

Determinants of Serological Response to Hepatitis B Vaccination In Hemodialysis Patients: A Systematic Review

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Background

- Patients with end stage renal disease (ESRD) are at an increased risk of contracting Hepatitis B (HBV) compared to the general population due to the immunosuppressive effect of renal failure and prolonged periods of vascular access.
- The response rate to the Hepatitis B vaccination in patients with ESRD is 55-88% compared to ≥95% in the general population
- To date, no systematic review has been done that links all the possible risk factors that could effect serologic response to the HBV vaccine.

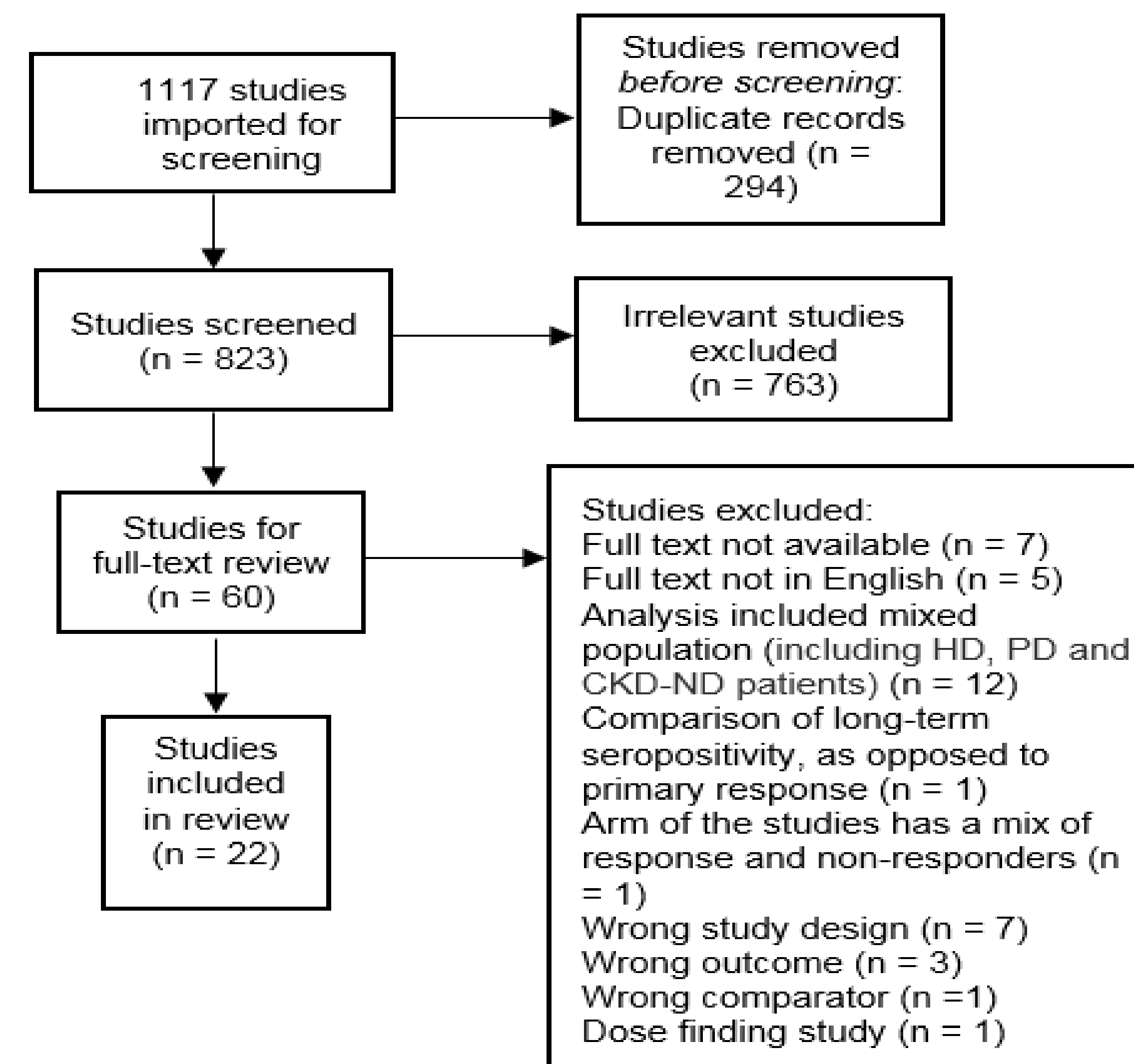
Objectives

- Primary:** To compile a list of all possible factors that have the potential to affect serological response to the Hepatitis B vaccine in hemodialysis patients.
- Secondary:** To characterize the above factors as either modifiable or non-modifiable.

Methods

- Inclusion:** Studies whose primary objective was to assess factors that affect serological response. RCTs, observational studies, case series, case reports, human studies were included.
- Exclusion:** Studies whose primary objective was NOT to assess factors that affect serological response. Systematic reviews, non English language studies and studies where analysis did not separate out type of dialysis modality were excluded.
- Databases:** Embase, MEDLINE, EBM Review and CINAHL
- Grey Literature:** TRIP, GRID, CADTH, clinicaltrials.gov, Google Scholar
- Search Terms:** Renal dialysis, dialysis, peritoneal dialysis, hemodialysis, continuous renal replacement therapy, hemofiltration, kidney disease, kidney failure, renal insufficiency, renal replacement therapy, Hepatitis B vaccine, sero*, Antiod*, Antigen*
- Screening:** Facilitated with Covidence web software. 100% duplicate by JM and NL. Level of agreement K = 0.65.
- Data Extraction:** Pre-specified data extraction form. 100% by JM and 25% by NL. Level of agreement K = 1.
- Analysis:** For all included studies, factors that were shown to statistically significantly affect serological response and those that did not were identified and tabulated.

Results - Figure 1: PRISMA Flow Diagram



Study Characteristics - Table1: Study Characteristics

Number of studies	22
Number of patients	2256
Average number of patients per study	102.5
Average age	55.96
% HD patients	100%
3 dose regimen	8
4 dose regimen	14
Number of studies that used EngerixB	12
Number of studies that used Recombivax	3
Number of studies that used other vaccines	7

Results - Table 2: Factors Affecting Serological Response

Always Statistically Significant*	Never Statistically Significant *	Variable results**
Adherence to protocol Beck Depression Index Score Physical functioning Bodily pain Vitality Social functioning Mental Health Pain Catastrophizing Score Lupus Pre-dialysis creatinine Anti-HBS level	Leukocyte level Dry weight Cancer Immunosuppressants HIV Supplemental vaccine Dialysis membranes Transfusions IPTH Calcitriol usage rHuEPO (+) Vascular kidney disease Glomerular kidney disease Interstitial kidney disease Polycystic kidney disease IL-2R level Ferritin HepB infection Heparin usage	Smoking history Previous transplant Coronary artery disease EPO usage General Health Perception Role-emotional MCS score Protein catabolic rate PTH level Phosphate level Calcium level Age at time of vaccination Anemia Vitamin D usage Transferrin saturation Total serum protein

* As found in 1 or more studies
** As found in 2 or more studies

Results - Table 3: Modifiable and Non-Modifiable Factors

Modifiable Risk Factors	Non-modifiable Risk Factors
Adherence to protocol Physical functioning Bodily pain Social functioning Pain Catastrophizing Score	Beck Depression Index Score Vitality Mental health Lupus Pre-dialysis creatinine Anti-HBS level

Discussion

- **Limitations:** Reasons for variability include different vaccines used, different vaccines regimens, different study designs, and variable baseline characteristics. Some of the above factors deemed always statistically significant and never statistically significant were assessed in a single study.
- **Future Implications:** These factors can be used to enhance HBV serological response by improving/removing the them before the vaccination is administered. Studies can be done assessing the barriers/facilitators to implementing a new vaccine protocol to mitigate the factors identified in this review.

Conclusions

This study aimed to identify all the possible factors that could have an affect on serological response to the HBV vaccine in HD patients. The above risk factors can be used to enhance HBV serological response by improving/removing the modifiable risk factors first before the vaccination is performed.

