijk te onderbouwen.

Introduction

General introduction

Blood donation and transfusion is hallmark to modern healthcare. A sufficient reservoir of safe blood products is of invaluable importance for a variety of means, ranging from medical to pharmacological and scientific purposes. Because of the indispensable position of blood products in healthcare we must at all times strive to maximize their safety by expanding our knowledge on possible transfusion transmitted diseases, their pathogenicity and ways of prevention of infecting the blood pool. The best means of doing so is through Evidence-Based Practice (EBP). Throughout the years, research has been accumulating and nowadays we have access to a pool of scientific data that by way of closer analysis can help us understand and improve blood safety more thoroughly.

Dental care is part of routine healthcare in a large part of society. Though dental care brings many benefits to the overall health of our population, we also know that in the perspective of blood safety there are risks we need to bare in mind. Viral as well as bacterial infections are known to be transmittable through both routine and invasive dental procedures.

Blood donor centers as well as healthcare workers have an important role in advising the overall population about these risks in order to detect possible hazards, prevent infection of the blood pool and maintain the safety of the recipients of blood products.

Blood donation in general practice

It is important for general practitioners (GPs) to be up to date with the current recommendations for blood donation. As part of the primary healthcare system, GPs function as important advisors of the overall population. When up to date with the most important recommendations for blood donor deferral, GPs have the opportunity to promote becoming a blood donor if reasons for deferral are absent and also to advise existing donors on deferral times adjusted to their health situations.
We believe it is suggestible for GPs to actively ask patients if they are blood donors during preventive consultations and explicitly note the answer in the medical file for future referral/deferral purposes.

Blood donation

Importance

Blood products as whole blood, concentrated blood platelets and plasma are used for medical, pharmacological and scientific purposes.
Many serious health issues, acute or chronic (e.g. high-impact collision, hip replacement, hematological disorders with recurrent anemia), need blood donated by blood donors to save lives. Currently, 70% of the population will need a blood transfusion at least once in their life while only 3% of the total population is a donor. Regular blood donation is essential not only because of limited donor quantity but also due to the limited storage time of blood products. Red blood cells can be stored for 42 days at a temperature between 2 and 6 degrees Celsius. After an initial cooling to 30°C, plasma can then be preserved for up to a year at -25°C. Blood platelets can only be stored for 5 days at 22°C and have to be kept in constant movement (1). These blood products are used in people of all ages and in different circumstances. In case of emergency events involving large quantities of people, sufficient reserves of these different blood products are indispensable.

The blood service of Belgian Red Cross-Flanders is responsible for ensuring that a constant supply of safe blood products is available to the majority of hospitals in Flanders. They guarantee to be able to provide sufficient quantities of safe, high-quality blood whenever it is needed (2). The center fully relies on voluntary blood donors.
In 2017, there were 165499 people who donated whole blood (257160), plasma (98265) or blood platelets (15784). 20% Of blood donors were aged between 18 and 23 years old.
When looking at the quantity of donations made in the year 2017, donors accounted for a total of 371209 donations. All donations underwent standard testing for human immunodeficiency virus (HIV), hepatitis B, hepatitis C and syphilis in the Belgian Red Cross blood centers. 638213 blood products were delivered to different hospitals to maintain their standard blood bank stock (3).

Donor eligibility criteria

Blood donor selection is needed to reduce the risk of adverse reactions in the donor and to minimize the risk of infection for the recipient of the blood product. Blood donor deferral measures are essential to modern blood-banking since they are effective, cheap, and can be implemented rapidly in case of emerging threats (e.g. HIV in the 1980's) (4). It is important to not base the

decision of deferral solely on diagnostic laboratory testing of the blood products, we need to take the window period into account. There is always a lag in time between the time of infection of the donor, and thus transmissibility through blood products, and the moment is becoming detectable by means of diagnostic screening. In this time period blood donor questionnaires are needed to detect behavioral risk and defer the blood donors at risk of TTI in order to protect the blood supply chain.
The model that is currently used for blood donor deferral aims for maximum safety for both donor and recipient. In general, the available evidence for current deferral reasons is of low quality, and for 60% of the top 30 reasons for excluding donors no evidence was found. Therefore, to maximize safety, exclusion criteria are always defined with a broad safety margin (4).
Blood donors can be deferred for reasons of donor or patient safety, product quality, or feasibility of the collection (4). A complete overview of the donor's health as well as some behavioral and environmental elements need to be taken into account.

Blood donor deferral happens based on a questionnaire filled out by the donor and a consultation with a physician during which vital parameters are checked and the questionnaire is discussed. The questionnaire comprises several questions aimed to disclose risks for adverse reaction to the donor or infection of the recipient. Questions directed at donor safety include age, interval between donations, pregnancy and use of medication. To protect the recipient from possible transfusion-transmissible infection donors are screened for foreign travel, surgery, procedures involving needles, exposure to human blood, drug use, sexual risk behavior, acute or chronic illness, vaccination history and dental care.

Dental care is a common reason for deferral. In Flanders, it is the 6th most common reason for donor exclusion (4). Currently, blood donors in Flanders are deferred for 0-7 days after dental treatment dependent on the type of treatment: no deferral in case of a regular check-up, 1 day after tooth filling and 7 days after more invasive dental care as tooth extraction or endodontic therapy (5). The current guidelines for deferral are based only on common sense and expert opinions. The aim of this systematic review is to collect the best available evidence investigating the association between a dental procedure and transfusion-transmissible infections in blood donors.

Evidence Based Medicine (EBM) and Evidence Based Practice (EBP)

Scientific data on different topics is abundant nowadays and the access to it has been simplified by the introduction of the internet and several easy to access databases. Because of the ample evidence that exists and the fact that it does not always come down to the same conclusion it is not always easy to withhold the scientifically best possible action on a certain topic. Evidence Based Medicine (EBM) is an evolution in decision making in the medical world that continuously tries to answer to this problem.
The term EBM has been used since 1990 when a group of investigators led by Gordon Guyatt at McMaster's University defined it as "a systematic approach to analyse published research as the basis of clinical decision making" (6,7). The term was later on more formally defined in 1996 by Sacket et al. who stated that EBM was "the conscientious and judicious use of current best evidence from clinical care research in the management of individual patients" (6).
Through the years, this concept has expanded beyond the medical world and found its way to other domains such as social work and education (8). This approach is now more generally known as Evidence Based Practice (EBP).

"EBM/EBP requires the integration of the best research evidence with our clinical expertise and our patient's unique values and circumstances." (7)

EBP is a way of decision-making that is based on 3 elements: scientific evidence obtained through research, expert opinions and preferences and values of the target group (figure 1). The integration of these three components into clinical decisions increases the opportunity for optimal clinical outcome and patient quality of life.



Figure 1: Evidence Based Practice is based on scientific research, expert opinions and the preferences and values of the target group.

In Belgian Red Cross-Flanders, Evidence Based Practice is a cornerstone of daily activity. The Centre for Evidence Based Practice (CEBaP) was launched in 2009 and is a global centre serving the aid sector by creating a scientific basis for humanitarian activities ranging from blood supply to developmental programs and emergency relief. It forms the scientific foundations of the policy carried out by Belgian Red Cross-Flanders, generates evidence syntheses and research for better aid globally and cooperates with the Belgian Centre for Evidence Based Medicine (CEBAM) and Cochrane Belgium to support EBP. CEBaP stands for investigating external scientific evidence in a transparent and objective way and connecting it with clinical expertise in order to attain the best possible policy for the aid sector. To promote and optimize the development of knowledge and EBP, evidence-based guidelines are updated every 5 years and systematic reviews and primary field research are developed to formulate up-to-date answers to current questions. CEBaP helps bridging the gap between theoretical knowledge and its practical application by supporting policy making within Belgian Red Cross-Flanders. The methodological charter by CEBaP offers full transparency and objectivity into the methodology used for their scientific activity. In summary, the existing standards of the Cochrane organisation are used for the development of systematic reviews, the AGREE II-instrument for guideline development and the goal of minimizing bias for primary study creation (9). All projects by CEBaP are published in peer-reviewed scientific journals (10).

Transfusion transmitted infections (TTI's) – adversary of blood donation

The supply of blood products remains subject to contamination, even though the risk of transfusion-transmitted infections today is lower than ever as a result of the implementation of vigilant donation procedures, donor selection, sensitive screening tests and effective inactivation procedures (11).

TTI's can be classified into bacterial, viral and parasitic infections. Bacterial infections were probably the first recognized TTI's as some of the first reports of post-transfusion sepsis date back from the time when blood was stored in glass bottles. The advent of closed, sterile systems for the collection and storage of blood has drastically diminished the frequency of bacterial contamination of blood products. For viral infections, viral screening has caused a great decline in blood contamination with human immunodeficiency virus (HIV), hepatitis B and hepatitis C virus (HBV and HCV respectively) (12).

Today, the most commonly encountered transfusion infections are of viral origin, even though it is known that for blood platelets specifically, the prevalence of bacterial contamination is greater than in red blood cell components or plasma because the temperature during storage is higher (cfr. supra) thus promoting bacterial proliferation (12,13).

Dental care and blood safety

The oral cavity is a natural habitat for a large number of microorganisms. Routine dental care procedures are generally open and invasive with possible skin and probable mucosal lesions and thus can pose a significant risk of cross-contamination and even systemic infection. This is of particular importance to transfusion medicine since systemic infection after dental care may include TTI's and thus put not only the donor but also the receiver of blood products at risk of viral and bacterial infections (14,15).
Pathogens that are known to be present in the oral cavity and respiratory tract, and thus possibly transmissible by dental care are: HBV, HCV, HIV, herpes simplex virus type 1 and 2, tuberculosis, staphylococci including MRSA and streptococci, among others (15).

There are several pathways of cross-contamination possible in a dental practice. Here we will only discuss the pathways of infection from surroundings to the patient. Contamination may occur through:

- Dental care staff (dentists, assistants): by not adopting hygiene protection measurements such as dental/surgical masks covering nose and mouth and single-use gloves. Even when asymptomatic it is important to take into account window periods of illnesses and asymptomatic shedding of viral parts.
- Instruments/surfaces used in dental care: patient-to-patient transmission of pathogens may occur by not properly sterilizing equipment used before, during or after dental care.
- Aerosols created by dental equipment or tap water used to rinse after procedure when skin or mucosal lesions are present may cause contamination with pathogens present in the dental unit waterlines, e.g. legionella (16,17).

Other factors that influence patient contamination during dental care are patients' immunity status, dose of pathogen transmitted, virulence of the pathogen as well as frequency of exposure (14).

Throughout the last decades several infection control measures have been widely applied in dentistry. Recommended measures such as wearing masks, single-use gloves and autoclaving of instruments have become standard precautions. Also, the concept of universal infection control, whereby all patients are treated as potential carriers of pathogen micro-organisms, have become accepted as best practice (18,19). Although we see an overall increase in effectiveness of preventive measures, and thus of transmission of TTI's, there are a few studies that suggest there is room for improvement in preventive measures taken by assisting personnel and the emphasis on proper use of preventive measures (e.g. gloves, masks) (18,20).

Objective

The aim of this thesis is to systematically review the literature to collect the best available evidence on the transmission of TTI's through dental care in otherwise healthy blood donors.

Materials and methods

PICO – question

Through the 'PICO' principle we formulated the following answerable clinical question as a starting point of our literature research: 'In blood donors (P), is dental treatment (I), compared to no dental treatment (C), a risk factor for transfusion transmissible infections (O)?'.

- Population: blood donors
- Intervention/Risk factor: dental treatment
- Comparison: no dental treatment
- Outcome: viral and/or bacterial infection (viremia/bacteremia)

Search strategy and study selection

We divided the search into two phases. The literature search for both phases was performed searching Medline (via the PubMed interface), Embase (via the Embase.com interface), the Cochrane Library and Web of Science. In the Medline and Cochrane databases a combination of Medical Subject Heading (MeSH) terms and text words were used where possible to make the search extensive. In Embase we used a combination of Embase subject headings (Emtree terms) and text words. In Web of Science only text words were used. MeSH/Emtree terms were exploded to cover all underlying subject headings.

In the first phase, we searched for systematic reviews (SR) and meta-analyses (MA) investigating the risk of transfusion-transmissible infections in blood donors. The search was performed from time of inception of the databases until 10/01/2017.
Consequently, we looked at the included and excluded studies of the selected systematic reviews and withheld the publications that studied dental care as a risk factor for infection.
In a second phase, an update of the evidence from the identified systematic reviews was carried out by performing a new literature search focusing on studies that studied dental care as a risk factor for infection in blood donors published between 01/03/2014 (the publication date of the most recent systematic review of which the search strategy was most inclusive) and 29/08/2017, our search date.
The complete search strategies for the different databases for both phases can be found in Appendix 1.

Selection criteria

Phase 1: Systematic reviews and meta-analyses were included if they met following inclusion and exclusion criteria:

- Study design: Inclusion: systematic reviews, only if the search strategy and selection criteria are clearly described. Exclusion: case series, cross-sectional studies, animal studies, ex vivo or in vitro studies, studies reporting no quantitative data, studies reporting only means, but no SDs, effect sizes, p-values.
- Population: Inclusion: populations comprising only blood donors. Exclusion: populations containing blood donors, but not exclusively consisting of blood donors.
- Intervention/risk factor: Inclusion: dental treatment, dental procedure, dental therapy, tooth extraction/filling/scaling, dental/teeth cleaning, dentistry, invasive dental treatment accompanied by hemorrhage. Exclusion: dental surgery, dental treatment performed by person other than dentist.
- Outcome: Inclusion: markers of transfusion-transmissible infections (TTI's).
- Language: Inclusion: All languages, if an English abstract is available.

Phase 2: The evidence found in phase 1 was updated with studies complying with following inclusion and exclusion criteria:

- Study design: Inclusion: observational studies, studies with data presented as case-control, experimental studies. Exclusion: case series, cohort studies, cross-sectional studies without case-control data, animal studies, ex vivo or in vitro studies, studies reporting no quantitative data, studies reporting only means, but no SDs, effect sizes, p-values.
- Population: Inclusion: populations comprising only blood donors. Exclusion: populations containing blood donors, but not exclusively consisting of blood donors.
- Intervention/risk factor: Inclusion: dental treatment, dental procedure, dental therapy, tooth extraction/filling/scaling, dental/teeth cleaning, dentistry, invasive dental treatment accompanied by hemorrhage. Exclusion: dental surgery, dental treatment performed by person other than dentist.
- Outcome: Inclusion: markers of transfusion-transmissible infections (TTI's).
- Language: Inclusion: All languages, if an English abstract is available.

For each phase, the results of the searches of the different online databases were imported to a single library in a reference manager (21). After removal of duplicates, two reviewers (AD and VB) independently did an initial screening based on titles and abstract, followed by full text screening of the remaining references implementing the criteria mentioned above. Disagreements on the inclusion of articles were resolved by discussion or, if no consensus was reached, by consulting a third reviewer (EDB).

Data extraction and quality assessment

The selected full texts were analyzed in detail and study characteristics, representative study data and limitations in study design were tabulated. Following study characteristics were extracted: study design, population, comparison or risk factor, outcome measures. Data are represented as odds ratios (OR) with 95% confidence intervals (CI). A p-value < 0.05 was considered significant. Odds ratios are calculated with Review Manager software if only raw data are available (22).

The quality of the data of the included studies was judged by using the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) concept. GRADE is a systematic and explicit approach to making judgments about the quality of evidence and the strength of recommendations (23).

The first step was the assessment of the quality of individual studies. Limitations in study design are judged by looking for methodological flaws in the individual selected studies: inappropriate eligibility criteria, inappropriate methods for exposure and outcome variables, no control for confounding factors, inappropriate or inadequate follow-up.
Subsequently, the level of evidence of the body of evidence is determined. The levels of evidence range from high (A) through moderate (B), low (C) and very low (D). Experimental studies start with an initial high (A) grading, while observational studies start with an initial low (C) grading. The level of evidence can be downgraded based on judging following items across the different included studies:

- Limitations in study design as described above
- Inconsistency (heterogeneity of results due to differences in population, intervention, outcome; widely differing estimates of effect)
- Imprecision (large variability of results, limited sample size/low number of events, lack of data)
- Indirectness (indirect population, intervention, comparator or outcome)
- Publication bias

An evidence summary was filled out to keep track of the assessment.

Meta-analysis

In order to evaluate the overall effect of association between dental care and TTI markers, a meta-analysis for the different TTI's was conducted. Only outcomes for which data from several studies was available were combined in a meta-analysis. Where possible, raw data was used to calculate the overall effect size and p-value and heterogeneity was assessed by visual inspection of the forest plot and by using the I^2 statistic and the Chi^2-test. There is significant heterogeneity if I^2 is higher than 60% and if $p<0.10$. For studies where no raw data was available, we constructed a random-effects model using the generic inverse variance method by calculating the log[OR] and its corresponding standard error (= [upper limit of the 95% CI – lower limit of the 95%CI]). For each outcome (hepatitis B and hepatitis C) all effect measures were pooled (one effect measure per study). If heterogeneity was found, a subgroup analysis according to type of dental treatment was done in order to try to explain the heterogeneity. Review Manager Software was used for all statistical analyses (22).

Results

Study identification and selection

The study identification process took place in two phases. Figure 2 and 3 provide a flowchart of the identification and selection of studies. In the first phase (systematic review selection) a total of 1014 studies were identified of which 142 duplicates were removed. Two reviewers independently screened remaining articles implementing in- and exclusion criteria. Most exclusions were based on ineligible study design (240 out of 293 for reviewer 1 and 33 out of 60 for reviewer 2) or ineligible intervention (35 out of 293 for reviewer 1 and 19 out of 60 for reviewer 2). After discussion between the two reviewers a total of 18 systematic reviews were withheld from which 14 individual studies were selected. The selection was obtained by screening the full reference lists of the included SR's and the first 20 articles from the 'similar articles' tab in the Medline database. In the second phase (observational study selection) a total of 3953 studies were identified of which 1100 duplicates were removed. After screening and discussion between the two reviewers a total of 6 observational studies were withheld. Among the excluded studies there were many excluded based on study design (cross-sectional studies, letters etc.) and intervention/risk factor (many did not study dental care as a risk factor) (see list of excluded studies in Appendices 2 and 3).

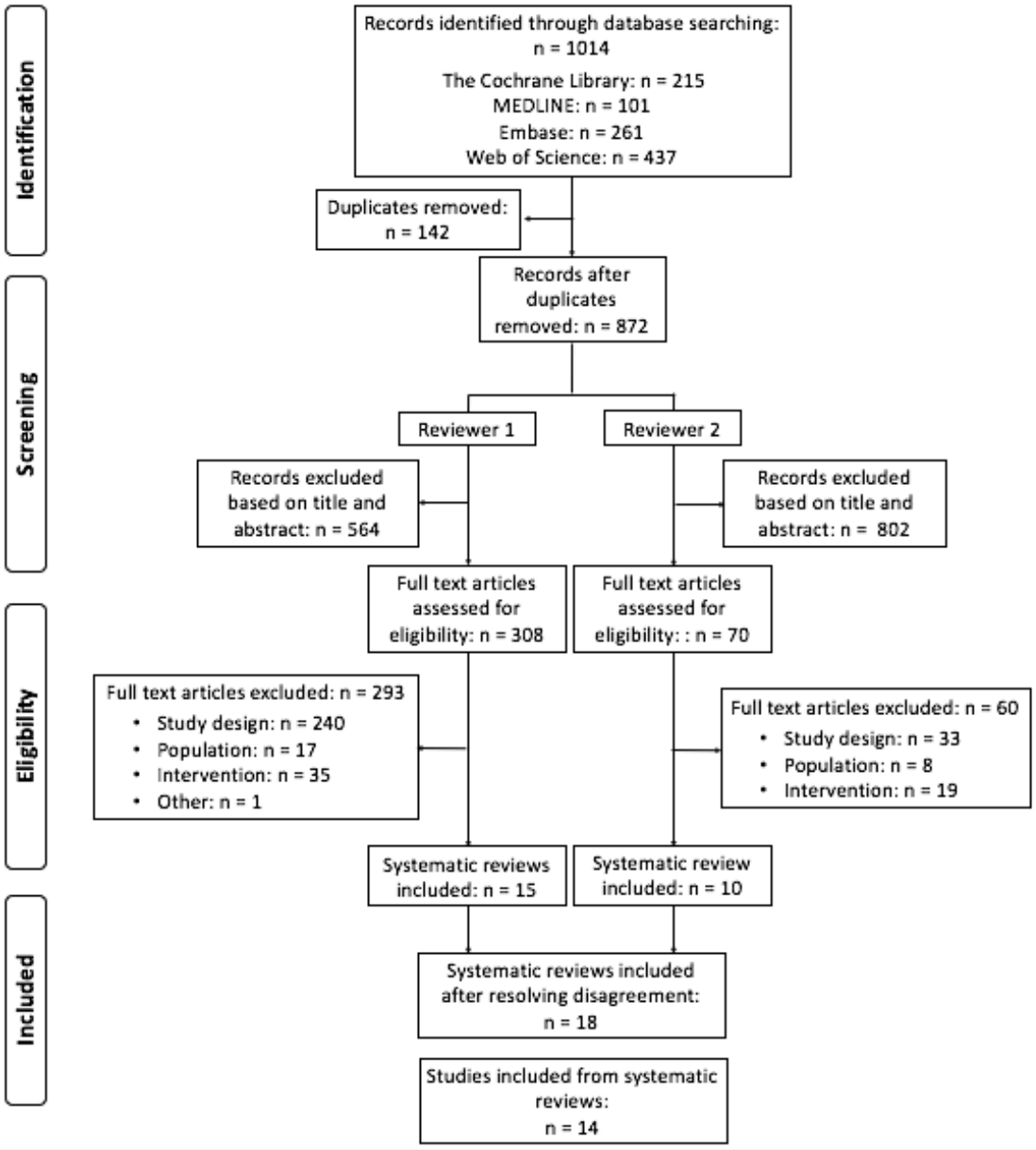


Figure 2: Flowchart of phase one: systematic review selection

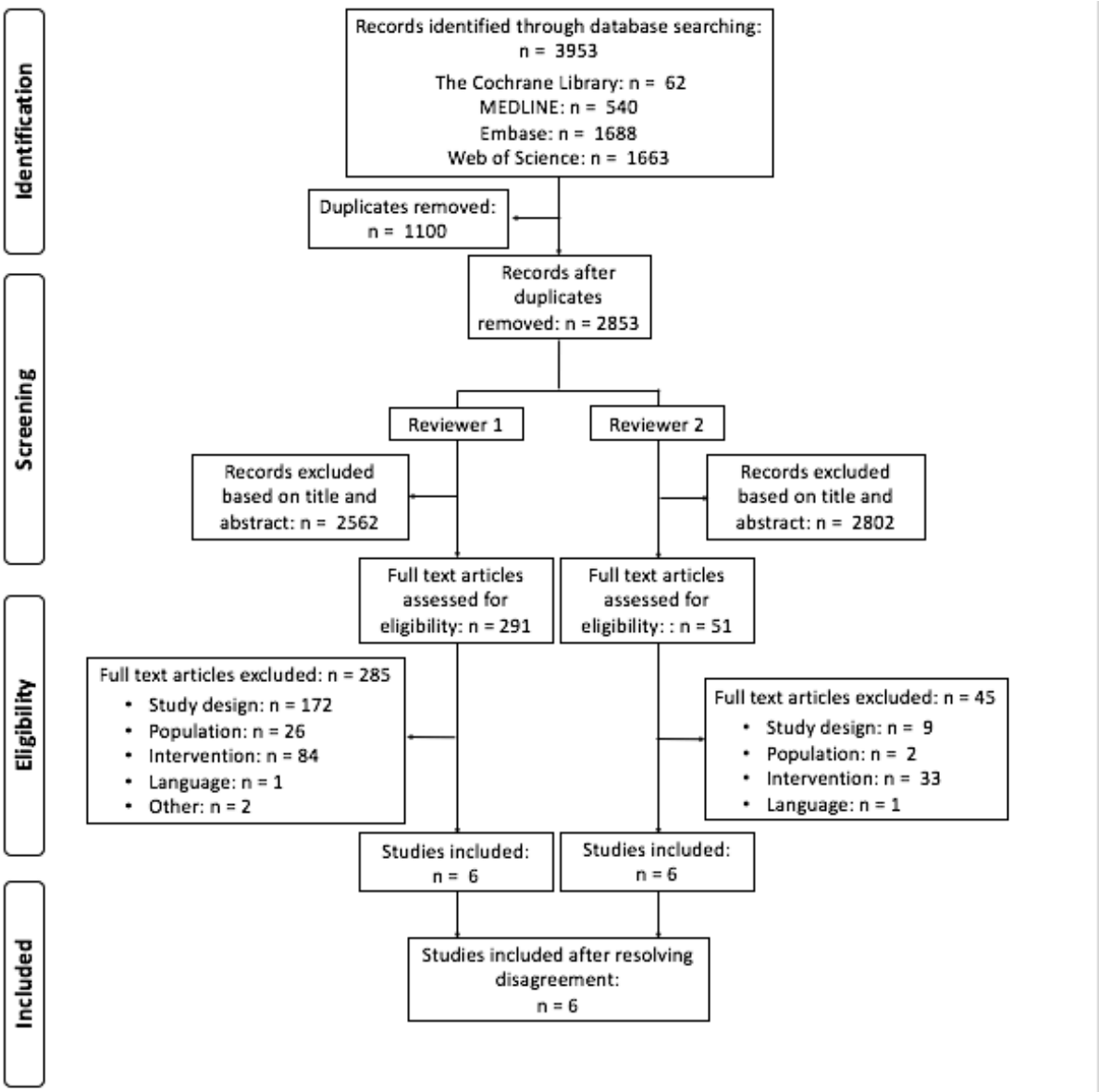


Figure 3: Flowchart of phase two: update of the systematic reviews

Study characteristics

An overview of study characteristics can be found in Appendix 4.

Hepatitis B

All 6 studies concerning hepatitis B were observational case-control studies including a total of 5815 participants (24-29). Two studies came from a high-income country, as defined by the World Bank (24,28,30), the other 4 were from low- to middle-income countries (25,26,27,29). The risk factor analysed was in one study specified as dental cleaning (25), 2 did not specify 'dental treatment' further (26,29) and 3 narrowed 'dental treatment' down to treatment executed by a dentist (24,28) or in dental clinics (27). The timeframe used to study exposure was in 2 studies defined as 'ever', thus a lifetime exposure (25,26), in the study of Younus et al is was 5 years prior to completing the questionnaire (28). In the remaining 3 studies the questioned time period for exposure was unclear (24,27,29). It must be noted that in the study of Younus et al data for hepatitis B and hepatitis C infection were combined.

Hepatitis C

There were 14 studies included that studied hepatitis C, all of them were observational case-control studies, including a total of 77533 participants (25,28,31-42). Four studies came from high-income countries, as defined by the World Bank (28,30,33,37,39), the others were from low- to middle income countries (25,31,32,34-36,38,40-42). The studied risk factor was in a few studies well defined: dental cleaning by Huang et al, invasive dental treatment (with haemorrhage) by Mitrovic et al, tooth extraction by Thaikruea et al and both tooth extraction and teeth cleaned by Kerzman et al and Murphy et al (25,37-39,41). Three studies narrowed the risk factor down to dental treatment executed by a dentist (28,31,36). The rest of the studies did not further specify the risk factor (32-35,40,42). The timeframe used to study exposure was in 2 studies defined as 'ever', thus a lifetime exposure (25,39), the study of Czerwinski et al implemented a time period of 6 months before diagnosis of infection (33) and Younus et al 5 years prior to completing the questionnaire (28). In the remaining 10 studies the questioned time period for exposure was unclear (31,32,34-38,40-42). It must be noted that in the study of Younus et al data for hepatitis B and hepatitis C infection were combined (28).

HIV

There was 1 observational case-control study included on HIV infection, comprising 726 individuals (43). The study was conducted in China, a country defined as a low- to middle-income country by the World Bank (30). The risk factor was defined as dental cleaning and the time frame used to study exposure was a lifetime (ever).

HTLV-1

One observational case-control study was included on HTLV-1 infection and included a total population of 1092 individuals (44). Iran, the country where the study was conducted is defined as a low- to middle-income country by the World Bank (30). The risk factor was defined as invasive dental treatment (with bleeding). The questioned time period for exposure was unclear.

Study results

An overview of the individual study data can be found in Appendix 5.

Hepatitis B

Data for 5 observational studies about hepatitis B were combined in a meta-analysis. However, large heterogeneity was found (I^2=83%, p=0.0001). We performed a subgroup analysis, where data for dental treatment and dental cleaning were analyzed in two different subgroups (figure 4). The subgroup analysis resulted in a decrease of heterogeneity. For dental treatment, 4 studies were combined, resulting in a statistically significant increased risk of hepatitis B after dental treatment (OR 1.79, 95%CI [1.48;2.18], p<0.00001) (24,26,27,29). For dental cleaning, a statistically significant increased risk of hepatitis B could not be demonstrated (25). Evidence is of very low quality and results cannot be considered precise due to low number of events and/or large variability of results.

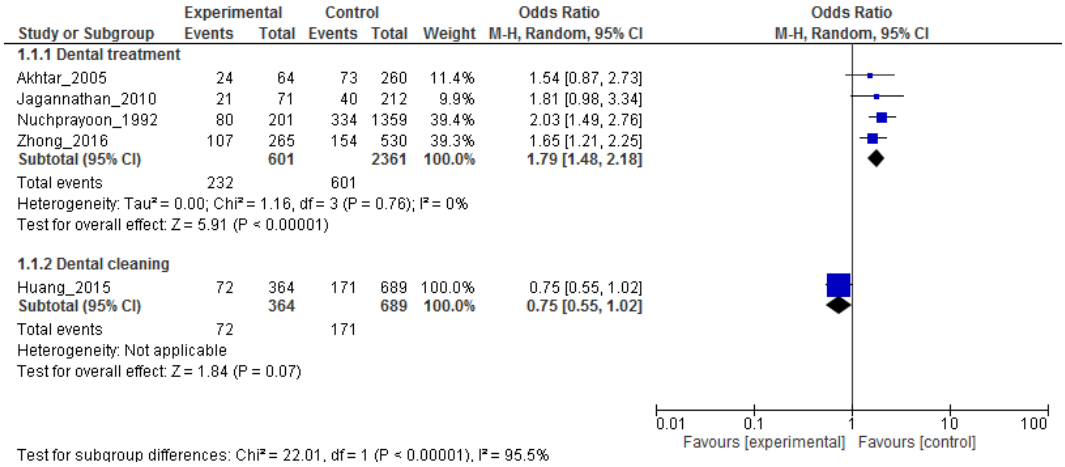


Figure 4: meta-analysis for hepatitis B (HbsAg detection).

Hepatitis C

13 studies for hepatitis C infection were combined in a meta-analysis. (25,31-42) However, large heterogeneity was found (I^2=95%, p<0.00001). Subgroups were created per treatment type (dental treatment, tooth extraction, teeth cleaning). Only for tooth extraction, low heterogeneity was identified, and results show a statistically significantly increased risk of hepatitis C after tooth extraction (OR 1.47, 95%CI [1.11;1.96], p=0.007) (see figure 5). Evidence is of very low quality and results cannot be considered precise due to low number of events and/or large variability of results.
For dental treatment and teeth cleaning, heterogeneity was still large (I^2= 96% and 90% respectively). Analyzing studies according to income of the country according to the World Bank did not decrease heterogeneity (30). Therefore, results for these studies are discussed separately.

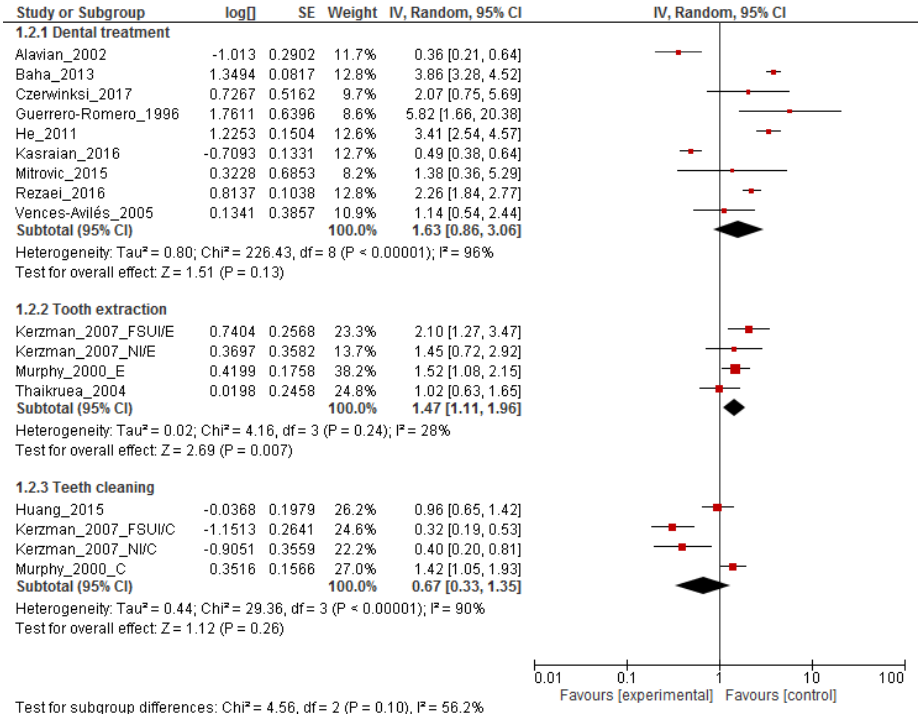


Figure 5: meta-analysis for hepatitis C (anti-HCV antibody detection.

There is conflicting evidence concerning dental treatment. Baha et al (OR 3.86, 95%CI [3.28;4.52], p<0.00001), Guerrero-Romero et al (OR 5.82, 95%CI [1.66;20.38], p=0.006), He et al (aOR 4.76, 95%CI [2.00-8.41], p<0.0001) and Rezaei et al (OR 2.53, 95%CI [2.02;3.16], p<0.001) showed a statistically significant increased risk of hepatitis C after dental treatment (32,34,35,40). However, two studies showed a statistically significant decrease of hepatitis C after dental treatment: Alavian et al (OR 0.36, 95%CI [0.21;0.64], p=0.0005) and Kasraian et al (OR 0.492, 95%CI [0.379;0.637], p<0.0001) (31,36). Furthermore, in 3 studies, a statistically significant increased risk of hepatitis C in case of dental treatment, compared to no dental treatment, could not be demonstrated (33,38,42).

There is conflicting evidence concerning teeth cleaning. Kerzman et al studied two different blood donor sub-populations finding a statistically significant decreased risk for hepatitis C in both subpopulations after teeth cleaning (aOR 0.4, 95%CI [0.2;0.8], p<0.05 and aOR 0.3, 95%CI [0.2;0.6], p<0.05, respectively (37). Murphy et al found a statistically significant increased risk of hepatitis C infection after having teeth cleaned (OR 1.42, 95%CI [1.05;1.93], p=0.02) (39). Furthermore, Huang et al could not demonstrate a statistically significant increased risk of hepatitis C in case of teeth cleaning (OR 0.96, 95%CI [0.65;1.42], p=0.83) (25).

Hepatitis B and/or hepatitis C

There was 1 study conducted by Younus et al that analyzed the risk of infection with hepatitis B and/or hepatitis C after dental treatment by a dentist (28). Data for both infections were combined. The overall analysis did not yield statistically significant results (OR 1.04, 95%CI [0.70;1.54], p=0.86) and thus could not demonstrate an increased risk of infection after dental treatment. Evidence is of very low quality and results cannot be considered precise due to low number of events and/or large variability of results.

HIV

The one relevant study concerning HIV infection after dental treatment was conducted by Wang et al. They studied a lifetime exposure to dental cleaning as a risk factor for HIV infection but a statistically significant increased risk of HIV after dental treatment could not be demonstrated (OR 1.05, 95%CI [0.61;1.79], p=0.87). Evidence is of very low quality and results cannot be considered precise due to low number of events and/or large variability of results (43).

HTLV-1

The study conducted by Hedayati-Moghaddam et al looked at the risk factor invasive dental treatment but a statistically significant increased risk of HTLV-1 could not be demonstrated (OR 1.33, 95%CI [0.96;1.86], p=0.09). Evidence is of very low quality and results cannot be considered precise due to large variability of results (44).

Quality of evidence

The quality of the body of evidence is determined following the GRADE approach. All included studies for the different TTI's were observational studies, hence with initial low quality of evidence. Thorough information about the risk of bias of the different studies can be found in Appendix 6.

Hepatitis B

In 3 out of 5 studies we found inappropriate eligibility criteria: there was insufficient matching between cases and controls (25-27). All studies showed to have used appropriate methods for outcome variables (same laboratory testing was carried out for both cases and controls) but many (80%) showed unclear or inadequate methods for exposure, meaning insufficient or no blinding of interviewing personnel or participants which could result in reporting bias (24,26,27,29). 3 Studies (60%) did not (sufficiently) control for confounding factors, thus did not thoroughly investigate the possibility of influence of other factors on outcome (25-27). There were no limitations concerning follow-up. Among other limitations we found Huang et al to show a difference in response rate between cases and controls, Jagannathan et al were unclear about exclusion factors and had a possible recall bias (25,26). The majority of studies (80%) had imprecision of results due to a low number of events (24-26,29) and Zhong et al also had imprecision due to a large variability of results (29). We did not find any evidence of publication bias. Overall, because of limitations in study design and imprecision, the quality of the body of evidence for hepatitis B was downgraded from low to very low.

Hepatitis C

A minority of studies for hepatitis C had inappropriate or unclear eligibility criteria (23%): either no information on demographic data of cases and controls was given (42) or there was insufficient matching between the two groups (25,37). All studies showed to have used appropriate methods for outcome variables (same laboratory testing was carried out for both cases and controls). 46% of the studies had unclear (32,34,40) or inappropriate methods for exposure (31,33,37) with no or insufficient blinding. We also found the majority of studies (77%) to not have controlled for confounding factors (25,31-34,38,40-42) or could not find sufficient information (36). There were no limitations concerning follow-up. We found 5 studies (38%) to also have other limitations concerning e.g. population and response rates, for which the details can be found in Appendix 6. After evaluating the studies for imprecision, we found 8 studies (62%) to show imprecision due to low number of events or a limited sample size (25,33-39) and 6 studies due to a large variability of results (25,33,38,39,41,42). Kerzman et al has imprecision due to a limited sample size for one subpopulation (Native Israeli's) because they did not reach the sample size calculated by power analysis (37). In two studies there was a lack of raw data (36,41). Overall, because of limitations in study design and imprecision, the quality of the body of evidence for hepatitis C was downgraded from low to very low.

Hepatitis B and/or hepatitis C

The study of Younus et al showed a limitation in methods for exposure: it was not clear if participants or interviewers were blinded to their serology status, therefore risking reporting bias (28). We found imprecision due to limited sample size and a large variability of results. There were no other limitations. Overall, the quality of the body of evidence for hepatitis B and/or C was downgraded from low to very low.

HIV

The only study we included about HIV had several limitations (43). There were inappropriate eligibility criteria because of significant differences between cases and controls (e.g. age, education, gender) and no controlling for confounding factors. All four blood centers from which this study's data are derived are located in high-prevalence areas for HIV which could mean selection bias. All participants received payment for participation which could influence their answers on the questionnaire and

thus could mean reporting bias. We also found limitations due to imprecision in the area of limited sample size and large variability of results (43). Due to limitations in study design and imprecision, the quality of the body of evidence for HIV was downgraded from low to very low.

HTLV-1

We found the study conducted by Hedayati-Moghaddam et al to have a possible reporting bias due to lack of blinding of interviewing personnel. Also, there was no controlling for confounding factors. The study shows imprecision due to a large variability of results. There are no other limitations (44). Due to limitations in study design and imprecision, the quality of the body of evidence for HTLV-1 was downgraded from low to very low.

Discussion

This systematic review investigates the association between dental treatment and different TTI's in blood donors. So far evidence about the transmission of TTI's through dental care in the blood donating population has been scarce. Therefore currently, deferral of blood donors after dental care is based on the precautionary principle. The principle implies that in the interest of public health, risk management actions should be taken even in the absence of certainty about risk, thus aiming for maximum safety (4). Since it is known that TTI's in blood donors pose a serious threat to public health, even in the absence of certainty about risk, precautionary measures must be taken. Therefore, blood donors are deferred after dental care. Currently, the amount of time blood donors are deferred in Flanders depends on the type of dental treatment, ranging from no deferral in case of a regular check-up up to 7 days after more invasive dental care (e.g. tooth extraction) (5). The current guidelines for deferral are based only on common sense and expert opinions. The aim of this systematic review is to summarize the currently published scientific evidence about this topic. To our knowledge, this is the first systematic review investigating the association between dental treatment and possible transfusion-transmissible infections in blood donors.

There have not been many publications on dental care and the risk of TTI in blood donors. Out of the 4967 potentially relevant studies, we retained only 19 that met the inclusion criteria. The TTI's we were able to study are HBV, HCV, HIV and HTLV-1. No studies were identified concerning infections with herpes simplex, herpes zoster, mycobacterium, pseudomonas, legionella, staphylococcus, streptococcus, MRSA, ESBL and CPE. We found, by means of conducting a meta-analysis, that the type of dental treatment is of big importance to the evidence (it hereby decreases heterogeneity, decreasing variation in study outcomes). Most studies investigated 'dental treatment' without any specification of the type of treatment. Some studies specified tooth extraction or teeth/dental cleaning. For HBV infection, there was limited evidence that demonstrated an increased risk after dental treatment, no association could be demonstrated for dental cleaning. When studying HCV infection, there was limited evidence that demonstrated an increased risk after tooth extraction. For dental treatment and for teeth cleaning the evidence was conflicting. The meta-analysis showed a large heterogeneity in results which could not be clarified by subgroup analysis based on country income or prevalence of the infectious parameter. A possible explanation could be the timeframe used to study exposure and the frequency of possible exposure to infectious agents.
Some studies show a protective effect of teeth cleaning, although other studies contradict this. It could however be hypothesized that when dental cleaning or dental care is performed on a regular basis and oral health is maintained, a decrease in invasive dental treatment could be expected, therefore leading to a decrease in TTI. Though, if dental treatment is postponed, more complex and invasive treatment may be needed with an increased risk of TTI. A study by Lockhart et al corroborates this hypothesis and demonstrates that indeed, more invasive treatments do increase the risk of bacteremia, but only if the treatment causes mucosal lesions in the oral cavity (45).

For HIV and HTLV-1 infection there was limited evidence that could not demonstrate a statistically significant increased risk of infection after dental treatment. It is important to emphasize that the quality of the body of evidence can be considered as very low because of the study type (observational studies), limitations in study design and imprecision due to low number of events, large variability of results and/or lack of data. This accounts to all the different TTI's investigated.

The systematic review we conducted has some important qualities and limitations. The review follows a rigorous methodology, including sensitive search strategies in 4 different scientific databases, comprehensive inclusion- and exclusion criteria and independent screening and analysis by two reviewers. By means of a meta-analysis with appropriate subgroup analyses, we enabled quantification of the associations and were able to increase statistical power and precision. A major limitation of this systematic review is that we were only able to include observational studies which by definition have a low quality of evidence. The included studies had several limitations (imprecision, inappropriate eligibility criteria, inappropriate methods for exposure, no controlling for confounding factors, other). A second limitation is the poor definition of the types of dental treatment in the included studies, therefore invasiveness of dental treatment was often hard to assess and the effect on risk of TTI was not interpretable. To improve the quality of evidence regarding this topic future research needs to be done. Experimental studies

could clarify the causal relationship between dental treatment and TTI's, but because of ethical implications on studies performed in humans we rather suggest more observational studies including a focus on the timeframe, frequency of exposure to dental care and the invasiveness of dental treatment performed.

In order to replace the current precautionary, principle-driven deferral policies for blood donors by evidence-based deferral policies, we need more high-quality primary research studies.

In conclusion, the evidence presented in this systematic review is of very low quality but does show an association between hepatitis B virus infection and dental treatment. Furthermore, limited evidence shows an increased risk of hepatitis C after tooth extraction. There seems to be a greater association with an increase of invasiveness of treatment. However, there is conflicting evidence concerning the association of dental treatment or teeth cleaning and hepatitis C. Additionally, an increased risk of HIV or HTLV-1 after dental treatment could not be demonstrated. These results are not sufficient to give an indication of the optimal deferral time after dental treatment. The evidence presented in this study corroborates the current precautionary principle of deferral of blood donors after dental care.

References:

1. Rode Kruis Vlaanderen. *Bloedproducten bewaren in perfecte omstandigheden.* Visited 25/04/2017: http://www.rodekruis.be/wat-doen-we/bloedvoorziening/de-weg-van-het-bloed/#5.-bloedproduct-bewaren-in-perfecte-omstandigheden

2. Rode Kruis Vlaanderen. *Our mission.* Visited 25/04/2017: http://www.rodekruis.be/en/who-are-we/we-help-people/our-mission/

3. Rode Kruis Vlaanderen. *Jaarverslag 2017.* Visited 25/04/2017: https://www.rodekruis.be/jaarverslagen/download/

4. Borra V, Vandewalle G, Van Remoortel H, Compernolle V, De Buck E, Vandekerckhove P. Blood donor deferral: time for change? An evidence-based analysis. International Journal of Clinical Transfusion Medicine 2016, 4: 55-66.

5: Rode Kruis Vlaanderen. *Mag ik bloed of plasma geven?* Visited 23/04/2018: https://www.rodekruis.be/wat-kan-jij-doen/geef-bloed-of-plasma/mag-ik-geven/#6_tandartsbezoek

6. Claridge JA, Fabian TC. History and development of evidence-based medicine. World J Surg. 2005 Apr; 29, 547-553.

7. Straus, S. E., Richardson, W. S., Glasziou, P., & Haynes, R. B. Evidence-Based Medicine: How to Practice and Teach EBM. 3rd ed. Edinburgh (UK): Elsevier Churchill Livingstone; 2005.

8. Morago P. Evidence-based practice: from medicine to social work. European Journal of Social Work 2006, 9(4): 461–477.

9. AGREE Enterprise website. Visited 21/06/2017: https://www.agreetrust.org

10. Rode Kruis Vlaanderen. *Centrum voor Evidence-Based Practice.* Visited on 21/06/2017: http://www.rodekruis.be/wie-zijn-we/onderzoek/evidence-based-practice/

11. Bihl F, Castelli D, Marincola F, Dodd RY, Brander C. Transfusion-transmitted infections. J Transl Med 2007, 5: 25.

12. Wagner SJ. Transfusion-trasmitted bacterial infections: risks, sources and interventions. Vox Sang. 2004 Jan; 86: 157-163.

13. Fessehaye N, Naik D, Fessehaye T. Transfusion transmitted infections - A retrospective analysis from the National Blood Transfusion Service in Eritrea. Pan African Medical Journal 2011, 9: 40.

14. Laheij AMGA et al. Healthcare-associated viral and bacterial infections in dentistry. J Oral Microbiol. 2012, 4: 10.

15: Sebastiani FR, Dym H, Kirpalani T. Infection Control in the Dental Office. Dent Clin North Am 2017, 61(2): 435-457.

16: Ricci ML, Fontana S, Pinci F, Fiumana E, Pedna MF, Farolfi P, Sabattini MA, Scaturro M. Pneumonia associated with a dental unit waterline. Lancet 2012, 379(9816):684.

17: Atlas RM, Williams JF, Huntington MK. Legionella contamination of dental-unit waters. Appl Environ Microbiol 1995, 61(4):1208-13.

18: Gordon B, Burke F, Bagg J, Marlborough H, McHugh E. Systematic review of adherence to infection control guidelines in dentistry. J Dent 2001, 29: 509-516.

19: Cleveland JL, Gray SK, Harte JA, Robison VA, Moorman AC, Gooch BF. Transmission of blood-borne pathogens in US dental health care settings. J Am Dent Assoc 2016, 147(9): 729–738.

20: Anders PL, Townsend NE, Davis EL, McCall WD. Observed infection control compliance in a dental school: A natural experiment. Am J Infect Control 2016, 44(9): e153-e156.

21. Endnote program. Accessible through: http://endnote.com

22. Review Manager (RevMan) [Computer program]. Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.

23. Atkins D, Best D, Briss PA, Eccles M, Falck-Ytter Y, Flottorp S, et al. Grading quality of evidence and strength of recommendations. BMJ. 2004;328(7454):1490

24. Akhtar S, Younus M, Adil S, Hassan F, Jafri SH. Epidemiologic study of chronic hepatitis B virus infection in male volunteer blood donors in Karachi, Pakistan. BMC Gastroenterol 2005, 5: 26.

25. Huang Y, Guo N, Yu Q, Lv Y, Ma H, Yun Z et al. Risk factors for hepatitis B and C infection among blood donors in five Chinese blood centers. Transfusion 2015, 55(2): 388-94.

26. Jagannathan L, Chaturvedi M, Mudaliar S, Kamaladoss T, Rice M, Murphy EL. Risk factors for chronic hepatitis B virus infection among blood donors in Bangalore, India. Transfusion medicine 2010, 20(6): 414-420.

27. Nuchprayoon T, Chumnijarakij T. Risk factors for hepatitis B carrier status among blood donors of the National Blood Center, Thai Red Cross Society. Southeast Asian J Trop Med Public Health 1992, 23(2): 246-53.

28. Younus M, Siddiqi AE, Akhtar S. Reassessment of selected healthcare associated risk factors for HBV and HCV infections among volunteer blood donors, Karachi, Pakistan. Cent Eur J Public Health 2009, 17(1): 31-5.

29. Zhong L, Xi G, Zhang L, Liu S, Wan L, Yu L et al. The estimation of prevalence and risk factors of hepatitis B virus infection among blood donors in Chengdu, China. J Med Virol 2016, 88(2): 260-7.

30. World Bank data. *Low- and middle-income countries.* Visited 11/03/2018: https://data.worldbank.org/income-level/low-and-middle-income

31. Alavian SM, Gholami B, Masarrat S. Hepatitis C risk factors in Iranian volunteer blood donors: a case-control study. Journal of Gastroenterology and Hepatology 2002, 17: 1092-1097.

32. Baha W, Foullous A, Dersi N, et al. Prevalence and risk factors of hepatitis B and C virus infections among the general population and blood donors in Morocco. BMC Public Health 2013, 13: 50.

33. Czerwinski M, Grabarczyk P, Stepien M, Kubicka-Russel D, Tkaczuk K, Brojer E et al. What weighs more-low compliance with self-deferral or minor medical procedures? Explaining the high rate of hepatitis C virus window-period donations in Poland. Transfusion 2017, 57(8): 1998-2006.

34. Guerrero-Romero JF, Castaneda A, Rodriguez-Moran M. Prevalencia y factores de riesgo asociados a hepatitis C en donadores de sangre en el municipio de Durango, Mexico.Salud Publica Mex 1996, 38: 94-100.

35. He Y, Zhang J, Zhong L, Chen X, Liu HM, Wan LK et al. Prevalence and risk factors for hepatitis C virus infection among blood donors in Chengdu, China. J Med Virol 2011, 83: 616-621.

36. Kasraian L, Negarestani N, Karimi MH, Dehbidi S. A Survey on the Prevalence of Depression in Blood Donors with Hepatitis C in Shiraz. Hepatitis Monthly 2016, 16(11): e31080.

37. Kerzman H, Green MS, Shinar E. Risk factors for hepatitis C virus infection among blood donors in Israel: a case-control study between native Israelis and immigrants from the former Soviet Union. Transfusion 2007, 47(7): 1189-96.

38. Mitrovic N, Delic D, Markovic-Denic L, Jovicic M, Popovic N, Bojovic K et al. Seroprevalence and risk factors for hepatitis C virus infection among blood donors in Serbia: A multicentre study. Dig Liver Dis 2015, 47(7): 572-6.

39. Murphy EL, Bryzman SM, Glynn SA, Ameti DI, Thomson RA, Williams AE et al. Risk factors for hepatitis C virus infection in United States blood donors. NHLBI Retrovirus Epidemiology Donor Study (REDS). Hepatology 2000, 31(3): 756-62.

40. Rezaei N, Amini-Kafiabad S, Maghsudlu M, Abolghasemi H. Risk factor analysis of hepatitis C virus seropositivity in Iranian blood donors: a case-control study. Transfusion 2016, 56(7): 1891-8.

41. Thaikruea L, Thongsawat S, Maneekarn N, Netski D, Thomas DL, Nelson KE. Risk factors for hepatitis C virus infection among blood donors in northern Thailand. Transfusion 2004, 44(10): 1433-40.

42. Vences-Aviles MA, Gonzalez-Bravo F. Diagnostico de la infeccion por el virus de le hepatitis C. Rev Mex Patol Clin 2005, 52(1): 6-12.

43. Wang J, Liu J, Huang Y, et al. An Analysis of Risk Factors for HIV Infection among Chinese Blood Donors. Transfusion 2013, 53(0 0): 2431-2440.

44. Hedayati-Moghaddam MR, Tehranian F, Bayati M. Human T-Lymphotropic Virus Type I (HTLV-1) Infection among Iranian Blood Donors: First Case-Control Study on the Risk Factors. Viruses 2015, 7(11): 5736-45.

45. Lockhart PB, Brennan MT, Sasser HC, Fox PC, Paster BJ, Bahrani-Mougeot FK. Bacteremia Associated with Tooth Brushing and Dental Extraction. Circulation. Circulation 2008, 117(24):3118-3125.

Appendices

Appendix 1: Complete search strategies

Phase 1: search strategies used to identify published systematic reviews regarding blood donor population and risk factors for transfusion transmittable infections (search date 10/01/2017):

The Cochrane Library (systematic reviews) using the following search strategy:
1. [mh "Blood Donors"] OR "blood don*":ti,ab,kw OR [mh "Blood Banks"] OR "blood bank":ti,ab,kw OR "blood banks":ti,ab,kw OR "blood service*":ti,ab,kw OR "blood center*":ti,ab,kw OR "blood centre*":ti,ab,kw OR "transfusion service*":ti,ab,kw OR "transfusion cent*":ti,ab,kw OR "blood withdraw*":ti,ab,kw
2. [mh "Bacterial Infections"] OR bacterial:ti,ab,kw OR bacteriaemia:ti,ab,kw OR bacteriemia:ti,ab,kw OR bacteremia:ti,ab,kw OR [mh "Virus Diseases"] OR viral:ti,ab,kw OR virus:ti,ab,kw OR viremia:ti,ab,kw OR viraemia:ti,ab,kw OR [mh "Sepsis"] OR [mh "Toxemia"] OR sepsis:ti,ab,kw OR toxemia:ti,ab,kw OR toxaemia:ti,ab,kw OR septicaemia:ti,ab,kw OR septicemia:ti,ab,kw OR "blood poisoning":ti,ab,kw OR [mh "Herpes Simplex"] OR "herpes simplex":ti,ab,kw OR HSV:ti,ab,kw OR [mh "Herpesvirus 3, Human"] OR [mh "herpes zoster"] OR "varicella zoster":ti,ab,kw OR VZV:ti,ab,kw OR [mh "HIV"] OR "human immunodeficiency virus":ti,ab,kw OR HIV:ti,ab,kw OR [mh "Hepatitis"] OR hepatitis:ti,ab,kw OR HBV:ti,ab,kw OR HCV:ti,ab,kw OR [mh "Mycobacterium"] OR mycobacterium:ti,ab,kw OR [mh "Tuberculosis"] OR tuberculosis:ti,ab,kw OR TBC:ti,ab,kw OR TB:ti,ab,kw OR [mh "Pseudomonas"] OR pseudomonas:ti,ab,kw OR [mh "Legionella"] OR legionella:ti,ab,kw OR [mh "Staphylococcus"] OR [mh "Streptococcus"] OR staphylococc*: ti,ab,kw OR streptococc*:ti,ab,kw OR [mh "Methicillin-Resistant Staphylococcus aureus"] OR MRSA:ti,ab,kw OR [mh "Enterobacteriaceae"] OR enterobacteria*:ti,ab,kw OR ESBL:ti,ab,kw OR CPE:ti,ab,kw
3. #1 AND #2

MEDLINE (via PubMed interface) for systematic reviews using the following search strategy:
1. "Blood Donors"[Mesh] OR blood don*[TIAB] OR "Blood Banks"[Mesh] OR blood bank*[TIAB] OR blood service*[TIAB] OR blood center*[TIAB] OR blood centre*[TIAB] OR transfusion service*[TIAB] OR transfusion cent*[TIAB] OR "blood withdraw*"[TIAB]
2. "Bacterial Infections"[Mesh] OR "Virus Diseases"[Mesh] OR "Sepsis"[Mesh] OR "Toxemia"[Mesh] OR "bacterial infection*"[TIAB] OR sepsis[TIAB] OR bacterial[TIAB] OR bacteriaemia[TIAB] OR bacteriemia[TIAB] OR bacteremia[TIAB] OR viral[TIAB] OR virus[TIAB] OR viremia[TIAB] OR viraemia[TIAB] OR septicaemia[TIAB] OR septicemia[TIAB] OR toxemia[TIAB] OR toxaemia[TIAB] OR "blood poisoning"[TIAB] OR "herpes simplex"[TIAB] OR "Herpes Simplex"[Mesh] OR HSV[TIAB] OR "varicella zoster"[TIAB] OR "Herpesvirus 3, Human"[Mesh] OR "herpes zoster"[Mesh] OR VZV[TIAB] OR "human immunodeficiency virus"[TIAB] OR HIV[TIAB] OR "HIV"[Mesh] OR hepatitis[TIAB] OR "Hepatitis"[Mesh] OR HBV[TIAB] OR HCV[TIAB] OR tuberculosis[TIAB] OR "Tuberculosis"[Mesh] OR TBC[TIAB] OR TB[TIAB] OR mycobacterium[TIAB] OR "Mycobacterium"[Mesh] OR pseudomonas[TIAB] OR "Pseudomonas"[Mesh] OR legionella[TIAB] OR "Legionella"[Mesh] OR "methicillin-resistant staphylococcus aureus"[Mesh] OR staphylococc*[TIAB] OR "Staphylococcus"[Mesh] OR "Streptococcus"[Mesh] OR streptococc*[TIAB] OR MRSA[TIAB] OR enterobacteria*[TIAB] OR "Enterobacteriaceae"[Mesh] OR ESBL[TIAB] OR "carbapenemase-producing gram-negative bacteria"[TIAB] OR CPE[TIAB]
3. Systematic review filter: ((((((((((Meta-Analysis as Topic[Mesh])) OR ((meta analy*[TIAB]))) OR ((metaanaly*[TIAB]))) OR ((Meta-Analysis[Publication Type]))) OR ((systematic review*[TIAB] OR systematic overview*[TIAB]))) OR ((Review Literature as Topic[Mesh])))) OR ((cochrane[TIAB] OR embase[TIAB] OR psychlit[TIAB] OR psyclit[TIAB] OR psychinfo[TIAB] OR psycinfo[TIAB] OR cinahl[TIAB] OR cinhal[TIAB] OR science citation index[TIAB] OR bids[TIAB] OR cancerlit[TIAB]))) OR ((reference list*[TIAB] OR bibliograph*[TIAB] OR hand-search*[TIAB] OR relevant journals[TIAB] OR manual search*[TIAB]))) OR ((((selection criteria[TIAB] OR data extraction[TIAB])) AND ((Review[PT]))))) NOT ((Comment[PT] OR Letter[PT] OR Editorial[PT] OR animal[Mesh] NOT (animal[Mesh] AND human[Mesh])))
4. 1-3 AND

Embase (via Embase.com interface) for systematic reviews using the following search strategy:
1. 'blood donor'/exp OR (blood NEXT/1 don*):ab,ti OR 'blood bank'/exp OR 'blood bank':ab,ti OR 'blood banks':ab,ti OR (blood NEXT/1 service*):ab,ti OR (blood NEXT/1 (center* OR centre*)):ab,ti OR (transfusion NEXT/1 service*):ab,ti OR (transfusion NEXT/1 cent*):ab,ti OR 'blood withdraw*':ab,ti
2. 'Bacterial Infection'/exp OR bacterial:ab,ti OR bacteriaemia:ab,ti OR bacteriemia:ab,ti OR bacteremia:ab,ti OR 'Virus Infection'/exp OR viral:ab,ti OR virus:ab,ti OR viremia:ab,ti OR viraemia:ab,ti OR 'Sepsis'/exp OR 'Toxemia'/exp OR sepsis:ab,ti OR toxemia:ab,ti OR toxaemia:ab,ti OR septicaemia:ab,ti OR septicemia:ab,ti OR 'blood poisoning':ab,ti OR 'Herpes Simplex'/exp OR 'herpes simplex':ab,ti OR HSV:ab,ti OR 'Varicella Zoster virus'/exp OR 'herpes zoster'/exp OR 'varicella zoster':ab,ti OR VZV:ab,ti OR 'Human immunodeficiency virus'/exp OR 'Human Immunodeficiency Virus':ab,ti OR HIV:ab,ti OR 'Hepatitis'/exp OR hepatitis:ab,ti OR HBV:ab,ti OR HCV:ab,ti OR 'Mycobacterium'/exp OR mycobacterium:ab,ti OR 'Tuberculosis'/exp OR tuberculosis:ab,ti OR TBC:ab,ti OR TB:ab,ti OR 'Pseudomonas'/exp OR pseudomonas:ab,ti OR 'Legionella'/exp OR legionella:ab,ti OR 'Staphylococcus'/exp OR 'Streptococcus'/exp OR staphylococc*:ab,ti OR streptococc*:ab,ti OR 'Methicillin Resistant Staphylococcus aureus'/exp OR MRSA:ab,ti OR 'carbapenemase producing Enterobacteriaceae'/exp OR 'Enterobacteriaceae'/exp OR enterobacteria*:ab,ti OR ESBL:ab,ti OR CPE:ab,ti
3. Systematic review filter: 'meta analysis (topic)'/exp OR 'meta analysis'/exp OR 'meta analysis':ab,ti OR 'meta-analysis':ab,ti OR 'systematic review (topic)'/exp OR 'systematic review'/exp OR 'cochrane':ab,ti OR 'embase':ab,ti OR 'pubmed':ab,ti OR 'medline':ab,ti OR 'reference list':ab,ti OR 'reference lists':ab,ti OR 'bibliography':ab,ti OR 'bibliographies':ab,ti OR 'hand-search':ab,ti OR 'manual search':ab,ti OR 'relevant journals':ab,ti OR 'selection criteria':ab,ti

OR 'data extraction':ab,ti
4. 1-3 AND

Web of Science (via WebOfScience.com interface) for systematic reviews using the following search strategy:
1. TS=("blood don*") OR TI=("blood don*") OR TS=("blood bank*") OR TI=("blood bank*") OR TS=("blood service*") OR TI=("blood service*") OR TS=("blood center*) OR TI=("blood center*) OR TS=("blood centre*") OR TI=("blood centre*") OR TS=("transfusion service*) OR TI=("transfusion service*) OR TS=("transfusion cent*") OR TI=("transfusion cent*") OR TS=("blood withdraw*") OR TI=("blood withdraw*")
2. TS=(bacterial) OR TI=(bacterial) OR TS=(bacteriaemia) OR TI=(bacteriaemia) OR TS=(bacteriemia) OR TI=(bacteriemia) OR TS=(bacteremia) OR TI=(bacteremia) OR TS=(viral) OR TI=(viral) OR TS=(virus) OR TI=(virus) OR TS=(viremia) OR TI=(viremia) OR TS=(viraemia) OR TI=(viraemia) OR TS=(sepsis) OR TI=(sepsis) OR TS=(toxemia) OR TI=(toxemia) OR TS=(toxaemia) OR TI=(toxaemia) OR TS=(septicaemia) OR TI=(septicaemia) OR TS=(septicemia) OR TI=(septicemia) OR TS=("blood poisoning") OR TI=("blood poisoning") OR TS=("herpes simplex") OR TI=("herpes simplex") OR TS=(HSV) OR TI=(HSV) OR TS=("varicella zoster") OR TI=("varicella zoster") OR TS=("herpes zoster") OR TI=("herpes zoster") OR TS=(VZV) OR TI=(VZV) OR TS=("human immunodeficiency virus") OR TI=("human immunodeficiency virus") OR TS=(HIV) OR TI=(HIV) OR TS=(hepatitis) OR TI=(hepatitis) OR TS=("HBV") OR TI=("HBV") OR TS=("HCV") OR TI=("HCV") OR TS=("mycobacterium") OR TI=("mycobacterium") OR TS=("tuberculosis") OR TI=("tuberculosis") OR TS=("TBC") OR TI=("TBC") OR TS=("TB") OR TI=("TB") OR TS=("pseudomonas") OR TI=("pseudomonas") OR TS=("legionella") OR TI=("legionella") OR TS=("staphylococc*") OR TI=("staphylococc*") OR TS=("streptococc*") OR TI=("streptococc*") OR TS=("MRSA") OR TI=("MRSA") OR TS=("enterobacteria*") OR TI=("enterobacteria*") OR TS=("ESBL") OR TI=("ESBL") OR TS=("CPE") OR TI=("CPE")
3. 1 AND 2

Phase 2: search strategies used to update selected systematic reviews from phase 1 (search date 29/08/2017):

The Cochrane Library searched using the following search strategy:
1. [mh "Blood Donors"] OR "blood don*":ti,ab,kw OR [mh "Blood Banks"] OR "blood bank":ti,ab,kw OR "blood banks":ti,ab,kw OR "blood service*":ti,ab,kw OR "blood center*":ti,ab,kw OR "blood centre*":ti,ab,kw OR "transfusion service*":ti,ab,kw OR "transfusion cent*":ti,ab,kw OR "blood withdraw*":ti,ab,kw
2. [mh "Bacterial Infections"] or bacterial:ti,ab,kw or bacteriaemia:ti,ab,kw or bacteriemia:ti,ab,kw or bacteremia:ti,ab,kw or [mh "Virus Diseases"] or viral:ti,ab,kw or virus:ti,ab,kw or viremia:ti,ab,kw or viraemia:ti,ab,kw or [mh Sepsis] or [mh Toxemia] or sepsis:ti,ab,kw or toxemia:ti,ab,kw or toxaemia:ti,ab,kw or septicaemia:ti,ab,kw or septicemia:ti,ab,kw or "blood poisoning":ti,ab,kw or [mh "Herpes Simplex"] or "herpes simplex":ti,ab,kw or HSV:ti,ab,kw or [mh "Herpesvirus 3, Human"] or [mh "herpes zoster"] or "varicella zoster":ti,ab,kw or VZV:ti,ab,kw or [mh HIV] or "human immunodeficiency virus":ti,ab,kw or HIV:ti,ab,kw or [mh Hepatitis] or hepatitis:ti,ab,kw or HBV:ti,ab,kw or HCV:ti,ab,kw or [mh Mycobacterium] or mycobacterium:ti,ab,kw or [mh Tuberculosis] or tuberculosis:ti,ab,kw or TBC:ti,ab,kw or TB:ti,ab,kw or [mh Pseudomonas] or pseudomonas:ti,ab,kw or [mh Legionella] or legionella:ti,ab,kw or [mh Staphylococcus] or [mh Streptococcus] or staphylococc*:ti,ab,kw or streptococc*:ti,ab,kw or [mh "Methicillin-Resistant Staphylococcus aureus"] or MRSA:ti,ab,kw or [mh Enterobacteriaceae] or enterobacteria*:ti,ab,kw or ESBL:ti,ab,kw or CPE:ti,ab,kw
3. Publication date filter: 2014 – 2017
4. 1-3 AND

MEDLINE (via PubMed interface) searched using the following search strategy:
1. "Blood Donors"[Mesh] OR blood don*[TIAB] OR "Blood Banks"[Mesh] OR blood bank*[TIAB] OR blood service*[TIAB] OR blood center*[TIAB] OR blood centre*[TIAB] OR transfusion service*[TIAB] OR transfusion cent*[TIAB] OR "blood withdraw*"[TIAB]
2. "Bacterial Infections"[Mesh] OR "Virus Diseases"[Mesh] OR "Sepsis"[Mesh] OR "Toxemia"[Mesh] OR "bacterial infection*"[TIAB] OR sepsis[TIAB] OR bacterial[TIAB] OR bacteriaemia[TIAB] OR bacteriemia[TIAB] OR bacteremia[TIAB] OR viral[TIAB] OR virus[TIAB] OR viremia[TIAB] OR viraemia[TIAB] OR septicaemia[TIAB] OR septicemia[TIAB] OR toxemia[TIAB] OR toxaemia[TIAB] OR "blood poisoning"[TIAB] OR "herpes simplex"[TIAB] OR "Herpes Simplex"[Mesh] OR HSV[TIAB] OR "varicella zoster"[TIAB] OR "Herpesvirus 3, Human"[Mesh] OR "herpes zoster"[Mesh] OR VZV[TIAB] OR "human immunodeficiency virus"[TIAB] OR HIV[TIAB] OR "HIV"[Mesh] OR hepatitis[TIAB] OR "Hepatitis"[Mesh] OR HBV[TIAB] OR HCV[TIAB] OR tuberculosis[TIAB] OR "Tuberculosis"[Mesh] OR TBC[TIAB] OR TB[TIAB] OR mycobacterium[TIAB] OR "Mycobacterium"[Mesh] OR pseudomonas[TIAB] OR "Pseudomonas"[Mesh] OR legionella[TIAB] OR "Legionella"[Mesh] OR "methicillin-resistant staphylococcus aureus"[Mesh] OR staphylococc*[TIAB] OR "Staphylococcus"[Mesh] OR "Streptococcus"[Mesh] OR streptococc*[TIAB] OR MRSA[TIAB] OR enterobacteria*[TIAB] OR "Enterobacteriaceae"[Mesh] OR ESBL[TIAB] OR "carbapenemase-producing gram-negative bacteria"[TIAB] OR CPE[TIAB]
3. "Epidemiologic Studies"[Mesh] OR "case control"[TIAB] OR "case-control"[TIAB] OR ((case[TIAB] OR cases[TIAB]) AND (control[TIAB] OR controls[TIAB])) OR "cohort study"[TIAB] OR "cohort analysis"[TIAB] OR "follow up study"[TIAB] OR "follow-up study"[TIAB] OR "observational study"[TIAB] OR longitudinal[TIAB] OR retrospective[TIAB] OR "cross sectional"[TIAB] OR "cross-sectional"[TIAB] OR questionnaire[TIAB] OR questionnaires[TIAB] OR survey[TIAB]
4. Publication date filter: 01/03/2014 – 29/08/2017
5. 1-4 AND

Embase (via Embase.com interface) searched using the following search strategy:
1. 'blood donor'/exp OR (blood NEXT/1 don*):ab,ti OR 'blood bank'/exp OR 'blood bank':ab,ti OR 'blood banks':ab,ti OR (blood NEXT/1 service*):ab,ti OR (blood NEXT/1 (center* OR centre*)):ab,ti OR (transfusion NEXT/1 service*):ab,ti OR (transfusion NEXT/1 cent*):ab,ti OR 'blood withdraw*':ab,ti
2. 'bacterial infection'/exp OR bacterial:ab,ti OR bacteriaemia:ab,ti OR bacteriemia:ab,ti OR bacteremia:ab,ti OR 'virus infection'/exp OR viral:ab,ti OR virus:ab,ti OR viremia:ab,ti OR viraemia:ab,ti OR 'sepsis'/exp OR 'toxemia'/exp OR sepsis:ab,ti OR toxemia:ab,ti OR toxaemia:ab,ti OR septicaemia:ab,ti OR septicemia:ab,ti OR 'blood poisoning':ab,ti OR

'herpes simplex'/exp OR 'herpes simplex':ab,ti OR hsv:ab,ti OR 'varicella zoster virus'/exp OR 'herpes zoster'/exp OR 'varicella zoster':ab,ti OR vzv:ab,ti OR 'human immunodeficiency virus'/exp OR 'human immunodeficiency virus':ab,ti OR hiv:ab,ti OR 'hepatitis'/exp OR hepatitis:ab,ti OR hbv:ab,ti OR hcv:ab,ti OR 'mycobacterium'/exp OR mycobacterium:ab,ti OR 'tuberculosis'/exp OR tuberculosis:ab,ti OR tbc:ab,ti OR tb:ab,ti OR 'pseudomonas'/exp OR pseudomonas:ab,ti OR 'legionella'/exp OR legionella:ab,ti OR 'staphylococcus'/exp OR 'streptococcus'/exp OR staphylococc*:ab,ti OR streptococc*:ab,ti OR 'methicillin- resistant staphylococcus aureus'/exp OR mrsa:ab,ti OR 'carbapenemase producing enterobacteriaceae'/exp OR 'enterobacteriaceae'/exp OR enterobacteria*:ab,ti OR esbl:ab,ti OR cpe:ab,ti
3. 'clinical study'/exp OR 'cohort analysis'/exp OR 'case control':ab,ti OR 'case-control':ab,ti OR ((case:ab,ti OR cases:ab,ti) AND (control:ab,ti OR controls:ab,ti)) OR 'cohort study':ab,ti OR 'cohort analysis':ab,ti OR 'follow up study':ab,ti OR 'follow-up study':ab,ti OR 'observational study':ab,ti OR longitudinal:ab,ti OR retrospective:ab,ti OR 'cross sectional':ab,ti OR 'cross-sectional':ab,ti OR questionnaire:ab,ti OR questionnaires:ab,ti OR survey:ab,ti OR 'epidemiological study':ab,ti
4. Publication date filter: 2014 – 2017
5. 1-4 AND

Web of Science (via WebOfScience.com interface) searched using the following search strategy:
1. TS=("blood don*" OR "blood bank*" OR "blood service*" OR "blood center*" OR "blood centre*" OR "transfusion service*" OR "transfusion cent*" OR "blood withdraw*")
2. TS=("bacterial" OR "bacteriaemia" OR "bacteriemia" OR "bacteremia" OR "viral" OR "virus" OR "viremia" OR "viraemia" OR "sepsis" OR "toxemia" OR "toxaemia" OR "septicaemia" OR "septicemia" OR "blood poisoning" OR "herpes simplex" OR "HSV" OR "varicella zoster" OR "herpes zoster" OR "VZV" OR "human immunodeficiency virus" OR "HIV" OR "hepatitis" OR "HBV" OR "HCV" OR "mycobacterium" OR "tuberculosis" OR "TBC" OR "TB" OR "pseudomonas" OR "legionella" OR "staphylococc*" OR "streptococc*" OR "MRSA" OR "enterobacteria*" OR "ESBL" OR "CPE")
3. Publication date filter: 2014 – 2017
4. 1-3 AND

Appendix 2: List of excluded studies from phase 1

First author	Year	Title	Type of exclusion	Reason for exclusion
Abbas	2015	Comparison between the prevalence of hbsag in voluntary non-remunerated blood donors and family replacement donors screened in the serology department in the Egyptian national blood transfusion center	Design	Not a systematic review
Abdullah	2016	Malaria and blood transfusion: major issues of blood safety in malaria-endemic countries and strategies for mitigating the risk of Plasmodium parasites	Intervention	Did not investigate risk factors for infection.
Abrams	2011	The Prevalence and Significance of HTLV-I/II Seroindeterminate Western Blot Patterns	Design	Not a systematic review
Acharya	2006	Viral hepatitis in India	Design	Not a systematic review
Addas-Carvalho	2013	Historical evolution of national blood bank regulations in brazil	Design	Not a systematic review
Alberti	2005	Towards more individualised management of hepatitis C virus patients with initially or persistently normal alanineaminotransferase levels	Design	Not a systematic review
Alberti	2003	Management of hepatitis c	Design	Not a systematic review
AlFaleh	1997	Hepatitis C virus (HCV) infection in Saudi Arabia: A review	Design	Not a systematic review
Allain	1998	The status of hepatitis C virus screening	Design	Not a systematic review
Allain	2004	Occult hepatitis B virus infection: implications in transfusion	Design	Not a systematic review
Allain	2002	Nucleic acid testing for emerging viral infections	Design	Not a systematic review
Allain	2009	Diagnostic algorithm for HBV safe transfusion	Design	Not a systematic review
Alter	2008	Pathogen reduction: A precautionary principle paradigm	Design	Not a systematic review
Arababadi	2012	Epidemiology of Occult Hepatitis B Infection Among Thalassemic, Hemophilia, and Hemodialysis Patients	Intervention	Did not investigate risk factors for infection.
Arababadi	2011	Post-Transfusion Occult Hepatitis B (OBI): A Global Challenge for Blood Recipients and Health Authorities	Design	Not a systematic review
Ashour	2009	Decreasing the risk of transfusion transmitted infections (TTIS) in the Egyptian Blood Transfusion Services	Design	conference abstract
Asselah	2000	Genetic variability of hepatitis c virus: clinical implications	Design	Not a systematic review
Babanejad	2016	The HBsAg Prevalence Among Blood Donors From Eastern Mediterranean and Middle Eastern Countries: A Systematic Review and Meta-Analysis	Intervention	Did not investigate risk factors for infection.
Bajpai	2011	Transfusion-transmitted hepatitis E: Is screening warranted?	Design	Not a systematic review
Barth	2010	Hepatitis B/C and HIV in sub-Saharan Africa: an association between highly prevalent infectious diseases. A systematic review and meta-analysis	Intervention	Did not investigate risk factors for infection
Batham	2007	Systematic review and meta-analysis of prevalence of hepatitis B in India	Intervention	about prevalence, not risk factors
Beilke	1992	Detection of Htlv-I in Clinical Specimens	Design	Not a systematic review
Belyhun	2016	Hepatitis viruses in Ethiopia: a systematic review and meta-analysis	Intervention	about prevalence, not risk factors
Besharat	2014	Potential Mutations Associated With Occult Hepatitis B Virus Status	Population	Did not investigate blood donor population
Biagini	2008	Anelloviruses (TTV and variants): State of the art 10 years after their discovery	Design	Not a systematic review
Blanchette	1991	Guidelines for Auditing Pediatric Blood-Transfusion Practices	Population	Did not investigate blood donor population
Blejer	2002	The risks of transfusion-transmitted infections	Design	Not a systematic review
Bloch	2012	Blood Transfusion Safety in Africa: A Literature Review of Infectious Disease and Organizational Challenges	Design	narrative review
Bollinger	1995	The Human-Immunodeficiency-Virus Epidemic in India - Current Magnitude and Future Projections	Design	Not a systematic review
Bonvicini	2006	Prevention of iatrogenic transmission of B19 infection: Different approaches to detect, remove or inactivate virus contamination	Design	Not a systematic review
Bosan	2010	A review of hepatitis viral infections in Pakistan	Intervention	about prevalence, not risk factors
Brook	2001	European guideline for the management of hepatitis B and C virus infections	Design	Not a systematic review
Bruhn	2014	Greater culture volume improves bacterial detection in apheresis platelets: A meta-analysis	Intervention	Did not look at risk factors for infection
Bryant	2007	Pathogen inactivation - The definitive safeguard for the blood supply	Design	Not a systematic review
Busch	2006	Transfusion-transmitted viral infections: building bridges to transfusion medicine to reduce risks and understand epidemiology and pathogenesis	Design	Not a systematic review
Bux	2008	Pulmonary Transfusion Reactions	Design	Not a systematic review
Candotti	2013	Molecular virology in transfusion medicine laboratory	Design	Not a systematic review
Candotti	2009	Transfusion-transmitted hepatitis B virus infection	Design	Not a systematic review
Cascio	2013	Sex, Risk, and Education in Donor Educational Materials: Review and Critique	Design	Not a systematic review
Caspari	2000	Virus safety of blood and plasma products in Germany - State of knowledge and open problems	Design	Not a systematic review
Caspari	1994	Hiv-P24 Antigen Test in the Blood Donation Service - Yes or No	Design	Not a systematic review
Chaabna	2015	Hepatitis C virus prevalence in the Horn of Africa sub-region of the Middle East and North Africa: Systematic review and meta-analysis	Design	Protocol
Chaabna	2016	Hepatitis C Virus Epidemiology in Djibouti, Somalia, Sudan, and Yemen: Systematic Review and Meta-Analysis	Intervention	about prevalence, not risk factors
Chams	2003	Is GB virus C alias "hepatitis" G virus involved in human pathology?	Design	Not a systematic review
Chattopadhya	1991	Behavioural risk factors for acquisition of HIV infection and knowledge about AIDS among male professional blood donors in Delhi	Design	no systematic review
Chiavetta	2000	Test-seeking as motivation in volunteer blood donors	Design	Not a systematic review
Chimparlee	2011	Hepatitis B and Hepatitis C Virus in Thai Blood Donors	Design	narrative review
Chou	2004	Screening for Hepatitis C Virus Infection: A Review of the Evidence for the U.S. Preventive Services Task Force	Population	Did not investigate blood donor population
Chuang	1999	Porphyria cutanea tarda and hepatitis C virus: a case-control study and meta-analysis of the literature	Population	Did not investigate blood donor population
Corcoran	2004	Advances in the biology, diagnosis and host-pathogen interactions of parvovirus B19	Design	Not a systematic review
Cornberg	2011	A systematic review of hepatitis C virus epidemiology in Europe, Canada and Israel	Population	Did not invetigate blood donor population

Courouce	1990	[Anti-HCV antibodies and transfusion recipients. Bibliographic data and current knowledge]	Design	Not a systematic review
Courouce	1999	Screening of blood donations for HTLV-I/II	Design	Not a systematic review
Cui	2013	Update on epidemiology of hepatitis B and C in China	Design	Not a systematic review
Dalton	2013	Hepatitis E	Design	Not a systematic review
Davison	2011	A re-evaluation of the risk of transfusion-transmitted HIV prevented by the exclusion of men who have sex with men from blood donation in England and Wales, 2005-2007	Design	Not a systematic review
Degos	1991	Assessment of Posttransfusion Non-a-Hepatitis Non-B-Hepatitis Prevention in France	Design	Not a systematic review
del Rio	2002	AIDS in Mexico: lessons learned and implications for developing countries	Design	Not a systematic review
Del Vecchio	2005	Management of liver disease in thalassemia: Main drug targets for a correct therapy	Design	Not a systematic review
Dhenain	2000	The TT virus: Review of the literature	Design	Not a systematic review
Di Minno	2016	Current concepts in the prevention of pathogen transmission via blood/plasma-derived products for bleeding disorders	Population	Did not investigate blood donor population
Dodd	2000	Indeterminate results in blood donor testing: What you don't know can hurt you	Design	Not a systematic review
Dow	1999	Microbiology confirmatory tests for blood donors	Design	Not a systematic review
Dow	2000	'Noise' in microbiological screening assays	Design	Not a systematic review
Dreier	2014	Autochthonous Hepatitis E Virus Infections: A New Transfusion-Associated Risk?	Design	Not a systematic review
Duan	2014	Current Challenges and the Management of Chronic Hepatitis C in Mainland China	Design	Not a systematic review
Dwyre	2011	Hepatitis B, hepatitis C and HIV transfusion-transmitted infections in the 21st century	Design	Not a systematic review
Eastlund	1998	Monetary blood donation incentives and the risk of transfusion-transmitted infection	Design	Not a systematic review
Ebeling	1991	Posttransfusion Hepatitis	Design	Not a systematic review
Eder	2009	Selection Criteria to Protect the Blood Donor in North America and Europe: Past (Dogma), Present (Evidence), and Future (Hemovigilance)	Design	Not a systematic review
Eder	2014	Postdonation Information and Blood Component Retrievals: Realigning Blood Center and Hospital Actions Based on Risk Assessment	Design	Not a systematic review
Etard	2003	Hepatitis C Antibodies among Blood Donors, Senegal, 2001 [2]	Design	Not a systematic review
Evatt	1999	Haemophilia therapy: assessing the cumulative risk of HIV exposure by cryoprecipitate	Design	Not a systematic review
Fabrizi	1999	GBV-C/HGV infection in end-stage renal disease	Design	Not a systematic review
Fabrizi	2001	TT virus infection in end-stage renal disease (ESRD)	Design	Not a systematic review
Farrugia	2004	Plasma for fractionation: safety and quality issues	Design	Not a systematic review
Farrugia	2001	Intravenous immunoglobulin: regulatory perspectives on use and supply	Design	Not a systematic review
Fearon	2011	West Nile story: the transfusion medicine chapter	Design	Not a systematic review
Fiebig	2004	Emerging infections in transfusion medicine	Design	narrative review
Field	2007	Transfusion in sub-Saharan Africa: does a Western model fit?	Design	Not a systematic review
Forčić	2001	Optimal pool size and window period	Design	Not a systematic review
Foschini	2001	TT virus-related acute recurrent hepatitis - Histological features of a case and review of the literature	Design	Not a systematic review
Frothingham	1996	Applications of the polymerase chain reaction to infectious disease diagnosis	Design	Not a systematic review
Galea	1997	The role of personal interviews by direct questioning on blood donors with particular reference to prevention of transfusion-related infections: A Scottish perspective	Design	Not a systematic review
Ganczak	2008	Nosocomial HIV infection: Epidemiology and prevention - A global perspective	Population	Did not investigate blood donor population
Gao	2011	Prevalence and trend of hepatitis C virus infection among blood donors in Chinese mainland: a systematic review and meta-analysis	Intervention	Did not investigate risk factors for infection.
Garraud	2016	The infectious risks in blood transfusion as of today - A no black and white situation	Design	Not a systematic review
Gessain	1992	Chronic myelopathy associated with human T-lymphotropic virus type I (HTLV-I)	Design	Not a systematic review
Godbole	2005	HIV/AIDS epidemic in India: risk factors, risk behaviour & strategies for prevention & control	Design	Not a systematic review
Goncalves	2010	Epidemiology, Treatment, and Prevention of Human T-Cell Leukemia Virus Type 1-Associated Diseases	Design	Not a systematic review
Goodnough	2003	Risks of blood transfusion	Design	Not a systematic review
Gotuzzo	2000	Human T-cell lymphotropic virus-I in Latin America	Design	Not a systematic review
Gresens	1998	Current risks of viral hepatitis from blood transfusions	Design	Not a systematic review
Gunst	2007	Transfusion of blood products and nosocornial infection in surgical patients	Design	Not a systematic review
Gunter	1995	Transfusion-Transmitted Cytomegalovirus - the Part-Time Pathogen	Design	Not a systematic review
Gurtler	1994	[Transfusion-associated HIV infection]	Design	no systematic review
Hahne	2013	Infection with hepatitis B and C virus in Europe: a systematic review of prevalence and cost-effectiveness of screening	Intervention	Prevalentie en kosteneffectiviteit
Hall	1994	Human T-Cell Leukemia-Lymphoma Virus, Type-Ii (Htlv-Ii) - Emergence of an Important Newly Recognized Pathogen	Design	Not a systematic review
Hartl	2016	Hepatitis E Seroprevalence in Europe: A Meta-Analysis	Intervention	Does not investigate risk factors for infection

Hedayati-Moghaddam	2013	A Systematic Review for Estimation of HTLV-I Infection in the Blood Donors of Iran	Intervention	Does not investigate risk factors for infection
Heintges	1997	Hepatitis C virus: Epidemiology and transmission	Design	Not a systematic review
Heringlake	1996	New hepatitis viruses	Design	Not a systematic review
Hitzler	2014	Single-Donor (Apheresis) Platelets and Pooled Whole-Blood-derived Platelets - Significance and Assessment of both Blood Products	Design	Not a systematic review
Hlela	2009	Human T-cell lymphotropic virus type -I: Prevalence and incidence of infection, a systematic review	Design	Not a systematic review
Hoher	1996	[Microbial safety of blood products]	Other	Article unavailable. Could not get access to the full content.
Hollinger	2008	Hepatitis B virus infection and transfusion medicine: science and the occult	Design	Not a systematic review
Hong	2012	Prevalence and trend of HIV infection among voluntary blood donors in China since implementation of the Blood Donation Law: a systematic review and meta-analysis	Intervention	Does not investigate risk factors for infection. Focus lies on epidemiology.
Hoshida	2004	Malignancies in organ transplant recipients	Design	Not a systematic review
Irving	1994	The Clinical Virology of Hepatitis-C Virus	Design	Not a systematic review
Iyer	2014	Red blood cell transfusion strategies and maximum surgical blood ordering schedule	Design	No clear desciption of the search strategy or inclusion criteria implemented in this review.
Izopet	2009	Chronic Hepatitis E	Design	Not a systematic review
James	1999	How understanding donor behavior should shape donor selection	Design	Not a systematic review
Jayaraman	2010	The risk of transfusion-transmitted infections in sub-Saharan Africa	Intervention	Does not investigate risk factors for infection. Focus lies on epidemiology.
Jilg	1994	Hepatitis-B - Significance for Transfusion Medicine	Design	Not a systematic review
Johnson	2016	Xenotropic Murine Leukemia Virus-Related Virus (XMRV) and the Safety of the Blood Supply	Design	Not a systematic review
Kaabia	2009	Q fever in Tunisia	Design	Not a systematic review
Kaba	2013	Epidemiology of Mammalian Hepatitis E Virus Infection	Design	Not a systematic review
Kaplan	1993	The Epidemiology of Human T-Lymphotropic Virus Type-I and Type-Ii	Design	Not a systematic review
Karimi	2013	Emerging infectious threats to the blood supply: seroepidemiological studies in iran - a review	Intervention	Does not investigate risk factors for infection
Karmochkine	1998	Modes of hepatitis C virus transmission	Design	Not a systematic review
Katus	2014	Safety of platelet transfusion: past, present and future	Design	Not a systematic review
Katz	2007	Computer-based blood donor screening: A status report	Design	Not a systematic review
Kaur	2015	Syphilis testing in blood donors: an update	Design	Not a systematic review
Kaur	2005	Transfusion-transmitted infections: Existing and emerging pathogens	Design	Not a systematic review
Kessler	1992	Aids .1	Design	Not a systematic review
Khodabandehloo	2013	Prevalence and trend of hepatitis C virus infection among blood donors in Iran: A systematic review and meta-analysis	Intervention	Does not investigate risk factors for infection.
Khodabandehloo	2014	Prevalence of Hepatitis C Virus Genotypes in Iranian Patients: A Systematic Review and Meta-Analysis	Intervention	Does not investigate risk factors for infection.
Khuroo	2016	Transmission of Hepatitis E Virus in Developing Countries	Design	Not a systematic review
Khuroo	2016	Hepatitis E: Discovery, global impact, control and cure	Design	Not a systematic review
Khuroo	2016	Hepatitis E: an emerging global disease - from discovery towards control and cure	Design	Not a systematic review
Kim	2015	Association of preS/S Mutations with Occult Hepatitis B Virus (HBV) Infection in South Korea: Transmission Potential of Distinct Occult HBV Variants	Design	Not a systematic review
Kinson	1997	GB virus C hepatitis G virus	Design	Not a systematic review
Kiyosawa	1991	Review of Hepatitis-C in Japan	Design	Not a systematic review
Klausen	2014	Bacterial contamination of blood components: Norwegian strategies in identifying donors with higher risk of inducing septic transfusion reactions in recipients	Design	Not a systematic review
Kleinman	1998	Donor selection procedures: Is it possible to improve them?	Design	Not a systematic review
Kleinman	1997	The incidence window period model and its use to assess the risk of transfusion-transmitted human immunodeficiency virus and hepatitis C virus infection	Design	Not a systematic review
Kleinman	2012	The National Heart, Lung, and Blood Institute Retrovirus Epidemiology Donor Studies (Retrovirus Epidemiology Donor Study and Retrovirus Epidemiology Donor Study-II): Twenty Years of Research to Advance Blood Product Safety and Availability	Design	Not a systematic review

Kretzer	2014	Hepatitis C Worldwide and in Brazil: Silent Epidemic-Data on Disease including Incidence, Transmission, Prevention, and Treatment	Design	Not a systematic review
Lanteri	2011	West Nile virus. II. Immunopathophysiology in humans	Design	Not a systematic review
Lapa	2015	Epidemiology of Hepatitis E Virus in European Countries	Design	Not a systematic review
Leao	2006	HCV infection: aspects of epidemiology and transmission relevant to oral health care workers	Design	Not a systematic review
Learmont	2002	The value of lookback to understanding blood-borne infectious diseases: The New South Wales' HIV experience	Design	Not a systematic review
Lee	2007	Changing approaches in HIV testing	Design	Not a systematic review
Leiss	2008	Men having sex with men donor deferral risk assessment: An analysis using risk management principles	Design	Not a systematic review
Leroi	2016	Prevalence of chronic hepatitis B virus infection in Thailand: a systematic review and meta-analysis	Intervention	Does not investigate risk factors for infection.
Lessler	2016	Times to key events in Zika virus infection and implications for blood donation: a systematic review	Intervention	Does not investigate risk factors for infection
Lewis	2010	Transmission routes and risk factors for autochthonous hepatitis E virus infection in Europe: a systematic review	Population	Did not investigate blood donor population
Li	2014	Prevalence of human T-lymphotropic virus type 1 infection among blood donors in mainland China: a meta-analysis	Intervention	Prevalence, not RF
Lin	2013	Donor selection for blood safety: Is it still necessary?	Design	Not a systematic review
Liu	2006	Epidemiology of HBV infection in Asian blood donors: Emphasis on occult HBV infection and the role of NAT	Design	Not a systematic review
Liu	2014	Correction: A bayesian meta-analysis on prevalence of hepatitis B virus infection among Chinese volunteer blood donors (PLoS ONE (2013) 8, 11 (e79203) DOI: 10.1371/journal.pone.0079203)	Design	Correction
Liu	2013	A Bayesian meta-analysis on prevalence of hepatitis B virus infection among Chinese volunteer blood donors	Intervention	Does not investigate risk factors for infection
Liumbruno	2009	Reduction of the risk of bacterial contamination of blood components through diversion of the first part of the donation of blood and blood components	Design	Not a systematic review
Lodi	1998	Hepatitis C virus infection - Review and implications for the dentist	Design	Not a systematic review
MacDonald	1996	Transmission of hepatitis C virus: Rates, routes, and cofactors	Design	Not a systematic review
Makvandi	2016	Update on occult hepatitis B virus infection	Design	Not a systematic review
Mansueto	2014	Transfusion transmitted leishmaniasis. What to do with blood donors from endemic areas?	Design	Not a systematic review
Marano	2015	Hepatitis E: an old infection with new implications	Design	Not a systematic review
Mardani	2016	Transfusion-Transmitted Malaria in Iran: A Narrative Review Article	Intervention	Does not investigate risk factors for infection.
Marlink	1996	Lessons from the second AIDS virus, HIV-2	Design	Not a systematic review
Marousis	1997	Genetic heterogeneity of hepatitis C virus and its clinical implications	Design	Not a systematic review
Martinello	2016	Prevalence and Disease Burden of HCV Coinfection in HIV Cohorts in the Asia Pacific Region: A Systematic Review and Meta-Analysis	Population	Did not investigate blood donors as population
Mboto	2006	Human immunodeficiency virus and hepatitis C co-infection in sub-Saharan West Africa	Design	Not a systematic review
McDonald	2006	Bacterial risk reduction by improved donor arm disinfection, diversion and bacterial screening	Design	Not a systematic review
McGrath	2001	Transfusion practices must be evidence-based	Design	Not a systematic review
Medina	2014	Blood Safety in the XXI century. Transfusion transmitted infectious diseases. International and mexican view	Design	Not a systematic review
Memon	2002	Hepatitis C: an epidemiological review	Population	Did not investigate blood donor population
Mohamoud	2013	The epidemiology of hepatitis C virus in Egypt: a systematic review and data synthesis	Population	Did not investigate blood donor population as main population
Mohamoud	2016	Epidemiology of hepatitis C virus in the Arabian Gulf countries: Systematic review and meta-analysis of prevalence	Population	Did not investigate blood donor population
Mohamoud	2012	The epidemiology of hepatitis C virus in Egypt: A systematic review	Population	Did not investigate blood donor population
Mora	2015	Hepatitis C virus infection in sub-saharan africa: Prevalence meta-analysis and risk factor review	Design	Not a systematic review
Mphahlele	1998	HGV: the identification, biology and prevalence of an orphan virus	Design	Not a systematic review
Mushahwar	2008	Hepatitis E virus: Molecular virology, clinical features, diagnosis, transmission, epidemiology, and prevention	Design	Not a systematic review
Muzembo	2016	Systematic review and meta-analysis of hepatitis C virus infection in the Democratic Republic of Congo	Intervention	Does not investigate risk factors for infection
Mylonakis	2000	Laboratory testing for infection with the human immunodeficiency virus: Established and novel approaches	Design	Not a systematic review
Mylonas	2010	HTLV infection and its implication in gynaecology and obstetrics	Design	Not a systematic review
Newell	1997	Hepatitis C antibody positive: What next?	Design	Not a systematic review
Newman	2001	Blood donor suitability and allogeneic whole blood donation	Design	Not a systematic review
Ngo	2013	Risk perception and its role in attitudes toward blood transfusion: A qualitative systematic review	Population	Did not investigate blood donors as population

Nicolas	2015	Infection with human retroviruses other than HIV-1: HIV-2, HTLV-1, HTLV-2, HTLV-3 and HTLV-4	Design	Not a systematic review
Noorali	2011	Of lives and livers: emerging responses to the hepatitis C virus	Design	Not a systematic review
O'Brien	2012	Surveillance of Transfusion-Transmissible Infections: Comparison of Systems in Five Developed Countries	Design	Not a systematic review
Offergeld	2014	Sexual risk behaviour and donor deferral in Europe	Design	Not a systematic review
Offergeld	2011	Is the deferral of men who have sex with men (MSM) from donating still appropriate?	Design	Not a systematic review
Omar	2013	Trend and seroprevalence in transfusiKon transmitted infections (TTI) among blood donors in national blood center, Kuala Lumpur (NBCKL)	Design	conference abstract
Pamphilon	1999	Prevention of transfusion-transmitted cytomegalovirus infection	Design	Not a systematic review
Pantanowitz	2002	Tick-borne diseases in transfusion medicine	Design	Not a systematic review
Parsyan	2007	Human erythrovirus B19 and blood transfusion - an update	Design	Not a systematic review
Perez-Gracia	2013	Hepatitis E: current status	Design	Not a systematic review
Perez-Gracia	2012	Hepatitis E. Current perspectives	Design	Not a systematic review
Perez-Gracia	2003	Hepatitis E virus: current status	Design	Not a systematic review
Perng	2013	Immunologic hypo- or non-responder in natural dengue virus infection	Design	Not a systematic review
Petersen	2008	West Nile Virus in the Americas	Design	Not a systematic review
Petersen	1993	Hiv Transmission through Blood, Tissues, and Organs	Design	Not a systematic review
Petersen	2010	Transfusion-transmitted arboviruses	Design	Not a systematic review
Platt	2016	Prevalence and burden of HCV co-infection in people living with HIV: a global systematic review and meta-analysis	Intervention	Does not investigate risk factors for infection
Prati	2006	Transmission of hepatitis C virus by blood transfusions and other medical procedures: A global review	Design	Not a systematic review
Pratt	2000	Primary care: Evaluation of abnormal liver-enzyme results in asymptomatic patients	Design	Not a systematic review
Price	1994	Immunohematology - Immune Cytopenias and Screening Blood-Donors for Immune-Response to Infection	Design	Not a systematic review
Pruett	2015	The Use of Rapid Diagnostic Tests for Transfusion Infectious Screening in Africa: A Literature Review	Intervention	Does not investigate risk factors for infection
Quinn	2001	AIDS in Africa: An epidemiologic paradigm	Design	Not a systematic review
Raimondo	2013	Occult HBV infection	Design	Not a systematic review
Rambusch	1998	The significance of hepatitis G virus hepatitis C virus coinfection - a review of the literature	Population	Did not investigate blood donors as population
Ramia	2015	Hepatitis E Virus (HEV) in the countries of the Middle East and North Africa (MENA) Region: An awareness of an infectious threat to blood safety	Design	Not a systematic review
Rao	2015	Hepatitis C seroprevalence and HIV co-infection in sub-Saharan Africa: a systematic review and meta-analysis	Intervention	Does not investigate risk factors for infection
Rebulla	1995	Blood-Transfusion in Beta-Thalassemia Major	Design	Not a systematic review
Reddy	2013	Blood transfusions in the surgical patient: A gift of life, but at what cost?	Design	Not a systematic review
Rezaee-Zayareh	2015	Occult HCV Infection: The Current State of Knowledge	Population	Did not investigate blood donors as population
Rezvan	2007	Transfusion-transmitted infections among multitransfused patients in Iran: a review	Design	Not a systematic review
Richard	2013	From donor to recipient: Transfusion chain specificities in the French ultra-marine areas	Design	Not a systematic review
Riome	2013	Syphilis prevalence in the middle east and North Africa: A systematic review	Intervention	Does not investigate risk factors for infection
Riou	2016	Hepatitis C virus seroprevalence in adults in Africa: a systematic review and meta-analysis	Intervention	Does not investigate risk factors for infection
Riquin	2016	Should we review, on ethical grounds, the conditions of access of men who have sex with men to blood donation?	Design	Not a systematic review
Roberts	2016	Problems and Approaches for Blood Transfusion in the Developing Countries	Design	Not a systematic review
Roggendorf	1994	Significance of Hcv Infection for Posttransfusion Hepatitis	Design	Not a systematic review
Roucoux	2004	The epidemiology and disease outcomes of human T-lymphotropic virus type II	Design	Not a systematic review
Ruiz-Aragon	2010	[Assessment of nucleic acid testing (NAT) for screening hepatitis B in blood donors. Systematic review]	Intervention	Does not investigate risk factors for infection
Salunkhe	2015	Development of blood transfusion product pathogen reduction treatments: A review of methods, current applications and demands	Design	Not a systematic review
Sambri	2013	West Nile virus in Europe: emergence, epidemiology, diagnosis, treatment, and prevention	Design	Not a systematic review
SanMiguel	1997	Genetic diversity of hepatitis C virus. Genotypes	Design	Not a systematic review
Sauleda	2014	Preventing transfusion-transmitted infectious diseases in spain: Is our blood safe enough?	Design	Not a systematic review
Sayed	2015	The emergence of hepatitis E virus in Europe	Design	Not a systematic review

Sayers	1992	Reducing the risk for transfusion-transmitted cytomegalovirus infection	Design	Not a systematic review
Schlenke	2014	Pathogen Inactivation Technologies for Cellular Blood Components: an Update	Design	Not a systematic review
Schmunis	2005	Safety of the blood supply in Latin America	Design	Not a systematic review
Schwarz	1994	[Transmission of parvovirus B19 by blood and blood components]	Design	Not a systematic review
Scobie	2013	Hepatitis E: source and route of infection, clinical manifestations and new developments	Design	Not a systematic review
Seed	2005	The current status and potential role of laboratory testing to prevent transfusion-transmitted malaria	Design	Not a systematic review
Seheult	2016	I am the 9%: Making the case for whole-blood platelets	Design	Not a systematic review
Seitz	2010	Quality and Safety in Blood Supply in 2010	Design	Not a systematic review
Seltsam	2011	UVC Irradiation for Pathogen Reduction of Platelet Concentrates and Plasma	Design	Not a systematic review
Selvarajah	2012	Transfusion transmission of HCV, a long but successful road map to safety	Design	Not a systematic review
Servant-Delmas	2009	Genetic diversity of human erythroviruses. Consequences on infectious safety of plasma derivatives	Design	Not a systematic review
Shaiegan	2015	Meta-analysis of cytomegalovirus seroprevalence in volunteer blood donors and healthy subjects in Iran from 1992 to 2013	Intervention	Does not investigate risk factors for infection
Shankar	2008	GB virus infection: a silent anti-HIV panacea within?	Design	Not a systematic review
Sharara	1997	Chronic hepatitis C	Design	Not a systematic review
Sherlock	1994	Chronic Hepatitis-C	Design	Not a systematic review
Shi	2014	Blood safety and availability: continuing challenges in China's blood banking system	Design	Not a systematic review
Shivkumar	2011	The diagnostic accuracy of rapid point of care tests used to diagnose hepatitis B: A bayesian meta-analysis	Intervention	Does not investigate risk factors for infection
Shulman	1991	Transmission of Parasitic and Bacterial-Infections through Blood-Transfusion within the United-States	Design	Not a systematic review
Shyamala	2014	Transfusion transmitted infections in thalassaemics: need for reappraisal of blood screening strategy in India	Design	Not a systematic review
Sievert	2011	A systematic review of hepatitis C virus epidemiology in Asia, Australia and Egypt	Population	not blood donors
Singh	2006	New developments in diagnosis of leishmaniasis	Design	Not a systematic review
Slade	1994	Human-Immunoglobulins for Intravenous Use and Hepatitis-C Viral Transmission	Design	Not a systematic review
Slavov	2011	Human parvovirus B19: general considerations and impact on patients with sickle-cell disease and thalassemia and on blood transfusions	Design	Not a systematic review
Sloand	1991	Hiv Testing - State-of-the-Art	Design	Not a systematic review
Slowther	2013	Evidence-Based Policy and Practice Leads to Changes in the Criteria for MSM to Donate Blood	Design	Not a systematic review
Smith	1995	Current Perspectives in Hepatitis-C	Design	Not a systematic review
Soldan	2003	Evaluation of the de-selection of men who have had sex with men from blood donation in England	Design	Not a systematic review
Soutar	1994	Recent Advances in the Development and Use of Plasma Concentrates	Design	Not a systematic review
Stormer	2014	Diagnostic Methods for Platelet Bacteria Screening: Current Status and Developments	Design	Not a systematic review
Szabo	2014	The epidemiologic burden of hepatitis c virus infection in Egypt	Intervention	Does not investigate risk factors for infection
Szabo	2011	The epidemiologic burden of hepatitis C virus infection in Latin America	Population	Did not investigate blood donor population
Tafesse	2016	Seroprevalence and diagnosis of HIV, HBV, HCV and syphilis infections among blood donors	Intervention	Does not investigate risk factors for infection
Taherkhani	2016	Epidemiology of hepatitis E virus in Iran	Design	Not a systematic review
Takahashi	2014	Features of hepatitis E virus infection in humans and animals in Japan	Design	Not a systematic review
Tanaka	2012	Hepatitis C in Asia: Prevalence and complications	Design	Not a systematic review
Tanaka	2011	Hepatitis B and C Virus Infection and Hepatocellular Carcinoma in China: A Review of Epidemiology and Control Measures	Design	Not a systematic review
Tang	2005	Chronic viral hepatitis in hemodialysis patients	Design	Not a systematic review
Taylor	2015	Probability of a false-negative HIV antibody test result during the window period: a tool for pre- and post-test counselling	Intervention	Does not investigate risk factors for infection
Teo	2009	Is dengue a threat to the blood supply?	Design	Not a systematic review
Theo	1993	Virology and Serology of Hepatitides - a Review	Design	Not a systematic review
Thomas	2000	Hepatitis C epidemiology	Design	Not a systematic review
Tibbs	1995	Methods of Transmission of Hepatitis-C	Design	Not a systematic review
Trepo	1999	Viral hepatitis	Design	Not a systematic review
Tsega	2000	Epidemiology, prevention and treatment of viral heapatitis with emphasis on new developments	Design	Not a systematic review

Turner	2008	Hepatitis E: a UK perspective	Design	Not a systematic review
Umar	2010	Prevalence of hepatitis C in Pakistan	Design	Conference abstract
Umer	2016	Hepatitis C virus prevalence and genotype distribution in Pakistan: Comprehensive review of recent data	Intervention	Does not investigate risk factors for infection
Vallejo	1995	The Human Lymphotropic Virus Type-I (Htlv-I)	Design	Not a systematic review
Vamvakas	2009	Relative safety of pooled whole blood-derived versus single-donor (apheresis) platelets in the United States: a systematic review of disparate risks	Intervention	Does not investigate risk factors for infection
Vamvakas	2009	Scientific Background on the Risk Engendered by Reducing the Lifetime Blood Donation Deferral Period for Men Who Have Sex With Men	Design	Not a systematic review
Vamvakas	2011	Relative Risk of Reducing the Lifetime Blood Donation Deferral for Men Who Have Had Sex With Men Versus Currently Tolerated Transfusion Risks	Design	Not a systematic review
Vamvakas	2009	Relative safety of pooled whole blood-derived versus single-donor (apheresis) platelets in the United States: a systematic review of disparate risks	Population	Pooled vs single donor platelets
Vamvakas	2009	Scientific Background on the Risk Engendered by Reducing the Lifetime Blood Donation Deferral Period for Men Who Have Sex With Men	Design	Narrative review
van den Burg	1998	Donor selection: the exclusion of high risk donors?	Design	Not a systematic review
Vanderpoel	1994	Hepatitis-C Virus 6 Years On	Design	Not a systematic review
Vernet	2004	Molecular diagnostics in virology	Design	Not a systematic review
Volkow	2005	Paid donation and plasma trade: unrecognized forces that drive the AIDS epidemic in developing countries	Design	Not a systematic review
Wagner	2004	Transfusion-transmitted bacterial infection: risks, sources and interventions	Design	Not a systematic review
Waheed	2010	Prevalence and risk factors associated with HBV transmission in Pakistani population	Design	Not a systematic review
Walsh	2001	Update on chronic viral hepatitis	Design	Not a systematic review
Walther-Wenke	2008	Incidence of bacterial transmission and transfusion reactions by blood components	Design	Not a systematic review
Wambier	2012	Brazilian blood donation eligibility criteria for dermatologic patients	Design	Not a systematic review
Wang	2016	Acute, Recent and Past HEV Infection among Voluntary Blood Donors in China: A Systematic Review and Meta-Analysis	Intervention	Does not investigate risk factors for infection
Waser	2014	Literature review on burden of hepatitis C virus infection in China, Japan, Korea, and Taiwan	Intervention	Does not investigate risk factors for infection
Watkins	2011	SaBTO review of blood donor selection criteria related to sexual behavior	Design	Not a systematic review
Watkins	2012	The Management of Blood Safety in the Presence of Uncertain Risk: A United Kingdom Perspective	Design	Not a systematic review
Wattre	1994	Hepatitis-E Virus - a Review	Design	Not a systematic review
Weber	1994	Diagnosis and epidemiology of transfusion-associated human cytomegalovirus infection: recent developments	Design	Not a systematic review
Webster	2009	Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion	Design	Not a systematic review
Webster	2013	Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion	Intervention	Does not investigate risk factors for infection
Webster	2015	Skin preparation with alcohol versus alcohol followed by any antiseptic for preventing bacteraemia or contamination of blood for transfusion	Intervention	Does not investigate risk factors for infection
Weiland	1992	Hepatitis-C - Virology, Epidemiology, Clinical Course, and Treatment	Design	Not a systematic review
Weiss	2008	Special Anniversary Review: Twenty-five years of human immunodeficiency virus research: successes and challenges	Design	Not a systematic review
Wiwanitkit	2005	Hepatitis G virus RNA positivity among the voluntary blood donors: a summary	Design	Not a systematic review
Yang	2012	Is fresh-frozen plasma clinically effective? An update of a systematic review of randomized controlled trials (CME)	Population	Did not investigate blood donor population
Yap	1990	Transfusion Transmitted Viral-Infections - Recent Developments in Blood-Donor Screening	Design	Not a systematic review
Yazbek	2016	Hepatitis E virus in the countries of the Middle East and North Africa region: an awareness of an infectious threat to blood safety	Intervention	Does not investigate risk factors for infection
Ye	2014	Epidemiological implications of HIV-hepatitis C co-infection in South and Southeast Asia	Intervention	Does not investigate risk factors for infection
Yen	2003	The epidemiology of hepatitis C virus infection	Design	Not a systematic review
Yoho	2003	Hepatitis C: A review	Design	Not a systematic review
Younossi	2000	Viral hepatitis guide for practicing physicians	Design	Not a systematic review
Yzebe	2002	TT virus - A review of the literature	Design	Not a systematic review
Zeller	2013	Mosquito-borne disease surveillance by the European Centre for Disease Prevention and Control	Design	Not a systematic review
Zhang	2016	Prevalence of hepatitis E virus infection among blood donors in mainland China: a meta-analysis	Intervention	Does not investigate risk factors for infection
Zhang	2015	Prevalence of HIV-1 subtypes among men who have sex with men in China: a systematic review	Population	Did not invetigate blood donor population
Zhiburt	2000	New hemotransmissive virus	Design	Not a systematic review
Zimrin	2009	Current issues relating to the transfusion of stored red blood cells	Design	Not a systematic review
Zou	2006	Potential impact of pandemic influenza on blood safety and availability	Design	Not a systematic review
Zuckerman	2000	Current topics in hepatitis B	Design	Not a systematic review

Appendix 3: List of excluded studies of phase 2

First author	Year	Title	Type of exclusion	Reason for exclusion
[no authors]	2016	Blood donation and Zika virus	Design	Editorial article

Al-Qahtani	2017	Prevalence of anelloviruses (TTV, TTMDV, and TTMV) in healthy blood donors and in patients infected with HBV or HCV in Qatar (vol 13, 208, 2016)	Population	Blood donors only as control population
Abakarov	2016	Antibodies to HTLV-I/II in donors' and high-risk group patients' blood samples	Intervention	Did not investigate dental care
Abolghasemi	2017	Blood and blood products: adequacy and safety	Design	Editorial article
Abreu-Silva	2016	Evidence of Recent Hepatitis E Virus Infection in Portuguese Blood Donors	Intervention	Did not investigate risk factors
Addai-Mensah	2015	Safety of Family Replacement Donors vs. Voluntary Non-Remunerated Donors in Komfo Anokye Teaching Hospital, Ghana: A Comparative Study	Intervention	Did not investigate dental care
Afzal	2017	Hepatitis C Virus and Interferon-Free Antiviral Therapeutics Revolution: Implications for Pakistan	Design	Review article
Ahmad	2014	A case control study for the identification of novel risk factors associated with hepatitis C viral infection in population of Lahore Pakistan	Intervention	Did not investigate dental care
Al Humayed	2017	Hepatitis C virus infection in southwestern Saudi Arabia: Are we still in the plateau phase?	Population	No data for blood donors
Al Shaer	2017	Analysis of blood donor pre-donation deferral in Dubai: characteristics and reasons	Intervention	No seperate data for dental care
Alhetheel	2014	Hepatitis G virus in Saudi blood donors and chronic hepatitis B and C patients	Intervention	Did not investigate dental care
Amorim	2014	Risk factors for HIV in Brazilian blood donors	Design	Conference abstract without usable data
an der Heiden	2015	Estimating the residual risk for HIV, HCV and HBV in different types of platelet concentrates in Germany	Design	Cross-sectional study
Anderson	2016	Rapid Donor Surveillance Study Develops Tool to Assess Risk in a Statistically Valid Sample of US Blood Donors: Babesia and Hepatitis E Virus Surveys	Intervention	Did not investigate dental care
Araujo	2015	Current epidemiology of hepatitis E virus infection in São Paulo, Brazil: Preliminary results	Intervention	Did not investigate dental care
Arellanos-Soto	2015	Constant risk of dengue virus infection by blood transfusion in an endemic area in Mexico	Intervention	Did not investigate dental care
Arroyo Perez	2015	Prevalence of hepatitis e virus in Mexican blood donors	Intervention	Did not investigate dental care
Arshad	2016	Prevalence of transfusion transmissible infections in blood donors of Pakistan	Intervention	Did not investigate dental care
Arshad	2015	The demographic and clinical characteristics of HBV and HCV positive blood donors	Intervention	Did not investigate dental care
Arshad	2017	Epidemiology of Hepatitis C Infection in Pakistan: Current Estimate and Major Risk Factors	Design	Review article
Ata	2017	Hepatitis b core antibody reactivity among voluntary non-remunerated blood donors versus replacement blood donors in Pakistan	Design	Conference abstract without usable data
Atipo-Ibara	2014	Hepatitis C: Study of the genotypes in Congo (Brazzaville)	Intervention	Did not investigate dental care
Ayfer	2015	Seroprevalence of human herpes virus 8 in blood donors and HIV(+) patients admitted to Ege University Hospital, Turkey	Intervention	Did not investigate dental care
Baiao	2014	Syphilis seroprevalence estimates of Santa Catarina blood donors in 2010	Intervention	Did not investigate dental care
Barman	2015	Is seroprevalence of hepatitis B and hepatitis C in Northeast India really high?	Design	Letter
Barreiro	2015	Prevalence of HIV, HBV and HCV positive serology in blood donors in a rural general hospital in Ethiopia	Design	Conference abstract without usable data
Ben Jemia	2014	Seroprevalency of transfusion-transmitted infections in first-time volunteer and replacement donors in Tunisia	Intervention	Did not investigate dental care
Ben-Ayed	2015	Hepatitis E virus seroprevalence among hemodialysis and hemophiliac patients in Tunisia (North Africa)	Intervention	Did not investigate dental care
Bes	2017	Epidemiological trends of HIV-1 infection in blood donors from Catalonia, Spain (2005-2014)	Population	Only HIV infected blood donors were included, no control group of healthy blood donors.
Bhardwaj	2014	Seroprevalence of HIV, HBV & HCV IN 1000 Blood Donors at Dayanand Medical College and Hospital, Ludhiana, Punjab, India	Population	Did not investigate blood donors
Bi	2017	The comparative study of cytomegalovirus igg seroprevalence among blood donors in wuhan in 2015 and 1990	Design	Conference abstract without usable data
Biadgo	2017	Transfusion-transmissible viral infections among blood donors at the North Gondar district blood bank, northwest Ethiopia: A three year retrospective study	Intervention	Did not investigate dental care
Biceroglu	2014	Probable hepatitis C virus transmission from a seronegative blood donor via cellular blood products	Design	Letter to the editor
Bigna	2017	Seroprevalence of hepatitis B virus infection in Cameroon: a systematic review and meta-analysis	Intervention	Did not investigate dental care
Birhaneselassie	2016	Prevalence of Transfusion-Transmissible Infections in Donors to an Ethiopian Blood Bank Between 2009 and 2013 and Donation Factors That Would Improve the Safety of the Blood Supply in Underdeveloped Countries	Intervention	Did not investigate dental care
Bisetegen	2016	Transfusion-Transmissible Infections among Voluntary Blood Donors at Wolaita Sodo University Teaching Referral Hospital, South Ethiopia	Intervention	Did not investigate dental care
Bloch	2015	A prospective evaluation of chronic B. microti infection in seroreactive blood donors	Intervention	Did not investigate dental care

Bloch	2015	Prospective evaluation of babesia microti-seroreactive blood donors by using laboratory and questionnaire assessment	Intervention	Did not investigate dental care
Bogdanovic	2017	Demographic characteristics of HIV seropositive blood donors-10 years study	Design	Retrospective descriptive study
Bolarinwa	2014	PREVALENCE AND ASSOCIATED CHARACTERISTICS OF CYTOMEGALOVIRUS (CMV) IMMUNOGLOBULIN ANTIBODIES AMONG BLOOD DONORS AT A UNIVERSITY TEACHING HOSPITAL IN NIGERIA	Intervention	Did not investigate dental care
Borhany	2016	Reactive blood donors and their demographic characteristics from a developing country	Design	Conference abstract without usable data
Brailsford	2015	Who should donate blood? Policy decisions on donor deferral criteria should protect recipients and be fair to donors	Design	Editorial article
Brown	2017	Apheresis for collection of Ebola convalescent plasma in Liberia	Intervention	Did not investigate risk factors
Bruggmann	2014	Historical epidemiology of hepatitis C virus (HCV) in selected countries	Intervention	Did not investigate risk factors
Bura	2017	Hepatitis e virus antibodies in HIV-infected patients and blood donors from western Poland: A preliminary report	Intervention	Did not investigate dental care
Bura	2017	Hepatitis E virus IgG seroprevalence in HIV patients and blood donors, west-central Poland	Intervention	Did not investigate dental care
Cai	2014	[Analysis on HIV infection status of voluntary blood donors in Chinese Nanjing area from 2003 to 2013]	Language	Full text only in Chinese language
Cai	2014	[Infection status of HBV, HCV and HIV in voluntary blood donors of Chinese Nanjing area during 2010-2013]	Language	Full text only in Chinese language
Cai	2014	Factors associated with HIV and syphilis infection among men who have sex with men blood donors in Shenzhen	Language	No English abstract available
Carlos	2015	Misconceptions about HIV infection in Kinshasa (Democratic Republic of Congo): a case-control study on knowledge, attitudes and practices	Intervention	Did not investigate risk factors
Chaabna	2015	Hepatitis C virus prevalence in the Horn of Africa sub-region of the Middle East and North Africa: Systematic review and meta-analysis	Design	Conference abstract without usable data
Chaabna	2016	Hepatitis C Virus Epidemiology in Djibouti, Somalia, Sudan, and Yemen: Systematic Review and Meta-Analysis	Design	Systematic review
Chan	2016	Bacterial contamination screening and donor follow-up in Australia: Clinical outcomes and spectrum of asymptomatic donor bacteraemia	Design	Conference abstract without usable data
Chang	2014	Seroprevalence and Demographic Determinants of Human T-Lymphotropic Virus Type 1 and 2 Infections Among First-Time Blood Donors-United States, 2000-2009	Intervention	Did not investigate dental care
Chemaitelly	2015	The Epidemiology of Hepatitis C Virus in the Fertile Crescent: Systematic Review and Meta-Analysis	Design	Systematic review
Chen	2016	[HCV infection status and risk factors in remunerated blood donors in Jiangsu province]	Language	Full text only in Chinese language
Chen	2015	Mutual blood donation is safer at small blood collection stations in China	Intervention	Did not investigate dental care
Chisale	2015	A pilot study to determine the normal haematological indices for young Malawian adults in Blantyre, Malawi	Intervention	Did not investigate dental care
Choga	2015	Prevalence and molecular characterization of Hepatitis B virus in blood donors in Botswana	Design	Conference abstract without usable data
Cook	2014	HTLV-1 and HTLV-2 Prevalence in the United States	Design	Editorial article
Crowder	2017	Prevalence, incidence, and risk factors of human immunodeficiency virus infection in blood donors in the Southeastern United States	Intervention	Did not investigate dental care
Custer	2014	Behavioral Factors Associated with HIV, HBV, HCV, and HTLV Infections in US Blood Donors	Design	Conference abstract without usable data
Custer	2015	Risk factors for retrovirus and hepatitis virus infections in accepted blood donors	Intervention	No seperate data for dental care
Custer	2015	Blood donor deferral for men who have sex with men: the Blood Donation Rules Opinion Study (Blood DROPS)	Intervention	Did not investigate dental care
Damgaard	2015	Viable bacteria associated with red blood cells and plasma in freshly drawn blood donations	Intervention	Did not investigate risk factors
David	2016	Epidemiological and clinical aspects on West Nile virus, a globally emerging pathogen	Design	Editorial article
Daw	2014	Prevalence of hepatitis B and hepatitis C infection in Libya: results from a national population based survey	Population	Did not investigate blood donors
de Kort	2016	On risk appraisal of behaviour	Design	Editorial article

Delage	2017	Preliminary results on the prevalence of acute hepatitis e virus infection in Canadian blood donors	Design	Conference abstract without usable data
Delage	2015	An exploration of risk factors for acquisition of hepatitis e virus infection in Quebec Blood Donors	Design	Conference abstract without usable data
Diarra	2014	Prevalence of HTLV-I virus in blood donors and transfusion in Mali: Implications for blood safety	Intervention	Did not investigate dental care
Dinh	2014	The Danish Blood Donor Study: Nasal and Throat Colonization with Staphylococcus aureus Among Healthy Danish Blood Donors	Intervention	no dental care
Diniz	2016	Risk Factors for Bartonella species Infection in Blood Donors from Southeast Brazil	Intervention	Did not investigate dental care
Dogra	2015	Seroprevalence of coinfections among blood donors in tertiary health care centre of Jammu region	Design	letter to editor
Dousari	2017	Frequency of hepatitis B and C among jiroft blood donors based on demographic characteristics	Intervention	Did not investigate dental care
Eder	2014	Postdonation Information and Blood Component Retrievals: Realigning Blood Center and Hospital Actions Based on Risk Assessment	Design	Editorial article
El Harrak	2016	Anticipating West Nile virus transmission risk from the Moroccan blood donation	Design	Abstract without usable data
El-Ghitany	2016	Toward a Simple Risk Assessment Screening Tool for HCV Infection in Egypt	Population	Did not investigate blood donors
El-Ghitany	2015	A comprehensive hepatitis C virus risk factors meta-analysis (1989-2013); Do they differ in Egypt?	Population	No data for blood donors
Elhamiani Khatat	2016	Human Exposure to Anaplasma phagocytophilum in Two Cities of Northwestern Morocco	Intervention	Did not investigate dental care
Elkeraie	2015	Sen Virus among Egyptian Hemodialysis Patients and Blood Donors	Design	Abstract without usable data
El-Sayed	2014	Risk factors of hepatitis c virus infection (HCV) in suez canal region, Egypt: A case-control study	Design	Conference abstract without usable data
Eyer	2015	Tick-borne encephalitis virus (TBEV) infection in Swiss blood donors - Preliminary results	Design	Conference abstract without usable data
Fadlalla	2015	The Epidemiology of Hepatitis C Virus in the Maghreb Region: Systematic Review and Meta-Analyses	Design	Systematic review
Farshadpour	2016	Prevalence and Trends of Transfusion-Transmissible Viral Infections among Blood Donors in South of Iran: An Eleven-Year Retrospective Study	Design	Retrospective study
Fatima	2016	Frequency and reasons of donor deferral prior to blood donation process-a single centre experience	Outcome	No quantitative data on TTI's
Fearon	2017	Hepatitis E in Canadian blood donors	Intervention	Did not investigate dental care
Fearon	2014	Seroprevalence of Babesia and Hepatitis E in Canadian Blood Donors	Intervention	Did not investigate dental care
Ferreira	2014	Demographic, risk factors and motivations among blood donors with reactive serologic tests for syphilis in Sao Paulo, Brazil	Intervention	Did not investigate dental care
Flaherty	2017	International travel and blood donation: risks and restrictions	Design	Editorial article
Gake	2017	Low seroprevalence of Zika virus in Cameroonian blood donors	Design	Letter
Galani	2016	Hepatitis C in Cameroon: What is the progress from 2001 to 2016?	Design	Editorial article
Galel	2017	First Zika-positive donations in the continental United States	Intervention	Did not investigate dental care
Gallian	2017	Zika virus in asymptomatic blood donors in Martinique	Design	Letter
Gallian	2017	Epidemiology of Chikungunya Virus Outbreaks in Guadeloupe and Martinique, 2014: An Observational Study in Volunteer Blood Donors	Intervention	Did not investigate risk factors
Gallian	2014	Prospective detection of chikungunya virus in blood donors, Caribbean 2014 (vol 123, pg 3679, 2014)	Design	Letter
Gallone	2017	Serosurveillance of hepatitis A in a region which adopted the universal mass vaccination	Intervention	No usable data for risk factors
Gallone	2017	Long time immunogenicity of measles vaccine in the vaccination era: An open question	Intervention	Did not investigate risk factors
Gao	2015	Frequency of Anti-HIV Confirmed by Western Blot and Donor Characteristics at Five Chinese Blood Centers	Design	Conference abstract without usable data
Gao	2017	A 30-year systematic review and meta-analysis of hepatitisB virus among blood donors in mainland China: revealing increase of new threats	Design	Systematic review
Goncalez	2015	The role of healthcare providers in HIV or other infectious diseases test-seeking behavior in different sub populations of brazilian blood donors	Design	Conference abstract without usable data
Gong	2016	Distribution of hepatitis C virus genotypes in volunteer blood donors from Chengdu, China	Intervention	no dental care
Grad	2017	Recommendations on hepatitis C screening for adults	Design	Guideline
Grazzini	2015	A cross-sectional study among blood donors on sexual risk behaviors for HIV infection	Design	Conference abstract without usable data
Guriev	2016	Epidemiology of hepatitis C in the republic of Moldova: Achievements and remaining challenges in prevention and control	Design	Cohort study
Hannachi	2014	High prevalence of Human Herpesvirus 8 in schizophrenic patients	Intervention	No separate data for dental care
Hashemzadeh	2016	Determination of sero-epidemiological of HTLV-1 and HTLV-2 among blood donors in Guilan Province of Iran	Intervention	Did not investigate dental care
Hatu	2014	The risk for hepatitis C infection in blood donors in Cluj County, Romania	Intervention	Did not investigate dental care
He	2016	Hepatitis B Virus Prevalence in Chinese Blood Donors: HBsAg-reactive Rates from Pre-donation Rapid Test and Post-donation Screening Test	Intervention	Did not investigate risk factors
Hesamizadeh	2016	Hepatitis A Virus and Hepatitis E Virus Seroprevalence Among Blood Donors in Tehran, Iran	Intervention	Did not investigate dental care
Hilda	2017	Prevalence of anti-hepatitis C virus antibody among pregnant women and blood donors at Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria	Intervention	Did not investigate dental care
Hjetland	2015	Subjective health complaints are not associated with tick bites or antibodies to Borrelia burgdorferi sensu lato in blood donors in western Norway: a cross-sectional study	Intervention	Did not investigate dental care
Hjetland	2014	Seroprevalence of antibodies to Borrelia burgdorferi sensu lato in healthy adults from western Norway: risk factors and methodological aspects	Intervention	Did not investigate dental care
Holm	2015	Declining prevalence of hepatitis E antibodies among Danish blood donors	Intervention	Did not investigate dental care

Huang	2015	Hepatitis C virus infection and risk factors in the general population: A large community-based study in eastern China, 2011-2012	Population	Did not investigate blood donors
Iyalla	2015	Seroprevalence study of HTLV-1 and 2 in prospective blood donors and pregnant women in Port Harcourt, Nigeria	Intervention	Did not investigate dental care
Jahromi	2015	Human T-Lymphotropic virus type I/II virus among blood donors: South of Iran	Design	Conference abstract without usable data
John-Olabode	2017	Serological evidence of hev infection in blood donors in Lagos Nigeria-a pilot study	Intervention	no dental care
Kabinda	2014	Factors for viral infection in blood donors of South Kivu in the Democratic Republic of Congo	Intervention	Did not investigate dental care
Kabinda	2014	[Hepatitis B and C among volunteer non-remunerated blood donors in Eastern Democratic Republic of Congo]	Intervention	Did not investigate dental care
Kanwal	2016	Prevalence of Hepatitis C in Diabetic Patients: A Prospective Study	Intervention	Did not investigate dental care
Karaboga	2014	Screening Test Seroprevalence of Blood Donors: The Results of Balcali Hospital Blood Center, University of Cukurova	Design	Conference abstract without usable data
Karra	2014	Prospective study of hepatitis B virus infection and its Genotypes in the North-Eastern India	Design	Conference abstract without usable data
Kaur	2015	Syphilis testing in blood donors: an update	Design	Review article
Kebede	2017	Transfusion-transmissible infection surveillance among blood donors in Southwest Ethiopia: A six years retrospective study	Intervention	Did not investigate dental care
Keshvari	2014	Differentiation of hepatitis B/hepatitis D coinfection and superinfection in asymptomatic blood donors: is it possible?	Design	Letter
Ketheeswaran	2016	Analysis of tranfusion transmissible infections [TTIS] positive cases among voluntary blood donars in a regional blood center in Srilanka between 2014 and 2015	Design	Conference abstract without usable data
Kirchmaier	2015	Incidence and prevalence of hepatitis e virus infections in blood donors from central Germany	Design	Conference abstract without usable data
Kouegnigan Rerambiah	2014	Evaluation of blood donors questionnaire in a developing country: The case of Gabon	Intervention	Did not investigate dental care
Kramer	2017	The Precautionary Principle and the Tolerability of Blood Transfusion Risks	Design	narrative review
Kubicka-Russel	2017	Epidemiological trends in HCV, HBV and HIV serological marker detection in polish blood donors (2005-2015)	Intervention	Did not investigate dental care
Kupek	2014	Changes in the prevalence, incidence and residual risk for HIV and hepatitis C virus in Southern Brazilian blood donors since the implementation of NAT screening	Design	Cross-sectional study
La Torre	2016	Risk factors from HBV infection among blood donors: A systematic review	Design	Systematic review reeds geïncludeerd in eerste fase
Laba	2016	Analysis of HIV infection in blood donors in the regional blood center in Poznan in the years 2005-2015	Design	Conference abstract without usable data
Laba	2015	The pilot studies for lyme disease (Lyme Borreliosis) in blood donors in rckik in Poznan	Design	Conference abstract without usable data
Lafeuillade	2015	Residual risk and retrospective analysis of transfusion-transmitted bacterial infection reported by the French National Hemovigilance Network from 2000 to 2008	Population	Did not investigate blood donors
Lange	2017	Hepatitis E in Norway: seroprevalence in humans and swine	Intervention	Did not investigate dental care
Laperche	2015	Thirteen years of nat screening in blood donors: New insights on HIV, HCV and HBV incident cases, the French experience	Design	Conference abstract without usable data
Larrieu	2014	Dengue outbreaks: a constant risk for Reunion Island. Results from a seroprevalence study among blood donors	Design	Cross-sectional study
Layden	2014	Evidence for multiple transmission pathways and geographic variation of HCV infection in Ghana, West Africa	Design	Conference abstract without usable data
Layden	2014	High Rates of HCV Active Infection in a Blood Bank Study in Ghana, West Africa	Design	Conference abstract without usable data
Layden	2015	High frequency of active HCV infection among seropositive cases in west Africa and evidence for multiple transmission pathways	Intervention	No seperate data for dental care
Layden	2015	High frequency of active HCV infection among seropositives in West Africa and evidence for multiple transmission pathways	Design	Conference abstract without usable data
L'Azou	2015	Dengue seroprevalence in the French West Indies: a prospective study in adult blood donors	Design	Cross-sectional study
Lee	2016	Risk factor for past hepatitis C infection among Chinese blood donors	Design	Conference abstract without usable data
Lee	2016	Incidence and risk factors of hepatitis C virus infection among human immunodeficiency virus (HIV) patients in a large HIV clinic in South Korea	Population	Did not investigate blood donors
Levi	2017	Contrasting HCV and HIV seroepidemiology in 11 years of blood donors screening in Brazil	Design	Interrupted time series
Levi	2015	HIV Seroepidemiology in 10 Years of Blood DonorScreening	Design	Conference abstract without usable data
Liakina	2015	Historical epidemiology of hepatitis C virus (HCV) in select countries - volume 3	Design	Systematic review
Lin	2016	Epidemiology and genotypes of hepatitis E in Jiangsu Province blood donors, an acute sporadic area of China	Design	Conference abstract without usable data
Liu	2014	A Bayesian Meta-Analysis on Prevalence of Hepatitis B Virus Infection among Chinese Volunteer Blood Donors (vol 8, e79203, 2013)	Design	Meta-analysis
Liumbruno	2015	A New Questionnaire to Improve the Effectiveness of Pre-donation Screening for Sexual Risk Behaviors of HIV Infection among Blood Donors in Italy	Design	Conference abstract without usable data
Lopes	2017	Racial differences in seroprevalence of HAV and HEV in blood donors in the Western Cape, South Africa: a clue to the predominant HEV genotype?	Design	Editorial article
Lopes	2016	Incidence of acute hepatitis E infection in blood donors in the Western Cape, South Africa	Design	Conference abstract without usable data
Lopez-Balderas	2015	Seroprevalence of hepatitis viruses and risk factors in blood donors of Veracruz, Mexico	Intervention	Did not investigate dental care
Lucarelli	2016	High prevalence of anti-hepatitis E virus antibodies among blood donors in central Italy, February to March 2014	Intervention	Did not investigate dental care
Madden	2016	Hepatitis E virus: Western Cape, South Africa	Population	No seperate data for blood donors
Maghsudlu	2015	Seroepidemiology of human T-cell lymphotropic virus type-I in blood donors of Northeastern Iran, Sabzevar	Design	Cross-sectional study

Mansuy	2015	Seroprevalence in blood donors reveals widespread, multi-source exposure to hepatitis E virus, southern France, October 2011	Design	Cross-sectional study
Mansuy	2016	A nationwide survey of hepatitis E viral infection in French blood donors	Design	Cross-sectional study
Mendes-Oliveira	2015	Hepatitis C: Prevalence of serologic markers and risk factors in blood donors at a large blood centre in South-eastern Brazil (2007-2010)	Intervention	Did not investigate dental care
Miletic Lovric	2016	Seroprevalence of hepatitis E among Croatian blood donors	Design	Conference abstract without usable data
Mirrezaie	2015	Exposure with minor risk factors among blood donors in Tehran province, Iran: A cohort study	Language	English abstract without usable data
Moghadam	2014	Phylogenetic Analysis of Hepatitis C Virus Strains and Risk Factors Associated With Infection and Viral Subtypes Among Iranian Patients	Design	Cross-sectional study
Mollenkopf	2016	Measuring incidence of HTLV-1: the other human retrovirus	Design	Editorial article
Mor	2015	Prevalence of Hepatitis E Virus Antibodies, Israel, 2009-2010	Design	Cross-sectional study
Mora	2016	A Synthesis of Hepatitis C prevalence estimates in Sub-Saharan Africa: 2000-2013	Design	Meta-analysis
Moritz	2016	Screening for Babesia microti in the U. S. Blood Supply	Design	Cross-sectional study
Moritz	2014	Risk factors identified in blood donors screening positive or inconclusive for babesia microti	Design	Conference abstract without usable data
Motayo	2015	Seroprevalence rates of hepatitis C virus (HCV) antibody and hepatitis B virus surface antigen (HBsAG) in blood donors in a Southwestern Nigerian city	Intervention	Did not investigate blood donors
Moyen	2015	Risk Factors Associated with Ebola and Marburg Viruses Seroprevalence in Blood Donors in the Republic of Congo	Design	Cross-sectional study
Mueller-Steinhardt	2017	Introduction of a german uniform donor questionnaire into blood donor screening	Design	Conference abstract without usable data
Muhammad	2016	Deferral of blood donors on the basis of predonation history and examination: 1 year experience at the blood bank of a tertiary care hospital in a developing country	Design	Conference abstract without usable data
Murphy	2015	Estimating the number of HTLV-2 infected persons in the world	Design	Written report of an oral presentation
Murphy	2016	Human T lymphotropic Virus types 1 and 2 (HTLV-1 and-2) and hepatitis C virus (HCV) epidemiology: lesson from studies of blood donors	Design	Conference abstract without usable data
Mutocheluh	2014	Risk factors associated with hepatitis B exposure and the reliability of five rapid kits commonly used for screening blood donors in Ghana	Intervention	Did not investigate dental care
Mutocheluh	2015	Knowledge and occupational hazards of barbers in the transmission of hepatitis B and C was low in Kumasi, Ghana	Design	Cross-sectional study
Muzzillo	2016	Risk factors and seroprevalence of hepatitis E in pregnant and non-pregnant women in a Southern region of Brazil	Intervention	Did not investigate dental care
Nambei	2016	Seroepidemiology of HIV, syphilis and hepatitis B and C viruses among blood donors in Bangui, Central African Republic	Design	Cross-sectional study
Narciso-Schiavon	2015	Clinical and epidemiological profile of female blood donors with positive serology for viral hepatitis B	Design	Cross-sectional study
Naseri	2015	The seroprevalence of brucellosis among blood donors in hamadan province, West of Iran	Design	Cross-sectional study
Nazer	2017	The Prevalence Rate of Human Immunodeficiency Virus Co-infection in HBV and HCV Positive Patients in Lorestan Province: A Single Referral Center Experience	Design	Cross-sectional study
Ndilu	2016	Characteristics, behaviors and association between Human African Trypanosomiasis and HIV seropositivity among volunteer blood donors in a semi-rural area: A survey from Kikwit, the Democratic Republic of Congo	Design	Cross-sectional study
Ngcobo	2014	The prevalence of HIV risk factors among South African national blood service donors	Design	Cross-sectional study
Ngcobo	2016	The HIV Prevalence in the South African National Blood Service Blood Donors - With Special Reference to Men Who Have Sex With men	Design	Cross-sectional study
Ngcobo	2016	The HIV prevalence in the South African national blood service blood donors-with special reference to men who have sex with men	Design	Cross-sectional study
Niazi	2015	Seroprevalence of Human T-Cell Lymphotropic Virus-1/2 in Blood Donors in Northern Pakistan: Implications for Blood Donor Screening	Design	Cross-sectional study
Niederhauser	2016	Seroprevelance of hepatitis E virus (HEV) in the swiss blood donors: Basis for future strategy for preventing HEV transmission to at risk individuals	Design	Conference abstract without usable data
Nishiya	2014	HCV Genotypes, Characterization of Mutations Conferring Drug Resistance to Protease Inhibitors, and Risk Factors among Blood Donors in Sao Paulo, Brazil	Design	Cross-sectional study
Noden	2014	Exposure and risk factors to coxiella burnetii, spotted fever group and typhus group Rickettsiae, and Bartonella henselae among volunteer blood donors in Namibia	Design	Cross-sectional study
Noden	2014	Risk assessment of flavivirus transmission in Namibia	Design	Cross-sectional study
O'Brien	2015	Transmissible disease risk factors among men who have sex with men - Comparison of blood donors VS. community men	Design	Cross-sectional study
O'Brien	2016	Residual risk of HIV, HCV and HBV at canadian blood services	Design	Conference abstract without usable data
O'Brien	2014	Are donors in Canada compliant with deferral for tattoos and piercing?	Design	Editorial article
O'Brien	2015	Impact of a 5-year deferral for men who have sex with men on donor compliance	Design	Interrupted time series
O'Brien	2016	Impact of a 5-year deferral from blood donation for men who have sex with men	Design	Interrupted time series
O'Brien	2017	Residual risk of HIV, HCV and HBV in Canada	Design	Cross-sectional study
Ojea	2017	Prospective study of prevalence of hepatitis e virus in donors from north-spain	Design	Cross-sectional study
Okonko	2015	HBV and HIV coinfections among intending blood donors in Port Harcourt, Nigeria	Design	Cross-sectional study
Okoye	2015	Seroprevalence of human T-cell lymphoma/leukemia virus type-1 (HTLV-1) antibodies among blood donors at Enugu, Nigeria	Design	Cross-sectional study
Oliveira	2014	Epidemiological aspects of HCV infection in non-injecting drug users in the Brazilian state of Para, eastern Amazon	Design	Cross-sectional study
Olotu	2016	Occult Hepatitis B virus infection in previously screened, blood donors in Ile-Ife, Nigeria: implications for blood transfusion and stem cell transplantation	Design	Cross-sectional study
Oluyinka	2015	Occult Hepatitis B Virus Infection in Nigerian Blood Donors and Hepatitis B Virus Transmission Risks	Population	No data of seronegative controls

Onoja	2016	Seroepidemiology of hepatitis B, C & HIV among blood donors in Jos, North-Central Nigeria	Design	Cross-sectional study
Owusu-Ofori	2016	Transfusion-transmitted malaria: donor prevalence of parasitaemia and a survey of healthcare workers knowledge and practices in a district hospital in Ghana	Intervention	Did not investigate dental care
Owusu-Ofori	2015	Transfusion-transmitted malaria: Prevalence among blood donors and a survey among healthworkers in a district hospital in Ghana	Design	Conference abstract without usable data
Panos	2014	Hantaviruses: Seroprevalence and risk factors among humans in Achaia prefecture, Greece	Design	Poster presentation
Pate	2016	Detection of Zika Virus in Puerto Rico Blood Donations	Design	Conference abstract without usable data
Pauli	2015	Hepatitis E Virus	Design	Editorial article
Piron	2017	Hepatitis e virus infection: Incidence and epidemiological characteristics of positive blood donors in Catalonia (Spain)	Design	Cross-sectional study
Pistorius	2016	Retrospective pilot study to determine if higher risk exists in the donor population that has indicated that they have been exposed to hepatitis B versus normal routine donor population	Intervention	Did not investigate dental care
Pitassi	2015	Bartonella spp. bacteremia in blood donors from Campinas, Brazil	Design	cross-sectional study
Platt	2016	Prevalence and burden of HCV co-infection in people living with HIV: a global systematic review and meta-analysis	Population	No seperate data for blood donors
Preubel	2015	Which infectious blood donors do we miss in the donor selection process? - Comparison of HIV or HCV infected blood donors with notified cases from general population	Design	Did not investigate dental care
Preußel	2016	Which infectious blood donors could be caught by the DHQ?-Comparison of infected blood donors with notified cases from general population	Design	Conference abstract without data
Raimondo	2016	HIV-positive blood donors unaware of their sexual at-risk behaviours before donation in Italy	Design	Interrupted time series
Ramos	2016	Prevalence of positive HIV, HBV, HCV and treponemal tests in blood donors in a rural hospital in southern Ethiopia	Design	Letter to the editor
Ranjan	2016	High Seroprevalence of Dengue Virus Infection in Blood Donors From Delhi: A Single Centre Study	Design	Longitudinal study (cross-sectional)
Rao	2015	Hepatitis C seroprevalence and HIV co-infection in sub-Saharan Africa: a systematic review and meta-analysis	Intervention	seroprevalence, not risk factors
Riaz	2016	A Review of Hepatitis C in the General Population in Pakistan	Design	Editorial article
Riveiro-Barciela	2014	Cirrhosis, Liver Transplantation and HIV Infection Are Risk Factors Associated with Hepatitis E Virus Infection	Population	Did not investigate blood donors
Rosenberg	2014	Acute hepatitis B in blood donors over a 5-year period in England and North Wales: who is getting infected?	Design	Cross-sectional study
Rueda	2014	[Oral transmission of Trypanosoma cruzi : a new epidemiological scenario for Chagas' disease in Colombia and other South American countries]	Design	Editorial article
Saber	2017	Incidence and Residual Risk of HIV, HBV and HCV Infections Among Blood Donors in Tehran	Intervention	no dental care
Sachdev	2015	Risk Factors for Transfusion Transmissible Infections Elicited on Post Donation Counselling in Blood Donors: Need to Strengthen Pre-donation Counselling	Design	Cross-sectional study
Sachdev	2015	Risk Factors for Transfusion Transmissible Infections Elicited on Post Donation Counselling in Blood Donors: Need to Strengthen Pre-donation Counselling	Intervention	no dental care
Sakata	2017	Screening of hepatitis e virus RNA with a transcription-mediated amplification assay in blood donors in Hokkaido, Japan	Design	Cross-sectional study
Sakata	2014	Hepatitis E virus RNA screening in blood donors in Hokkaido, Japan	Design	Cross-sectional study
Sargento	2016	Hepatitis E virus-should we reconsider its role in blood donor screening?	Design	Conference abstract without usable data
Sauleda	2014	Preventing transfusion-transmitted infectious diseases in spain: Is our blood safe enough?	Design	Conference abstract without usable data
Ščepkinovə	2014	Elimination the risk of hepatitis B virus transfusion-transmitted infection in the phase of possible occult HBV infection	Design	cross-sectional study
Schink	2017	Blood donor deferral policies across Europe and characteristics of men who have sex with men screened for human immunodeficiency virus in blood establishments: data from the European Men-who-have-sex-with-men Internet Survey (EMIS)	Population	Did not investigate blood donors
Schreuder	2016	Hepatitis E virus infection among blood donors in the South Caribbean: is screening warranted?	Design	Letter to the editor
Scully	2016	Check before you travel: Zika virus - another emerging global health threat	Design	Editorial article
Seyed-Askari	2015	The prevalence of transfusion transmitted infections among blood donors in Kerman, Iran	Design	Cross-sectional study
Shao	2016	An outbreak of HCV genotype 6a and 2a infection in South China: Confirmation of iatrogenic transmission by phylogenetic analysis of the NS5B region	Design	Cross-sectional study
Sharifi	2016	Chronic Hepatitis B Virus (Hbv) Infection in Asymptomatic Blood Donors	Design	Conference abstract without usable data
Sharma	2015	Percutaneous Route as a Risk Factor for Seropositivity of Hepatitis C Virus Infection	Population	No seronegative control group
Shittu	2014	RISK FACTORS AND SERO-PREVALENCE OF HEPATITIS B SURFACE ANTIGEN AMONG BLOOD DONORS IN UNIVERSITY OF ILORIN TEACHING HOSPITAL, ILORIN, NIGERIA	Design	Cross-sectional study
Shokoohi	2016	Diagnosis of sub acute bacterial endocarditis following bacteriologic screening of apheresis platelet donations: Beware of dental work in donors	Design	Case series
Shrestha	2016	Hepatitis E virus seroepidemiology: a post-earthquake study among blood donors in Nepal	Design	Cross-sectional study
Singh	2016	A prospective study of prevalence of occult HBV infection and assessment of risk factors for HBV transmission in persons with occult HBV infection	Design	Conference abstract without usable data
Siransy	2015	ABO/Rh Blood Groups and Risk of HIV Infection and Hepatitis B Among Blood Donors of Abidjan, Cote D'ivoire	Intervention	Did not investigate dental care
Slavov	2015	Human parvovirus 4 in Brazilian patients with haemophilia, beta-thalassaemia major and volunteer blood donors	Design	Letter to the editor
Slot	2017	Meat consumption is a major risk factor for hepatitis E virus infection	Intervention	Did not investigate dental care

Slot	2016	Two decades of risk factors and transfusion-transmissible infections in Dutch blood donors	Design	Interrupted time series
Spasojevic	2017	Behavioral profile of persons with chronic hepatitis c infection in vojvodina	Design	Cross-sectional study
Stambolieva	2016	Potential risk for transfusion transmitted infection in transfusion center-strumica, Macedonia	Design	cross-sectional study
Steele	2014	Donors deferred for self-reported Chagas disease history: Does it reduce risk?	Design	Case series
Szymczyk-Nuzka	2014	Donor qualifications-how to get true answer?	Design	Conference abstract without usable data
Tagny	2017	Risk factors for human immunodeficiency virus among blood donors in Cameroon: evidence for the design of an Africa-specific donor history questionnaire	Intervention	No seperate data for dental care
Taherkhani	2015	Epidemiology of hepatitis C virus in Iran	Design	Review
Taherkhani	2016	Epidemiology of hepatitis E virus in Iran	Design	Review
Tedder	2016	Virology, serology, and demography of hepatitis E viremic blood donors in South East England	Design	Interrupted time series
Tedder	2017	Hepatitis E risks: pigs or blood-that is the question	Population	Did not investigate blood donors
Timova	2015	Donors' health as one of the priorities of blood donor management	Design	Conference abstract without usable data
Traore	2016	Hepatitis E Virus Prevalence among Blood Donors, Ouagadougou, Burkina Faso	Design	Letter to the editor
Tuzuner	2016	The seroprevalence of HBV, HCV and HIV in blood donors	Design	Conference abstract without usable data
Umemura	2014	Occurrence of acute hepatitis E virus infection in the Hakodate district: A prospective study of four hospitals in Hakodate City	Language	Full text only in Chinese language
Vahidnia	2015	Risk factors and epidemiology of human tlymphotropic virus types 1 and 2 in US blood donors	Design	Conference abstract without usable data
Vahidnia	2015	Risk factors and epidemiology of human T-lymphotropic virus types 1 and 2 in US blood donors	Design	Poster presentation
Valcina	2016	Legionella pneumophila Seropositivity-Associated Factors in Latvian Blood Donors	Design	Cross-sectional study
Vallinoto	2016	Prevalence and risk behaviour for human immunodeficiency virus 1 infection in Marajo Island, Northern Brazil	Design	Cross-sectional study
Valois	2014	HCV infection through perforating and cutting material among candidates for blood donation in Belem, Brazilian Amazon	Design	Cross-sectional study
van de Laar	2017	Phylogenetic evidence for underreporting of male-to-male sex among human immunodeficiency virus-infected donors in the Netherlands and Flanders	Population	No seronegative control group
Van De Laar	2015	Two decades of risk factors and transfusiontransmissible infections in dutch blood donors	Design	Conference abstract without usable data
van Gageldonk-Lafeber	2017	Hepatitis E virus seroprevalence among the general population in a livestock-dense area in the Netherlands: a cross-sectional population-based serological survey	Intervention	Did not investigate dental care
Vermeulen	2015	Prevalence of HIV and Hepatitis B and C viruses in South African Blood Donors, 2012-2014	Design	Conference abstract without usable data
Vilibic-Cavlek	2015	Epidemiology of hepatitis C in Croatia in the European context	Design	Review
Vilibic-Cavlek	2016	Seroepidemiology of Hepatitis E in Selected Population Groups in Croatia: A Prospective Pilot Study	Intervention	Did not investigate dental care
Vladimirsky	2015	HBV infection at the sentinel units network in Argentina, 2007-2014	Population	Did not investigate blood donors
Vo	2016	A retrospective analysis of false-positive infectious screening results in blood donors	Intervention	Did not investigate dental care
Vollmer	2016	Knowledge Is Safety: The Time Is Ripe for Hepatitis E Virus Blood Donor Screening	Design	Letter to the editor
Wang	2016	Acute, Recent and Past HEV Infection among Voluntary Blood Donors in China: A Systematic Review and Meta-Analysis	Intervention	not about risk factors
Wasitthankasem	2017	Assessment of hepatitis C virus infection in two adjacent Thai provinces with drastically different seroprevalence	Intervention	Did not investigate dental care
Wong	2015	Failure of self-disclosure of deferrable risk behaviors associated with transfusion-transmissible infections in blood donors	Design	Cross-sectional study
Woodring	2014	Did CDC's 2006 revised HIV testing recommendations make a difference? Evaluation of HIV testing in the US household population, 2003-2010	Design	Cross-sectional study
Woodring	2015	HIV Infection in U.S. Household Population Aged 18-59: Data From the National Health and Nutrition Examination Survey, 2007-2012	Population	Did not investigate blood donors
Workalemahu	2017	Seroepidemiology of Human Brucellosis Among Blood Donors in Southern Ethiopia: Calling Attention to a Neglected Zoonotic Disease	Intervention	Did not investigate dental care
Wujcicka	2014	Impact of socioeconomic risk factors on the seroprevalence of cytomegalovirus infections in a cohort of pregnant Polish women between 2010 and 2011	Population	Did not investigate blood donors
Xiao	2014	Detection of GB virus C/hepatitis G markers in Chinese voluntary blood donors	Design	Letter to the editor
Xiao	2016	Factors associated with syphilis infection: a comprehensive analysis based on a case-control study	Population	Did not investigate blood donors
Xie	2015	Seroprevalence of Human Immunodeficiency Virus, Hepatitis B Virus, Hepatitis C Virus, and Treponema pallidum Infections among Blood Donors on Bioko Island, Equatorial Guinea	Intervention	seroprevalence, not risk factors
Ximenes	2015	Population-Based Multicentric Survey of Hepatitis B Infection and Risk Factors in the North, South, and Southeast Regions of Brazil, 10-20 Years after the Beginning of Vaccination	Population	Did not investigate blood donors
Xue	2015	Single nucleotide polymorphisms of toll-like receptor 7 in hepatitis C virus infection patients from a high-risk chinese population	Intervention	Did not investigate dental care
Yamada	2015	Seroprevalence, genotypic distribution and potential risk factors of hepatitis B and C virus infections among adults in Siem Reap, Cambodia	Population	Did not investigate blood donors
Yang	2015	Transmission of Hepatitis B and C Virus Infection Through Body Piercing A Systematic Review and Meta-Analysis	Other	Already included in our study as a systematic review in step 1
Yang	2016	Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses, and Treponema pallidum infections among blood donors at Shiyan, Central China	Intervention	Did not investigate dental care
Yang	2016	Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses, and Treponema pallidum infections among blood donors at Shiyan, Central China	Intervention	no dental care
Yano	2015	Hepatitis B virus infection in Indonesia	Design	Review

Ye	2014	Epidemiological Implications of HIV-Hepatitis C Co-Infection in South and Southeast Asia	Design	Review
Yin	2015	Risk factors of hepatitis C virus transmission and genotype distribution in former blood donors from Chinese rural area	Population	Did not investigate current blood donors
Yoon	2014	Hepatitis E Virus (HEV) Seroprevalence in the general population of the Republic of Korea in 2007-2009: a nationwide cross-sectional study	Population	Did not investigate blood donors
Yousif	2015	Seroprevalence of undiagnosed transfusion transmissible infections (HIV, hepatitis B and C and syphilis) in donated blood in National Blood Banks, Khartoum, Sudan	Design	Conference abstract without usable data
Zakutna	2015	Pilot Cross-Sectional Study of Three Zoonoses (Lyme Disease, Tularaemia, Leptospirosis) among Healthy Blood Donors in Eastern Slovakia	Design	Cross-sectional study
Zhang	2017	Seroprevalence and risk factors associated with hepatitis E virus infections among people and pigs in Tibet, China	Population	Did not investigate blood donors
Zhang	2017	The genotype and subtype distribution of hepatitis C virus among blood donors of five Chinese blood centers for the period 2012-2014	Design	Conference abstract without usable data
Zhang	2015	Prevalence and risk factors of syphilis infection and high-risk behaviour investigation among blood donors	Design	Conference abstract without usable data
Zhao	2014	Prevalence, trends, and risk factors of HIV infection among blood donors in a region of central China from 2004 to 2013	Design	Conference abstract without usable data
Zhong	2016	The estimation of prevalence and risk factors of hepatitis B virus infection among blood donors in Chengdu, China	Other	Already included from previous screening in step 1

Appendix 4: Study characteristics of included studies

Author, year, Country	Study design	Population	Risk factor	Remarks
Akhtar, 2005, Kuwait	Observational: case-control study	Study period: October 15, 2001 to March 15, 2002. 324 in total: 64 cases (HBsAg positive blood donors) + 260 controls (HBsAg negative blood donors), age 18-64 years, Pakistani nationality (47% of cases and 61% of controls belong to Mohajir ethnicity), all male population	Several risk factors [Only data for 'history of dental treatment by dentist' was extracted]	Identified from the systematic review of *Ali, 2011* Prior to selection of population individuals admitting to known risk factors for Hepatitis B and C and HIV infections were excluded. Exposure data collected by a pre-tested structured questionnaire during a personal interview. No information about blinding of participants and interviewers. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Alavian, 2002, Iran	Observational: case-control study	Study period: April 1996 to June 1998. 389 in total: 193 cases (HCV-positive blood donors, 177 male + 16 female, mean age 35.7 ± 9.9 years) + 196 controls (HCV-negative blood donors, 176 male + 20 female, mean age 37.9 ± 9.2 years). None of the control group subjects were either HBsAg- or HIV-positive.	Several risk factors [Only data for 'treatment by dentist' was extracted]	Identified from the systematic review of *Mahboobi, 2013* Exposure data collected by structured confidential interview by general practitioners who were not blinded to the results of the HCV antibody tests of the subjects. Not sure if subjects were blinded. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Baha, 2013, Morocco	Observational: case-control study	Study period: January 1st, 2008 to December 31, 2010. 41269 in total: 651 cases (anti-HCV positive volunteer blood donors, age: 144 <40 years, 507 >40 years; 185 female + 466 male) + 40 618 controls (anti-HCV negative volunteer blood donors, age: 16686 <40 years, 23932 >40 years; 12312 female + 28306 male)	Several risk factors [Only data for 'dental therapy' was extracted]	Identified from the systematic review of *La Torre, 2016* The first 17 691 persons were tested only for anti-HCV Ab and the subsequent 23 578 persons were tested for both anti-HCV and HBsAg. Social workers interviewed all participants using a standard and individual questionnaire. No information about blinding of subjects or interviewers to serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Czerwinski, 2017, Poland	Observational: case-control study	Study period: 2002-2014. 188 in total: 47 HCV cases (mean age 28.5 years, 43 male + 4 female, 7 first time donors + 40 repeat donors. Cases have recently acquired HCV infection (detection of HCV RNA with negative HCV antibodies, or documented HCV antibody seroconversion over the last 12	Several risk factors [Only data concerning dental procedures are extracted.]	Exposure data collected through a face-to-face interview with a physician using a questionnaire with closed-end questions about donor's characteristics, health conditions, and other risk factors along with a broad list of recent exposures

		months) + 141 controls (mean age 28.6 years, 129 male + 12 female, 39 first time donors + 101 repeat donors). Controls were negative for all screened infection markers.		that could explain their acquisition of an infection up to 6 months before diagnosis. No information about blinding of interviewers and subjects.
Guerrero-Romero, 1996, Mexico	Observational: case-control study	Study period: June 1993 to December 1994. 357 in total: 87 cases (anti-HCV positive blood donors, mean age 38,7 ± 12 years, 78 male + 9 female) + 270 controls (anti-HCV negative blood donors, mean age not specified, 240 male + 30 female)	Several risk factors [Only data for 'dental work' was extracted]	Identified from the systematic review of *Santos-Lopez, 2008* Data on exposure collected by obtaining clinical history. No information about blinding of subjects to their serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)
He, 2011, China	Observational: case-control study	Study period: July 2006 to June 2007. 915 volunteer blood donors in total: 305 cases (anti-HCV positive blood donors, 166 male + 139 female, age range 18-55 years) + 610 controls (anti-HCV antibody negative, 332 male + 278 female, age range 18-55 years)	Several risk factors [Only data for 'dental treatment' was extracted]	Identified from the systematic review of *Mahboobi, 2013* Individuals who tested positive for HBsAg, anti-HIV, syphilis and/or ALT were excluded from the cases and control groups. Exposure data collected by professional medical personnel using a risk assessment questionnaire. No information about blinding of subjects or interviewers to serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Hedayati-Moghaddam, 2015, Iran	Observational: case-control study	Study period: September 2011-August 2013. 1092 in total: 316 cases of which 246 (181 males + 65 females, mean age 39.1±10.6 years) were referred for consulting and were subsequently interviewed. Four controls were individually matched to each case (n=1241) on the basis of age (±2 years), gender, and date and center of donation. 776 controls (613 males + 163 females, mean age 38.3±10.6 years) agreed to be interviewed. All controls were negative for HBV, HCV, HIV, HTLV and Treponema pallidum.	Several risk factors [Only data for 'invasive dental treatment (with bleeding)' are extracted.]	No information on which time period of risk factors was questioned (lifetime history or more recent?). Exposure data collected by interview by trained research assistants using a questionnaire. No information about blinding of interviewers and subjects to serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Huang, 2015, China	Observational: case-control study	Study period: 2009-2011. Part of the NHLBI Retrovirus Epidemiology Donor Study-II (REDS-II) program. HBV and HCV cases and controls from 5 blood centres in China. 1227 in total: 364 HBV cases (148 aged ≤25 years, 88 aged 26-35 years, 121 aged >35 years; 251 male + 108 female; 313 first time donors + 31 repeat donors), 174 HCV cases (51 aged ≤25 years, 43 aged 26-35 years, 78 aged >35 years; 96 male + 77 female; 143 first time donors +	History of transfusion, cosmetic and medical surgery, acupuncture, dental cleaning, finger sticks, and subcutaneous injections and several other risk factors. [Only data concerning dental cleaning are extracted.]	Participants were given 100 RMB ($15) for completing the questionnaire. Exposure data collected by a self-administered questionnaire sent by mail. Subjects were blinded to their serological status. The time frame used to study the risk factor 'dental cleaning' is a lifetime exposure (ever).

		31 repeat donors) + 689 controls (219 aged ≤25 years, 180 aged 26-35 years, 274 aged >35 years; 430 male + 245 female; 193 first time donors + 424 repeat donors). Controls were nonreactive for ALT, HBsAg, anti-HCV, anti-HIV-1/2 and syphilis.		
Jagannathan, 2010, India	Observational: case-control study	Study period: April 2003 to March 2006. 283 in total: 71 cases (blood donors seropositive for HBsAg; age range 18-45 years) + 212 controls (blood donors with unknown HBsAg status sampled at mobile blood donation camps; age range 18-45 years)	Several risk factors [Only data for 'dental, ever' was extracted]	Identified from the systematic review of *La Torre, 2016* There was no specification of the term 'dental' as risk factor. Exposure data collected by self-administered questionnaire. Cases were not blinded for their serological status. Data on exposure for controls gathered at the time of donation, thus they were blinded. The time frame used to study the risk factor 'dental' is a lifetime exposure (ever).
Kasraian, 2016, Iran	Observational: case-control study	Study period: March 21, 2012 to March 21, 2013. 118 in total: 59 cases (blood donors with positive results in HCV screening test followed by positive confirmatory test) + 59 controls (blood donors who had negative screening test results) No information on age or gender.	Several risk factors [Only data for Going to a dentist are extracted.]	Exposure data was gathered through an interview with a psychiatrist. Both subjects and psychiatrists were blinded to serological status of subjects. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Kerzman, 2007, Israel	Observational: case-control study	Study period: Data gathered between May 2002 and June 2003. 434 in total: 2 study groups: - *Native Israeli's (NI):* 50 cases (all HCV seropositive NI blood donors who were detected in 2000 to 2001 and from 2002 + 6 additional FSUI donors who had immigrated to Israel between 1950 and 1965, 74% male, 16% <30 years of age) + 128 controls (HCV-seronegative NI BDs, randomly selected from the MDA computerized databank, 77,3% male, 48,4% <30 years of age) - *Immigrants from the former Soviet Union (FSUI):* 128 cases (blood donors who immigrated from the FSU to Israel in 1989 (5) or since 1990 (123) and were diagnosed as HCV-positive when donating blood in 2000-2001, 82% male, 53,9% <30 years of age) + 128 controls (HCV-seronegative blood donors who had immigrated from the FSU since 1990 and were randomly selected from the MDA computerized databank, 73,4% male, 68% <30 years of age)	Several risk factors [Only data for 'tooth extraction' and 'teeth cleaned' was extracted]	Identified from the systematic review of *Yang, 2015* Power analysis was carried out: sample size was calculated with an alpha (Type I error) of 5% and power (1-β) of 80%. Expected difference in risk factors between groups: 20%, with 50% ratio of each independent variable. ⇒ Sample size of 128 for each group Donors with co-infection with HIV and/or HBV were excluded. Exposure data was collected by a validated questionnaire. No information on blinding to serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)

Mitrovic, 2015, Serbia	Observational: case-control study	Study period: January 1st – December 31st 2013 in 10 transfusion centres in Serbia. 27160 voluntary blood donors who gave blood for the first time were enrolled in the study. 96 in total: 32 cases (HCV-positive blood donors, 25 males + 7 females, mean age 32.1±8.4 years) + 64 controls (HCV-negative blood donors, 50 males + 14 females) Two sex-matched and age-matched controls were selected from the same population of inclusion as the case patients, without HCV infection or other parenterally acquired diseases.	Several risk factors [Only data for Invasive dental treatment (accompanied by haemorrhage are extracted]	Exposure data collected by anonymous self-administered questionnaire. Subjects were not blinded for their serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Murphy, 2000, USA	Observational: case-control study	Study period: 1994-1995. 1797 in total: 758 cases (HCV-seropositive blood donors; 400 male + 351 female; 64 aged <29y, 607 aged 30y-49y, 72 aged >50y) + 1039 controls (HCV-seronegative blood donors; 568 male + 463 female; 81 aged <29y, 815 aged 30y-49y, 131 aged >50y)	Several risk factors [Only data for 'tooth extraction' and 'teeth cleaned' was extracted]	Identified from the systematic review of *De Buck, 2015* Exposure data was gathered by anonymous questionnaires sent by mail. No information on blinding of the subjects to serological status. The time frame used to study the risk factor 'teeth cleaning' was a lifetime.
Nuchprayoon, 1992, Thailand	Observational: case-control study	Study period: January 1989 to July 1990. 2626 in total: 876 cases (HBsAg positive blood donors, age 28.2 ± 9.7 years, 622 male + 254 female) + 1750 controls (HBsAg negative blood donors, age 32.7 ± 9.2 years, 1342 male + 408 female, 1596 controls donated more than once)	Several risk factors [Only data for 'treatment in dental clinics' was extracted]	Identified from the systematic review of *Yang, 2015* Power analysis was carried out: sample size was calculated with assumption of least relative risk of related factors =2, α=0.05 and β=0.1 Result: 690 cases with cases to controls ratio 1:2. Data for treatment in dental clinics derived from blood donors whose blood had showed HBsAg but had not been positive in the one prior to the last. Exposure data was gathered by self-administered questionnaires. No information on blinding of the subjects to serological status. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Rezaei, 2016, Iran	Observational: case-control study	Study period: 2009-2013. 2512 in total: 970 cases (HCV-positive blood donors, 913 males (mean age 36.46±9.18 years) + 38 females (mean age 42.21±10.28 years)) + 1542 controls (HCV-negative blood donors, 1471 males (mean age 36.51±9.26 years)	Several risk factors [Only data for Dentistry are extracted]	Exposure data was gathered through questionnaires filled in during a face-to-face interview with doctors at the blood center. Not clear if participants were aware of infection status at time of interview.

		+54 females (mean age 36.37±8.89 years))		No information on which time period of risk factors was questioned (lifetime history or more recent?)
Thaikruea, 2004, Thailand	Observational: case-control study	Study period: January 2001 - June 2002. 495 in total: 166 cases (HCV-positive blood donors, age >18 years) + 329 controls (HCV-negative blood donors, age >18 years)	Several risk factors [Only data for 'history of having a tooth extracted' was extracted]	Identified from the systematic review of *Sievert, 2011* Three types of blood donors were included: replacement donors, autologous donors and volunteer donors. Exposure data gathered by private interviews conducted by health personnel. Interviewers were blinded to the serological status of participants. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Vences-Avilés, 2005, Mexico	Observational: case-control study	Study period: 1995 – 2003. 112 in total (18 females with average age of 39 years + 94 males with average age of 33 years): 45 cases (blood donors who were HCV-positive after RIBA testing) + 67 controls (blood donors who were HCV-negative after RIBA testing)	Several risk factors [Only data for 'dental treatment' was extracted]	Identified from the systematic review of *Chiquete, 2007* Exposure data gathered by an interview by doctors of the blood bank using a standardized questionnaire. The interrogating doctor did not know the serological status of the participants. No information on which time period of risk factors was questioned (lifetime history or more recent?)
Wang, 2013, P.R. China	Observational: case-control study	Study period: March 2010 - March 2011 726 in total: 77 cases (HIV-positive blood donors, 63 male + 14 female; 21 aged ≤25 years, 31 aged 26-35 years, 22 aged >35 years) + 649 controls (HIV-negative blood donors, 412 male + 223 female; 201 aged ≤25 years, 170 aged 26-35 years, 262 aged >35 years)	Several risk factors [Only data for 'dental cleaning' was extracted]	Identified from the systematic review of *Lu, 2014* Exposure data collected by a self-administered questionnaire sent by mail. Participants were unaware of serology status at time of questionnaire. The time frame used to study the risk factor 'dental cleaning' is a lifetime exposure (ever).
Younus, 2009, USA	Observational: case-control study	Study period: October 2001 – March 2002 560 in total: 166 cases (blood donors positive for HCV antibody and/or HBsAg, 57 aged 18-25 years, 93 aged 26-40 years, 16 aged >40 years; all males; Pakistani nationality) + 394 controls (HCV and HBV seronegative blood donors, 212 aged 18-25 years, 159 aged 26-40 years, 23 aged >40y; all males; Pakistani nationality)	Several risk factors [Only data for 'dental treatment by dentist' was extracted]	Identified from the systematic review of *Sievert, 2011* Cases and controls who tested reactive for other transmissible diseases such as HIV and malaria were excluded. Exposure data collected by personal interviews with trained interviewers using a structured questionnaire. No information about blinding of subjects or interviewers to serological status. The time frame used to study the risk factor 'dental treatment' is 5

				years prior to completing questionnaire.
Zhong, 2016, China	Observational: case-control study	Study period: January 2011 – October 2012 795 in total (mean age 32.69±10.23 years; 501 males): 265 cases (HBsAg-positive blood donors, age range 18-55 years; 167 male + 98 female) + 530 controls (HBsAg-negative blood donors, age range 18-55 years; 334 male + 284 female)	Several risk factors [Only data for 'dental treatment' was extracted]	Identified from the systematic review of *Yang, 2015* All participants in this study were negative for anti-HCV, anti-HIV, syphilis and ALT. Exposure data collected by telephone questionnaire by professional medical personnel. No information of blinding of interviewers or subjects. No information on which time period of risk factors was questioned (lifetime history or more recent?)

Appendix 5: Individual study data

Outcome	Risk factor	Effect Size	#studies, # participants	Reference
Hepatitis B				
HBsAg positive	History of dental treatment by dentist	Not statistically significant: 24/64 vs 73/260 § aOR: 1.6, 95%CI [0.7;3.6] (p=0.14) *	1, 64 vs 260	Akhtar, 2005
HBsAg positive	Dental cleaning	Not statistically significant: 72/364 vs 171/689 § OR: 0.75, 95%CI [0.55;1.03] ¥ (p=0.07)	1, 364 vs 689	Huang, 2015
HBsAg positive	Dental, ever	Not statistically significant: 21/71 vs 40/212 § OR: 1.81, 95%CI [0.98;3.34] (p=0.06) *	1, 71 vs 212	Jagannathan, 2010
HBsAg positive	Treatment in dental clinics	Statistically significant: 80/201 vs 334/1359 OR: 2.03, 95%CI [1.49;2.76] (p<0.00001) * With harm for treatment in dental clinics	1, 201 vs 1359	Nuchprayoon, 1992
HBsAg positive	Dental treatment	Statistically significant: 107/265 vs 154/530 § aOR: 1.71, 95%CI [1.21;2.43] (p=0.002) With harm for dental treatment	1, 265 vs 530	Zhong, 2016
Hepatitis C				
HCV positive	Treatment by dentist	Statistically significant: 147/193 vs 176/196 OR: 0.36, 95%CI [0.21;0.64] (p=0.0005) * With benefit for treatment by dentist	1, 193 vs 196	Alavian, 2002
HCV positive	Dental therapy	Statistically significant: 407/651 vs 12267/40618 OR: 3.86, 95%CI [3.28;4.52] (p<0.00001) * With harm for dental therapy	1, 651 vs 40618	Baha, 2013
HCV positive	Had dental procedure	Not statistically significant: 7/47 vs 11/141 § OR: 2.07, 95%CI [0.75;5.47] ¥ (p=0.16) *	1, 47 vs 141	Czerwinski, 2017
HCV positive	Dental work	Statistically significant: 7/87 vs 4/270 § OR: 5.82, 95%CI [1.66;20.38] (p=0.006) * With harm for dental work	1, 87 vs 270	Guerrero-Romero, 1996
HCV positive	Dental treatment	Statistically significant: 150/305 vs 135/610 § aOR: 4.76, 95%CI [2.00;8.41] (p<0.0001) With harm for dental treatment	1, 305 vs 610	He, 2011
HCV positive	Dental cleaning	Not statistically significant: 42/174 vs 171/689 §	1, 174 vs 689	Huang, 2015

		OR: 0.96, 95%CI [0.65;1.42] ¥ (p=0.83)		
HCV positive	Going to a dentist	Statistically significant: 12/59 vs ?/59 £§ OR: 0.492, 95%CI [0.379;0.637] (p<0.0001) With benefit for going to the dentist	1, 59 vs 59	Kasraian, 2016
HCV positive	Tooth extraction	Native Israeli's, NI's: Not statistically significant: 35/50 vs 79/128 § aOR: 0.8, 95%CI [0.3;1.8] (p=0.3) *	1, 50 vs 128 (power analysis)	Kerzman, 2007
		Immigrants from the former Soviet Union, FSUI's: Statistically significant: 84/128 vs 61/128 aOR: 1.9, 95%CI [1.1;3.3] (p=0.004) * With harm for tooth extraction	1, 128 vs 128 (power analysis)	
	Teeth cleaned	Native Israeli's, NI's: Statistically significant: 29/50 vs 99/128 § aOR: 0.4, 95%CI [0.2;0.8] (p<0.05) With benefit for teeth cleaned	1, 50 vs 128 (power analysis)	
		Immigrants from the former Soviet Union, FSUI's: Statistically significant: 37/128 vs 72/128 aOR: 0.3, 95%CI [0.2;0.6] (p<0.05) With benefit for teeth cleaned	1, 128 vs 128 (power analysis)	
HCV positive	Invasive dental treatment	Not statistically significant: 4/32 vs 6/64 § OR: 1.381, 95%CI [0.36;5.291] ¥ (p=0.727)	1, 32 vs 64	Mitrovic, 2015
HCV positive	Tooth extraction	Not statistically significant: 73/758 vs 68/1039 § aOR: 1.3, 95%CI [0.9;1.8] ¥ (p>0.05)	1, 758 vs 1039	Murphy, 2000
	Teeth cleaned (ever)	Statistically significant: 91/758 vs 91/1039 § OR: 1.42, 95%CI [1.05;1.93] (p=0.02) * With harm for teeth cleaned	1, 758 vs 1039	
HCV positive	Dentistry	Statistically significant: 815/970 vs 1079/1542 OR: 2.53, 95%CI [2.02;3.16] (p<0.001) With harm for dentistry	1, 970 vs 1542	Rezaei, 2016
HCV positive	History of having a tooth extracted	Not statistically significant: OR: 1.02, 95%CI [0.63;1.65] ¥ (p>0.05) £†	1, 166 vs 329	Thaikruea, 2004
HCV positive	Dental treatment	Not statistically significant: 23/45 vs 32/67 § OR: 1.14, 95%CI [0.54;2.44] ¥ (p=0.73) *	1, 45 vs 67	Vences-Avilés, 2005
Hepatitis B and/or Hepatitis C				
HBsAg and/or HCV positive	Dental treatment by dentist	Not statistically significant: 51/166 vs 118/394 § OR: 1.04, 95%CI [0.70;1.54] ¥ (p=0.86) *	1, 166 vs 394	Younus, 2009
HIV				
HIV positive	Ever had dental cleaning	Not statistically significant: 20/77 vs 163/649 § OR: 1.05, 95%CI [0.61;1.79] ¥ (p=0.87) *	1, 77 vs 649	Wang, 2013
HTLV-1				
HTLV-1 positive	Invasive dental treatment	Not statistically significant: 188/246 vs 550/776 OR: 1.33, 95%CI [0.96;1.86] ¥ (p=0.09) *	1, 246 vs 776	Hedayati-Moghaddam, 2015

(a)(m)OR: (adjusted)(multivariate)odds ratio, CI: confidence interval
* Calculations done by the reviewer(s) using Review Manager software
£ No raw data: number of events for each group not specified.
¥ Imprecision (large variability of results)
† Imprecision (lack of data)
§ Imprecision (limited sample size or low number of events)

Appendix 6: Quality assessment of the studies

Author, Year	Inappropriate eligibility criteria	Inappropriate methods for exposure and outcome variables	Not controlled for confounding	Incomplete or inadequate follow-up	Other limitations
Hepatitis B					
Akhtar, 2005	No No significant differences between cases and controls based on demographics.	Unclear Exposure investigated through pre-tested structured questionnaire. No information about blinding of participants. Outcome in both groups measured by ELISA kits to detect HBsAg.	No Controlled for significant risk factors related with outcome from univariate analysis.	No Outcome was used for inclusion, thereafter one questionnaire needed to be completed to evaluate risk. There was no need for follow-up.	No
Huang, 2015	Yes There are some differences between cases and controls (less education and younger than controls).	No Exposure measured by questionnaire with multiple choice responses. Subjects were blinded to serology status. Questions were selected based on a thorough review of the international and Chinese literature to ensure that the questions were comprehensive and culturally appropriate. Outcome for both groups was measured by two different ELISA tests.	Yes No control for confounding factors.	No A maximum of five follow-up calls were made if the questionnaire was not sent back to the blood centres. Only returned questionnaires were included. There was no loss to follow-up.	Yes Response rates of case groups was lower than the control group.
Jagannathan, 2010	Yes Differences in age, socioeconomic status, place of residence, voluntary vs replacement donor and first-time vs repeat donor status.	Yes Exposure of both groups was measured by a self-administered questionnaire, though in cases after notification about their HBsAg status, in controls before outcome was known ⇒ possible reporting bias Outcome for both groups was measured by EIA assay, if necessary confirmed by a second EIA and two different HBsAg ELISA kits.	Yes For the risk factor 'dental' no adjustment for confounding factors was carried out.	No Positive donors were invited for test results and to fill out questionnaire, control group filled out questionnaire at time of donation. No follow-up necessary.	Yes 34 Subjects were excluded due to 'small numbers' of which definition is unclear. Possible recall bias.
Nuchprayoon, 1992	Yes Cases and controls were matched by systematic random sampling. The mean age of controls was significantly higher than that of cases, there were also differences in marital status and first time vs repeat donation.	Unclear Exposure in both groups was measured by pretested self-administered questionnaire. No information about blinding of the researchers. Outcome for both groups was based on RPHA testing, and if necessary confirmed by two ELISA tests for HBsAg.	Yes Not controlled for confounding factors.	No All individuals returning the filled-in questionnaire were included. If important data from the questionnaires were missing, they would be completed in the next visit. No loss to follow-up.	No
Zhong, 2016	No Cases and controls were matched by sex, age and donation date.	Unclear Exposure for both groups was measured by telephone questionnaire conducted by professional medical personnel. Not clear if participants were aware of serology status. Outcome for both groups was measured by two different ELISA tests for HBsAg.	No Multiple conditional logistic regression was carried out for 'dental treatment'. The forward stepwise method was used for variable selection in the multiple conditional logistic regression.	No All participants willing to be contacted by telephone for the questionnaire were included. There was no loss to follow-up.	No
Hepatitis C					
Alavian, 2002	No	Yes	Yes	No Outcome was used for inclusion,	No

	No differences in age or gender between cases and controls.	Exposure investigated through structured confidential interview. The questioners were not blinded to the results of the anti-HCV antibody test: possible underestimation of prevalence of positive risk factors in control group. Outcome (anti-HCV antibody detection) in both groups measured by ELISA. Certainty for HCV positivity was achieved through additional RIBA testing.	Not controlled for confounding factors.	thereafter one questionnaire needed to be completed to evaluate risk. Those refusing to answer the questions were excluded from the study. There was no loss to follow-up.	
Baha, 2013	No All subjects were grouped by sex and age range.	Unclear Exposure investigated through a standard and individual questionnaire. No information about blinding of participants or interviewers to serological status. Outcome measured by a third-generation enzyme immunoassay, if positive ratification was done by PCR.	Yes Not controlled for confounding factors.	No Inclusion of population based on outcome. There was no need for follow-up.	No
Czerwinski, 2017	No For each case, three controls were randomly matched. Controls were the same sex, a similar age, were first-time donors and gave blood up to 12 months after identification of cases.	Yes Exposure was based on a post-donation questionnaire with closed-end questions. The survey contained questions on sensitive topics that could have been reported inaccurately. Outcome for both groups was measured by anti-HCV serological screening and confirmed by NAT for RNA of HCV.	Yes For dental care, there was no control for confounding factors.	No There is one follow-up visit to take blood samples to confirm HCV status, where the post donation survey was administered in a face-to-face interview. There was no loss to follow-up.	Yes Possible ascertainment bias: only 30% of WP infections included.
Guerrero-Romero, 1996	No For each case 3 controls were selected after being matched for age, sex, years of education, civil state and urban/rural origin.	Unclear Exposure investigated through a questionnaire on risk factors. No information about blinding of participants to their serological status. Outcome for both groups evaluated by second generation HCV antibody ELISA testing.	Yes Not controlled for confounding factors.	No A previously filled out questionnaire with risk factors was available for all subjects. There was no need for follow-up.	Yes Not clear for which time period the risk factors were assessed.
He, 2011	No For each case, two age- and sex-matched controls were selected.	No Exposure investigated through a risk assessment questionnaire conducted by professional medical personnel. No information about the blinding of medical personnel conducting investigation on risk assessment. Outcome for both groups evaluated by anti-HCV ELISA testing.	No A multivariable logistic regression model of risk factors associated with serological evidence of infection with hepatitis C virus was conducted.	No An exposure risk assessment was available for all subjects. There was no need for follow-up.	Yes Not clear for which time period the risk factors were assessed.
Huang, 2015	Yes There are some differences between cases and controls (less education and younger than controls).	No Exposure measured by questionnaire with multiple choice responses. Subjects were blinded to serology status. Questions were selected based on a thorough review of the international and Chinese literature to ensure that the questions were comprehensive and culturally appropriate.	Yes No control for confounding factors.	No A maximum of five follow-up calls were made if the questionnaire was not sent back to the blood centres. Only returned questionnaires were included. There was no loss to follow-up.	Yes Response rates of case groups was lower than the control group.

		Outcome for both groups was measured by two different ELISA tests.			
Kasraian, 2016	No Controls were age- and sex-matched with cases. There were differences in education level and proportion of professional jobs.	No Exposure for both groups measured by interview performed by a psychiatrist who was blinded to the status of HCV at the time of interview. Subjects were also blinded to serological status. Outcome for both groups was measured by same laboratory testing for anti-HCV antibody.	Unclear Not clear if there is controlled for confounding for going to a dentist.	No Inclusion was based on serological testing. All data on outcome was gathered during the interview. There was no need for follow-up.	No
Kerzman, 2007	Yes Differences in age, marital status, education status	Yes Exposure investigated through a structured questionnaire by a non-anonymous telephone interview. No blinding of the researcher. Donors were aware of their serology status ⇒ possible reporting bias. Outcome for both groups evaluated by 3rd generation microparticle chemiluminescence immunoassay and repeat-reactive samples confirmed with recombinant immunoblot assay.	No Multiple logistic regression analysis was used. Controlled for age and significant risk factors were also controlled for IV drug use	No All responders to exposure questions were included. No follow-up necessary.	Yes The case-group of NI did not reach the sample size determined through power analysis.
Mitrovic, 2015	No Controls were age- and sex-matched with cases. There was a significant difference in marital status and educational level but should not influence results.	No Exposure for both groups measured by anonymous questionnaire with standardized questions. Case patients and controls were not blinded to HCV status. Outcome for both was measured by a third-generation ELISA test and confirmed by a second ELISA test to confirm if necessary.	Yes Not controlled for confounding for dental treatment. Only significant results in univariate analysis were analysed in a multivariate analysis.	No Inclusion based on serological status. Only people who sent back the filled in questionnaire were included in the study. There was no need for follow-up.	No
Murphy, 2000	No Cases and controls were matched based on age, sex, race/ethnicity, center and first-time vs repeat-donor status. Donation dates between cases and controls were maximum ~7 months apart.	No Exposure was measured by anonymous questionnaire. No information about blinding of the researchers. Outcome was measured by combining enzyme immunoassay and recombinant immunoblot for both cases and controls.	No Controlled for intravenous drug use.	No All individuals returning the filled-in questionnaire are included. Subjects with missing data were excluded from the models, but this did not usually exceed 10% of the total population.	Yes Unclear numbers in subdivision of the risk factor 'teeth cleaned': the amount of cases and controls in subcategories summed up does not match the total number of included cases and controls in this study.
Rezaei, 2016	No Controls were age-matched to cases.	Unclear Identical questionnaire used for cases and controls in face-to-face interview. Not clear if participants were aware of HCV status: possible response bias. Outcome for both groups measured by same laboratory testing.	Yes Not controlled for confounding for dental treatment.	No Outcome was used for inclusion. Only participants willing to complete the questionnaire on exposure were included in the study. No need for follow-up.	No
Thaikruea, 2004	No One to four controls who donated blood within a 15-day period of each case were	No Exposure for both groups was measured by private interviews by health personnel of same gender.	Yes 'History of having a tooth extracted' was not controlled	No Participants were invited by letter and a second letter was sent if necessary.	No

	matched for age within 5 years, gender and donation sites and selected randomly.	Interviewers and physicians did not know HCV status of the participant. Outcome for both groups was analysed by EIA-3 testing and positive results confirmed by repeated EIA-3, PCR or RIBA-3.	for confounding factors.	Questionnaire was taken at same time that blood was drawn to confirm HCV status. Potential controls who declined to participate or did not respond were replaced using the same matching criteria.	
Vences-Avilés, 2005	Unclear No information on matching, no demographic data given.	No Donors were interviewed by the physician, who was blinded to serology status. Outcome for both groups analysed by ELISA and RIBA and if necessary confirmed by RNA detection by RT-PCR.	Yes Not controlled for confounding factors.	No Inclusion of population based on outcome. Participants are interviewed for risk factors. There was no loss to follow-up.	No
Hepatitis B and/or Hepatitis C					
Younus, 2009	No No information on matching. Demographic characteristics show some differences in age alone.	Unclear Exposure for both groups was measured by trained interviewers using a structured questionnaire. Not sure if participants or interviewer were aware of serology status. Outcome for both groups was measured by ELISA-III kits for HBsAg and HCV-antibody.	No Controlled for age, race, household income, family history of HBV and/or HCV, …	No Only data of participants who answered questionnaires were included. No loss to follow-up.	No
HIV					
Wang, 2013	Yes Significant differences in age, education, gender, ethnicity, marital status and donation center between groups.	No Exposure was measured by risk factor questionnaires mailed to cases and controls. Donors were unaware of infection status when filling out questionnaire. Outcome for both groups was measured by two different ELISA kits and confirmed using Western blot assays if necessary.	Yes 'Dental cleaning' was not controlled for confounding factors.	No Only data of participants who returned the questionnaire were included. There was no loss to follow-up.	Yes All four blood centers from which this study's data derived are located in HIV high-prevalence areas. Donors received payment for participation, this might influence their answers on the questionnaire
HTLV-1					
Hedayati-Moghaddam, 2015	No For each case, 4 controls were matched for age, gender and date and center of donation. Significant differences were seen remarriage, education, income and birth place, but should not influence results.	Yes Exposure measured by interview conducted by trained research assistants. Possible response bias, due to the non-anonymous questioning. Outcome for both groups measured by ELISA testing and if necessary confirmed by Western Blot analysis.	Yes No control for confounding for dental care.	No Inclusion based on outcome. Data on exposure collected by interview. There was no need for follow-up.	No