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ΕΡΕΥΝΗΤΙΚΗ ΕΡΓΑΣΙΑ

The infectious complications of ABO incompatibility in renal transplant patients A meta-analysis

OBJECTIVE **To evaluate the impact and types of infections in ABO-incompatible kidney transplant patients.** METHOD **The study was a meta-analysis. The search strategy utilized databases such as Embase, Scopus, and PubMed. We conducted our study between July and August 2024 and we collected data on the occurrence of infection complications in kidney transplant patients with ABO incompatibility. The data were calculated with the aim to determine the cumulative effect estimate. We used the Mantel-Haenszel test to analyze the data.** RESULTS **Thirty-one articles were included comprising 2,114 patients with ABO incompatibility and 32,287 patients with ABO compatibility. Our results indicated that patients with ABO incompatibility undergoing kidney transplantation had a 1.49 times higher risk of infection compared to those with ABO compatibility. More specifically, the types of infections that increased in ABO incompatible kidney transplant patients included sepsis, cytomegalovirus (CMV) infection, BK virus (BKV) infection, herpes zoster virus (HZV) infection, and pneumonia. However, we could not establish a link between urinary tract infections (UTIs) and *Pneumocystis pneumonia* (PCP) occurrences in ABO incompatible kidney transplant patients.** CONCLUSIONS **ABO incompatibility in kidney transplant patients has a crucial impact on causing infection complications.**

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Λοιμώδεις επιπλοκές της ασυμβατότητας ΑΒΟ σε ασθενείς με μεταμόσχευση νεφρού: Μια μετα-ανάλυση

Περίληψη στο τέλος του άρθρου

Key words

ABO incompatibility
Complication
Infection
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Predictor

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Kidney transplantation remains a significant global challenge. The prevalence of kidney transplantation shows considerable variation across different regions and countries. The estimated global median prevalence of kidney transplantation is around 255 per million population (pmp), ranging from 3 pmp in the Bahamas to 693 pmp in Portugal.[1] In another study, it was also reported that the prevalence of kidney transplantation was approximately 82 pmp in the year 2010.[2] Moreover, mortality rate of kidney transplant patients was also reported widely. The number of mortality is based on different conditions, like post-transplant time and comorbidity and diabetes. The average five-year survival rate for the transplant patients is 80%. However, this number may be far less for patients with comorbidities like diabetes or whose graft has failed.[3] The risks in kidney transplantation are just staggering. Complications of kidney transplantation are a lot and are serious, from concerns like organ rejections to even high mortality, as well as uncertainty in survival for grafts and in renal function, in addition to the enhanced risk for infections.[4–6] Significantly, the reported complications were more with ABO incompatibility than complicating further management and outcomes of kidney transplantation.[7–10]

ABO incompatibility is the state where an individual's immune system responds to the blood group antigens of another individual.[11] ABO incompatibility in relation to kid-

ney transplantation refers to the presence of natural anti-A and/or anti-B antibodies of the recipient against the donor's A and or B blood group antigens.[12] It has been found that the prevalence of ABO incompatibility among the general population is approximately 9.2%.[13] Furthermore, the mortality rate related to ABO incompatibility appreciably varies depending on the context and population under study. With blood transfusion, there have been deaths with as little as 30 mL up to more than three units of blood given, with the most frequent lethal dose being one unit.[14] With graft survival, the rates at six months range from 83% to 76%.[15] ABO incompatibility is a very challenging condition to manage in kidney transplantation. An ABO-incompatible patient in kidney transplantation requires more intensive immunosuppressive therapy, and indeed, the patients also need desensitization protocols like immunoglobulin G and plasmapheresis.[16] Theoretically, this increases the risk of infection.[12] At present, the reports regarding the incidence of infections in ABO-incompatible kidney transplant patients and their type were still varied and inconclusive. The current meta-analyses only reported the prevalence of infections in kidney transplant patients with ABO incompatibility.[9,10] This study, therefore, had an objective to assess the impact of the incidence of infections in kidney transplant patients with ABO incompatibility and the type of infections that are likely to occur. These findings may serve as the foundation for future guidelines in the management of the kidney transplant patient.

MATERIAL AND METHOD

Design

The design of this study was a meta-analysis. We conducted this study from July to August 2024. To achieve the aim of this study, we collected information on the occurrence of infection complications in patients with ABO incompatibility among kidney transplant patients to determine the cumulative effect estimate. We ensured that the study protocol adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist.[17] The study protocol has been registered with Prospero under the number 577769.

Eligibility criteria

We established the inclusion criteria for this study, as follows: Study designs including randomized controlled trials and observational studies, study contexts evaluating the incidence of infection complications in kidney transplant patients with ABO incompatibility, and the availability of complete data necessary for calculating cumulative effect estimates. The exclusion criteria for this study were defined as follows: Studies deemed irrelevant based on their titles and or abstracts, articles categorized as reviews or commentaries, and studies of insufficient quality based on the assessment using the Newcastle-Ottawa Scale (NOS).

Quality assessment

We used the NOS to assess the quality of the articles included in the present study. This scoring method evaluates several components, including the selection of study groups, the comparability of the groups, and the assessment of exposure or outcomes of interest. The NOS method has a minimum score of 0 and a maximum score of 9. The interpretation of the NOS is as follows: Scores ranging from 0 to 3 indicate low-quality studies, scores from 4 to 6 indicate moderate-quality studies, and scores from 7 to 9 indicate high-quality studies.[18] SMDN, AE, MS, and DSBS conducted the article quality assessment independently. If differing evaluations were obtained during this process, the discrepancies were resolved through discussions with a senior researcher (JKF).[19]

Search strategy

We established that the source databases used for article search in the present study were PubMed, Embase, and Scopus. The search for articles was conducted up to 15 July 2024. We considered only articles published in English for evaluation. In our study's article search, we used the OR and AND operators to narrow or broaden the search results. The AND operator was used to narrow the search, where this operator would display all the keywords being searched for. Therefore, only articles containing all those keywords were shown in the search results. On the other hand, the OR operator was used to broaden the search by displaying articles that contained any one of the keywords. The keywords used in the article search for this study were "ABO incompatibility" OR "ABO blood group mismatch" AND "infections" OR "infectious complications" AND "renal transplantation" OR "kidney transplantation." These keywords were adapted from medical subject headings (MeSH). Additionally, other methods employed to find articles included searching through the reference lists of related articles.

Data extraction

To achieve the objectives of this study, we established several information to be collected from each article. This information included the name of the first author, year of publication, country where the study was conducted, study design, age of participants, outcomes, sample size of cases and controls, and the incidence of infections in each group. The data extraction process was carried out independently by SMDN, AE, MS, and DSBS. If any data discrepancies were found, discussions with a senior researcher (JKF) were held to resolve the issues.

Covariates

In this study, we defined the predictor covariate as ABO in-

compatibility in renal transplant patients. Meanwhile, the outcome covariate was set as the occurrence of infections in patients with ABO incompatibility in renal transplantation. To determine the types of infections to be evaluated in this study, we conducted an initial search regarding data availability. Our search revealed that the infections of interest in the present study included all infections, sepsis, cytomegalovirus (CMV) infection, BK virus (BKV) infection, herpes zoster virus (HZV) infection, urinary tract infection (UTI), pneumonia, and *Pneumocystis carinii* pneumonia (PCP).

Statistical analysis

Data on the occurrence of infections in patients with ABO incompatibility in renal transplantation in our study was presented as n (%). The data analysis steps in this study included assessing potential publication bias, evaluating potential heterogeneity, and analyzing the main findings to determine the effect estimate. First, we used Egger's test and funnel plots to assess potential publication bias. Potential publication bias was defined as an Egger's p-value <0.05 and an asymmetric funnel plot. If the analysis detected potential publication bias, we adjusted using the Trim and Fill method.[20] Second, to evaluate heterogeneity, we applied I-squared and p-heterogeneity statistics. We used a random-effects model to calculate the cumulative effect estimate if p-heterogeneity <0.10 or I-squared >50%. Conversely, we used a fixed-effects model if p-heterogeneity ≥0.10 or I-squared ≤50%.[21] Third, the main findings in our study were assessed using the Mantel-Haenszel test. We presented effect estimates as odds ratios (OR) with 95% confidence intervals (95% CI) in a forest plot.[22] Data analysis for this study was conducted using Review Manager software, version 5.1 (RevMan, Cochrane, UK).

RESULTS

Article selection

We conducted an initial search and found 7,433 articles from the database. Additionally, we also identified 17 more articles through a search of reference lists from related articles. From these, 56 articles were excluded due to duplication. Moreover, a total of 7,326 articles were also excluded because they were irrelevant to the topic. We then selected 68 articles for full-text analysis. Of these, 14 articles were excluded due to incomplete data. Furthermore, 23 articles were also excluded because they were reviews. Finally, we included 31 articles as the final sample for this study.[23–53] The baseline characteristics of these 31 articles are presented in table 1, and figure 1 illustrates the article selection flowchart for this study according to PRISMA guidelines.

The occurrence of infection complications in ABO incompatibility patients undergoing renal transplantation

The infection complications evaluated in this study included all infections, sepsis, CMV infection, BKV infection, HZV infection, UTI, pneumonia, and PCP. For the occurrence of all infections in ABO incompatibility patients undergoing renal transplantation, we analyzed data from 31 articles.[23–53] Our calculations showed that ABO incompatibility patients undergoing renal transplantation had an increased risk of infection complications compared to ABO compatible patients (OR: 1.49; 95% CI: 1.21, 1.83; p Egger: 0.1570; p heterogeneity: <0.0001; p=0.0002) (fig. 2). Regarding sepsis, data from 10 articles[23,25,26,28,40–42,45,47,53] revealed that there was an increased risk of sepsis in ABO incompatibility patients undergoing renal transplantation compared to ABO compatible patients (OR: 1.60; 95% CI: 1.12, 2.29; p Egger: 0.7693; p heterogeneity: 0.2080; p=0.0100) (fig. 3A). Concerning CMV infection risk, we included 25 articles.[23,25,27–33,37–51,53] Our results indicated that ABO incompatibility in renal transplantation patients was associated with an increased risk of CMV infection compared to ABO compatible patients (OR: 1.36; 95% CI: 1.06, 1.75; p Egger: 0.0132; p heterogeneity: 0.0520; p=0.0200) (fig. 3B). Similarly, for BKV infection risk, data from 14 articles[25,28–31,35,38–41,45,46,48,50] showed that ABO incompatibility was associated with an increased risk of BKV infection compared to ABO compatible patients undergoing renal transplantation (OR: 1.83; 95% CI: 1.14, 2.94; p Egger: 0.3684; p heterogeneity: 0.0540; p=0.0100) (fig. 4A). Additionally, data from nine articles[29,31,37,38,40,46,47,50,53] also demonstrated that an increased risk of HZV infection was associated with ABO incompatibility in renal transplantation patients compared to ABO compatible patients (OR: 1.68; 95% CI: 1.15, 2.43; p Egger: 0.8752; p heterogeneity: 0.3950; p=0.0070) (fig. 4B). Furthermore, nine articles[24,25,32,38,40,41,45–47] revealed that the risk of pneumonia was higher in ABO incompatibility patients undergoing renal transplantation compared to ABO compatible patients (OR: 1.88; 95% CI: 1.38, 2.58; p Egger: 0.7117; p heterogeneity: 0.8520; p<0.0001) (fig. 4C). However, the risk of UTI and PCP did not show differences between ABO incompatibility and ABO compatible patients undergoing renal transplantation.

Heterogeneity among studies and potential publication bias

Regarding potential publication bias, our results identified that the CMV infection variable had potential publication bias. Therefore, the effect estimate calculation was adjusted using the Trim and Fill method. Concerning heterogeneity among studies, evidence of heterogeneity was found for the variables of all infections, CMV infection, BKV infection, and UTI. As a result, the effect estimate calculation was performed using a random effects model. A

Table 1. Baseline characteristics of studies included in our analysis.

Study	Country	Design	Age (years)	Sample size	Outcomes	Quality assessment
Ashimine et al[23]	Japan	RC	40.1±15.1	320	Infection, rejection, survival	High
Axelrod et al[24]	US	R	18–60	26,775	Infection, cost, survival	High
Becker et al[25]	Germany	R	46 (18–65)	102	Infection, cost, survival, surgical complication	High
Flint et al[26]	Australia	P	50 (32–61)	89	Survival, rejection, infection, graft function	High
Fuchinoue et al[27]	Japan	R	43.5±13.7	393	Renal function, survival, infection	High
Genberg et al[28]	Sweden	R	35.1±14.3	45	Renal function, infection, B-cell	High
Habicht et al[29]	Germany	RC	45.6±2.6	67	Rejection, infection, surgical complication	High
Hatakeyama et al[30]	Japan	R	45.0±12.0	42	Rejection, infection, survival	High
Hwang et al[31]	Korea	R	44.1±9.2	173	Renal function, survival, infection	High
Iwai et al[32]	Japan	R	64.7±3.9	21	Rejection, infection, surgical complication	High
Jeon et al[33]	Korea	R	19–58	83	Renal function, infection, rejection	High
Jha et al[34]	India	R	42.0±12.5	689	Renal function, rejection, infection	High
Kim et al[35]	Korea	R	50 (19–69)	797	Survival, graft function, rejection, infection	High
Ko et al[36]	Korea	R	44.2±12.4	18	Survival, renal function, infection, rejection	High
Kohei et al[37]	Japan	R	40.4±12.3	185	Survival, rejection, infection	High
Kwon et al[38]	Korea	R	41.3±12.1	834	Survival, infection, surgical complication, graft function	High
Lee et al[40]	Korea	R	43.3±13.8	213	Rejection, graft survival, infection	High
Melexopoulou et al[39]	Greece	R	39.0±11.0	60	Survival, graft function, renal function, infection	High
Bennani et al[41]	France	R	45.0±13.5	88	Survival, graft function, infection, renal function	High
Okumi et al[42]	Japan	RC	38.1±11.7	1032	Graft function, survival, infection	High
Park et al[43]	Korea	R	49.0±6.5	32	Survival, infection, renal function, surgical complication	High
Sánchez-Escuredo et al[44]	Spain	P	44.0±13.0	176	Survival, rejection, infection	High
Schachtner et al[45]	Germany	P	52 (18–65)	97	Infection, mortality, renal function	High
Shin et al[46]	Korea	R	42.8±11.8	469	Survival, renal function, infection, surgical complication	High
Shishido et al[47]	Japan	R	11.9±4.5	323	Rejection, infection, survival	High
Subramanian et al[48]	US	P	52.2±3.6	63	Graft function, renal function, infection, survival	High
Tanabe et al[49]	Japan	R	43.0±13.5	125	Graft survival, mortality, infection	High
Van Agteren et al[50]	Netherlands	R	54 (22–75)	100	Graft survival, infection	High
Yokoyama et al[51]	Japan	R	46.4±14.6	71	Rejection, renal function, infection	High
Yu et al[52]	Korea	R	48.0±8.2	716	Survival, renal function, graft function, infection	High
Zschiedrich et al[53]	Germany	P	47.0±11.0	203	Mortality, graft loss, infection, renal function	High

R: Retrospective, RC: Retrospective cohort, P: Prospective

summary of the potential and publication bias analysis is presented in table 2.

DISCUSSION

Our results revealed that patients with ABO incompatibility who underwent kidney transplantation had an increased risk of infectious complications compared to ABO compatible patients. Furthermore, the risk of sepsis, CMV infection, BKV infection, HZV infection, and pneumonia was higher in patients with ABO incompatibility who underwent kidney transplantation compared to ABO compatible patients. Until now, our study was the first to evaluate infectious complications in detail in patients with ABO incompatibility who underwent kidney transplantation. Therefore, we could not compare our results with previous studies. Nonetheless, previous meta-analysis studies had reported general complications of ABO incompatibility in kidney transplantation. They found that patients with ABO incompatibility who underwent kidney transplantation

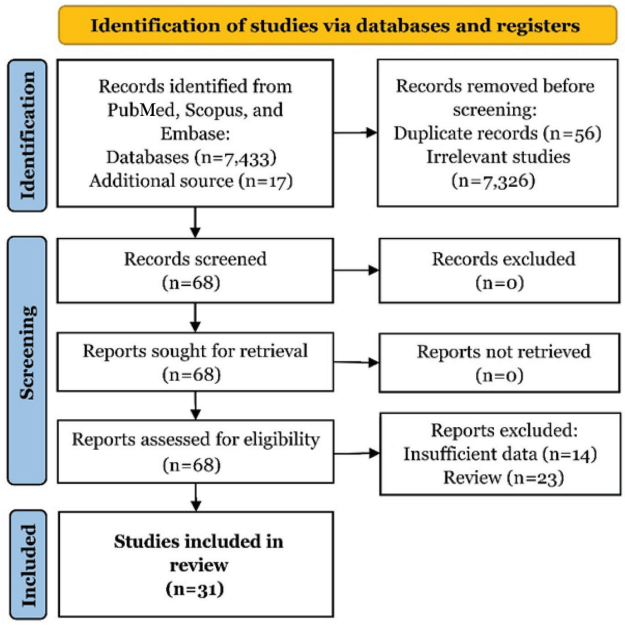

Figure 1. A flowchart of article selection in our study.

had an increased risk of mortality, graft failure, rejection, and bleeding.[7–10] Furthermore, in the context of infections, previous studies had reported only general prevalence data. They did not report the specific risks or the types of infections that could occur in patients with ABO incompatibility who underwent kidney transplantation. Moreover, those studies included case series, which certainly introduced serious bias into the meta-analysis.[9,10] Our study only included observational studies, thus minimizing the risk of bias. Therefore, our results provided new insights into the types of infections that could occur in patients with ABO incompatibility who underwent kidney transplantation.

Theoretically, the reasons behind our findings cannot be precisely predicted. However, several factors may support our results. First, kidney transplant patients with ABO incompatibility receive more aggressive immunosuppressive drugs to prevent rejection of the transplanted organ. Therefore, this intensified immunosuppression might create a greater opportunity for infections by increasing suscep-

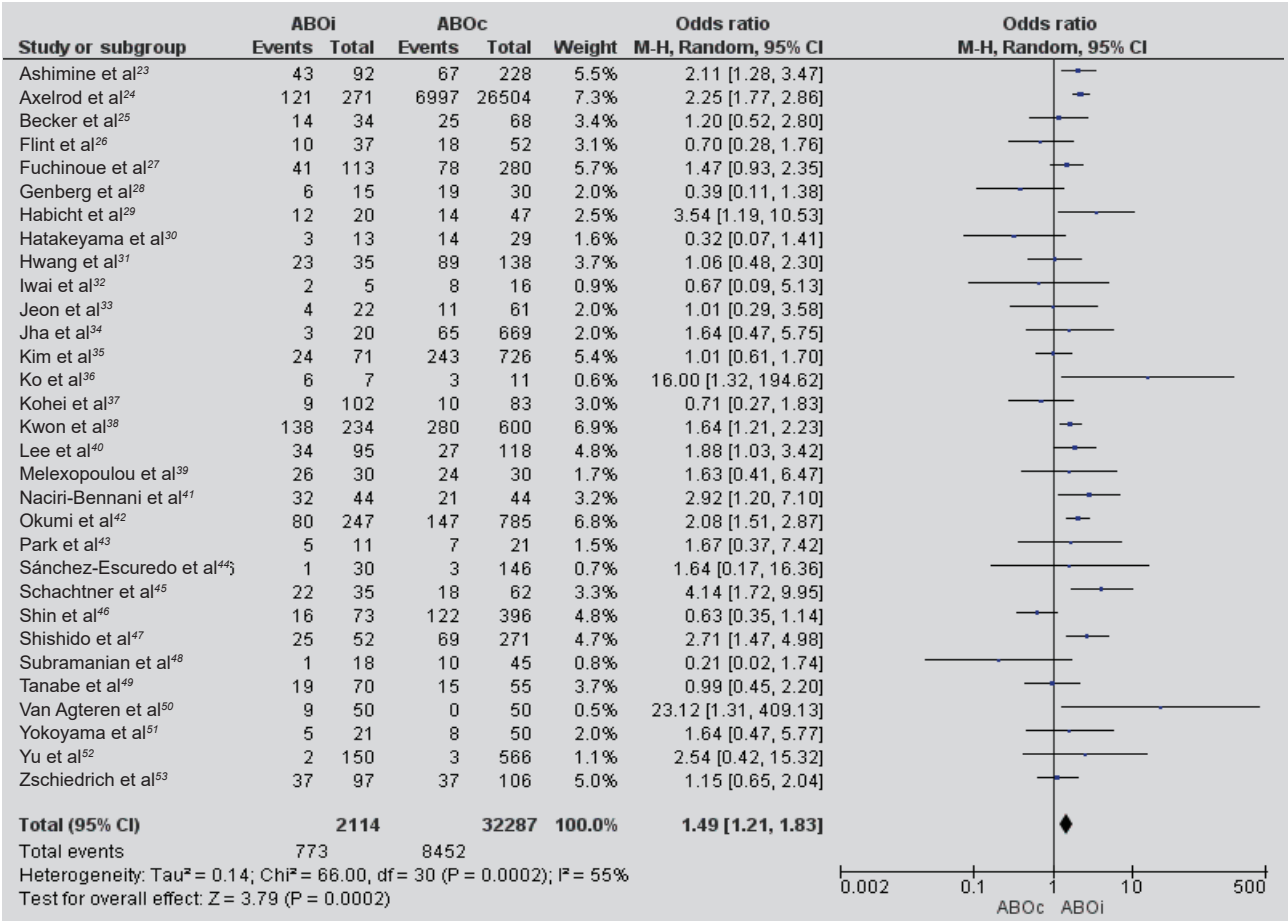

Figure 2. A forest plot of the association between ABO incompatibility and the risk of all-cause infection among renal transplantation patients (odds ratio [OR]: 1.49; 95% confidence interval [95% CI]: 1.21, 1.83; p Egger: 0.1570; p heterogeneity: <0.0001; p=0.0002).

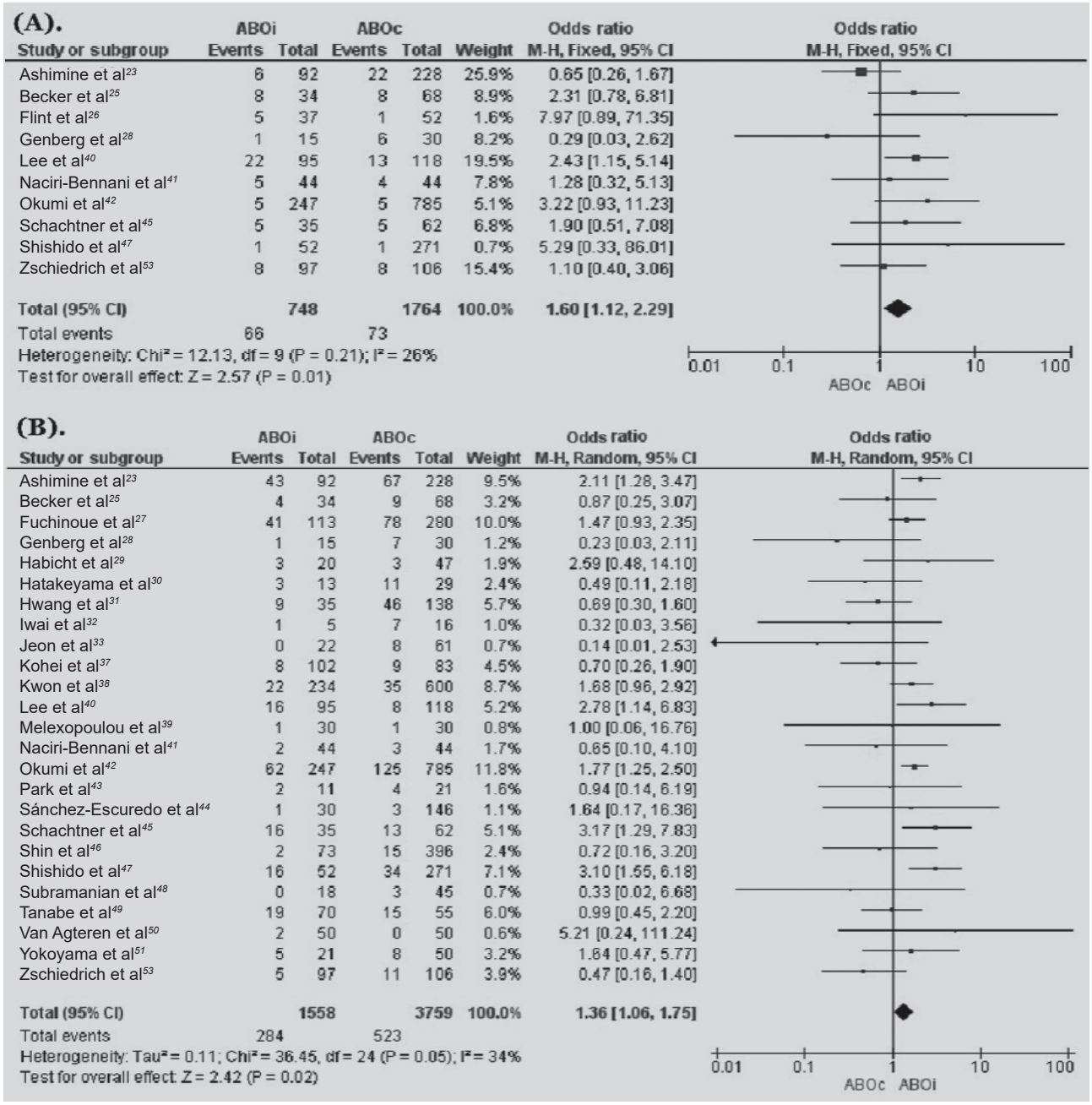

Figure 3. A forest plot of the association between ABO incompatibility and the risk of sepsis. (A) (odds ratio [OR]: 1.60; 95% confidence interval [95% CI]: 1.12, 2.29; p Egger: 0.7693; p heterogeneity: 0.2080; p=0.0100) and Cytomegalovirus (CMV) infection. (B) (OR: 1.36; 95% CI: 1.06, 1.75; p Egger: 0.0132; p heterogeneity: 0.0520; p=0.0200) among renal transplantation patients.

tibility because the body's ability to fight pathogens has weakened. This includes side effects that increase the risk of infections in desensitization protocols, such as immunoglobulin G administration and plasmapheresis.[16,54] Second, kidney transplant patients with ABO incompatibility have an increased risk of antibody-mediated rejection (AMR).[55] This can lead to inflammation and damage in the transplanted kidney, thereby creating an environment prone to infection.[56,57] Third, following an infection, the withdrawal of immunosuppressive agents has been shown to increase the risk of graft loss and further complications.[58] Therefore, in patients with ABO incompatible kidney transplants, a dynamic balance needs to be achieved between maintaining adequate immunosuppression and appropriate infection management.[16] Finally, the cumulative effect of more aggressive immunosuppressive therapy, utilization

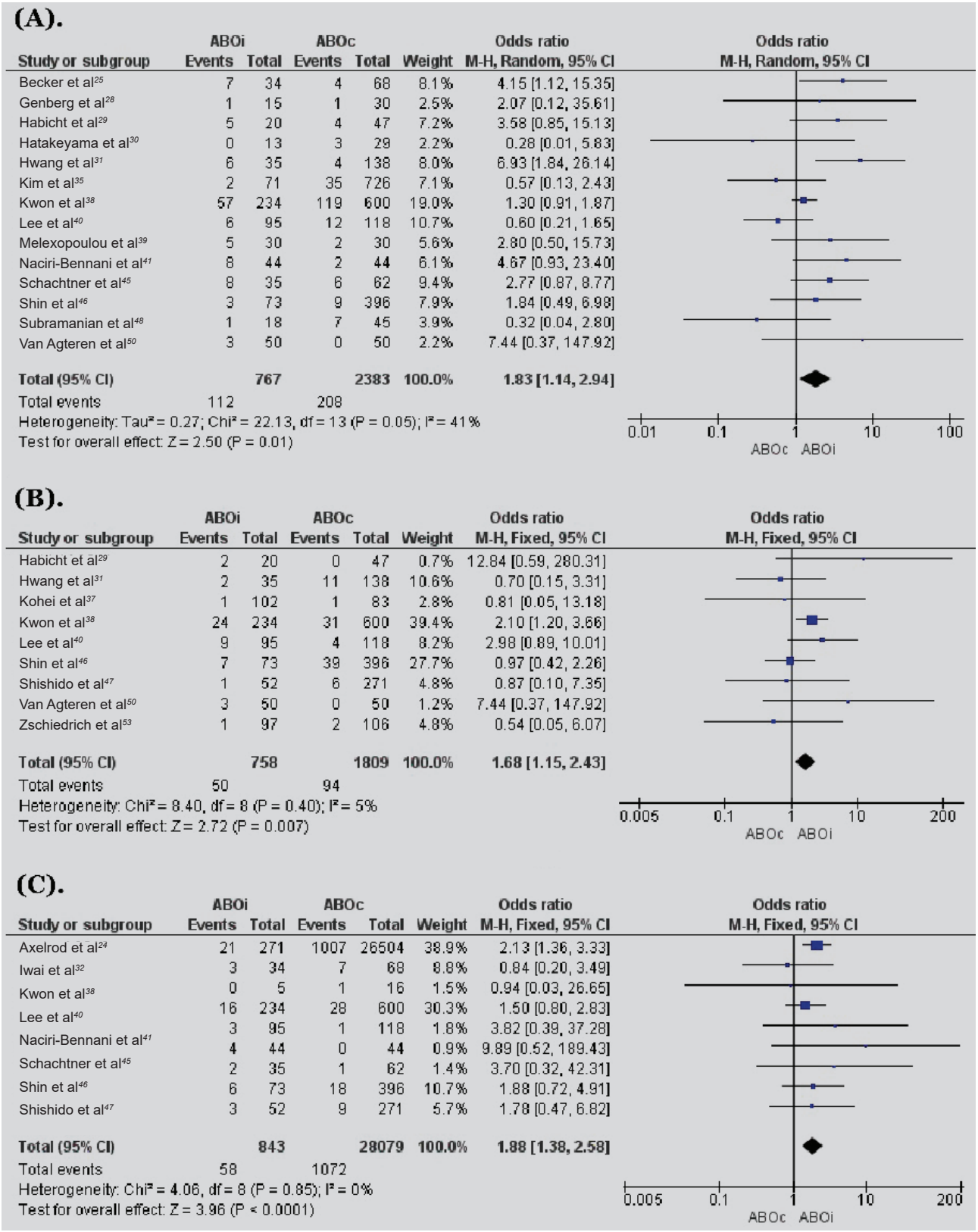

Figure 4. A forest plot of the association between ABO incompatibility and the risk of BK virus (BKV) infection (A) (odds ratio [OR]: 1.83; 95% confidence interval [CI]: 1.14, 2.94; p Egger: 0.3684; p heterogeneity: 0.0540; p=0.0100), herpes zoster virus (HZV) infection. (B) (OR: 1.68; 95% CI: 1.15, 2.43; p Egger: 0.8752; p heterogeneity: 0.3950; p=0.0070), and pneumonia. (C) (OR: 1.88; 95% CI: 1.38, 2.58; p Egger: 0.7117; p heterogeneity: 0.8520; p<0.0001) among renal transplantation patients.

of desensitization protocols, risk for AMR, and increased susceptibility to certain infections results in a greater risk of infection among kidney transplant patients with ABO incompatibility compared to those who are ABO compatible. This may help explain our findings that patients with ABO incompatible kidney transplants have a higher risk of infections compared to ABO compatible patients.

This study had several important clinical implications. First, it was the first reported meta-analysis detailing infectious complications in kidney transplant patients with ABO incompatibility. Previously, meta-analysis studies had reported prevalence data of infections in kidney transplant patients with ABO incompatibility, ranging between 22–41%.[9,10] Our study reported a significantly increased infection risk in ABO incompatible kidney transplant patients compared to the ABO compatible group. Second, overall, our study provided new theoretical insights into infectious complications in kidney transplant patients with ABO incompatibility. Third, our findings showed that ABO incompatibility significantly increased susceptibility to septicemia, CMV infection, BKV infection, HZV infection, and pneumonia. This raised serious concerns among medical practitioners regarding the increased risk and the need for more comprehensive management and attention. Fourth, our results could be used as a basis for improving kidney transplant guidelines in the future. There was a need to emphasize which types of infections to watch for and how to manage them as soon as they appeared. However, further studies with better designs were still needed to understand the actual risk of ABO incompatibility in causing infections in kidney transplant cases.

We identified several limitations in this meta-analysis that need to be carefully considered. First, we did not account for potential confounding factors that might affect our results. These potential confounding factors include variations in immunosuppressive therapy, desensitization protocols, and the occurrence of AMR. These factors could introduce bias and affect our findings. Second, the sample included in this study did not represent the global population. The studies included were only from developed countries. As a result, our findings may not be generalizable to kidney transplant cases in developing countries. It is known that healthcare practices and patient demographics may differ between developed and developing countries. Third, the age range of the study population varied. This could also influence the risk of infection. Age is a known factor affecting the body's response to infection.[59] Older or younger patients may have different susceptibilities to infections.[60,61] This factor could impact the overall risk profile reported in our meta-analysis. Fourth, there was considerable variability in the administration of immunosuppressive drugs among the study populations. This variability could affect the incidence of infectious complications. Different immunosuppressive regimens might have different impacts on infection risk.[16,62] Therefore, we emphasize that variability in treatment protocols should be considered when interpreting the results of this meta-analysis.

In conclusion, we have identified that an increased risk of infection was observed in patients with ABO incompatibility who underwent kidney transplantation compared to ABO compatible patients. Specifically, the risk of several types of infections, such as sepsis, CMV infection, BKV infection, HZV infection, and pneumonia was found to be elevated in ABO incompatible kidney transplant patients. Our study emphasizes the importance of vigilance regarding infectious complications in ABO incompatibility patients and comprehensive management strategies to achieve better outcomes for patients.

Table 2. Summary of analysis regarding the infectious complications of ABO incompatibility in renal transplantation patients.

Covariates	Case/total (n)	Model	NS	OR	95% CI	p Egger	p Het	p
All infection	9,225/34,401	Random	31	1.49	1.21–1.83	0.1570	<0.0001	0.0002
Sepsis	139/2,512	Fixed	10	1.60	1.12–2.29	0.7693	0.2080	0.0100
CMV infection	807/5,317	Random - TF	25	1.36	1.06–1.75	0.0132	0.0520	0.0200
BKV infection	320/3,150	Random	14	1.83	1.14–2.94	0.3684	0.0540	0.0100
HZV infection	144/2,567	Fixed	9	1.68	1.15–2.43	0.8752	0.3950	0.0070
UTI	4,410/29,113	Random	10	0.93	0.56–1.55	0.1027	<0.0001	0.7810
Pneumonia	1,130/28,922	Fixed	9	1.88	1.38–2.58	0.7117	0.8520	<0.0001
PCP	16/2,153	Fixed	5	2.59	0.92–7.27	0.7670	0.6480	0.0700

OR: Odd ratio, CI: Confidence interval, NS: Number of studies, p Het: p heterogeneity, NA: Not available, CMV: Cytomegalovirus, BKV: BK virus, HZV: Herpes zoster virus, PCP: *Pneumocystis carinii* pneumonia, UTI: Urinary tract infection

ΠΕΡΙΛΗΨΗ

Λοιμώδεις επιπλοκές της ασυμβατότητας ABO σε ασθενείς με μεταμόσχευση νεφρού: Μια μετα-ανάλυση

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ΣΚΟΠΟΣ Η αξιολόγηση του αντίκτυπου και των τύπων λοιμώξεων σε ασθενείς με μεταμόσχευση νεφρού που δεν είναι συμβατοί με το σύστημα ABO. **ΥΛΙΚΟ-ΜΕΘΟΔΟΣ** Η μελέτη είναι μια μετα-ανάλυση. Η στρατηγική αναζήτησης χρησιμοποίησε βάσεις δεδομένων, όπως Embase, Scopus και PubMed. Η μελέτη διεξήχθη μεταξύ Ιουλίου και Αυγούστου 2024. Έγινε συλλογή δεδομένων σχετικά με την εμφάνιση επιπλοκών λοίμωξης σε ασθενείς με μεταμόσχευση νεφρού με ασυμβατότητα ABO. Τα δεδομένα υπολογίστηκαν με σκοπό τον προσδιορισμό της σωρευτικής εκτίμησης του αποτελέσματος. Χρησιμοποιήθηκε η δοκιμασία Mantel-Haenszel για την ανάλυση των δεδομένων. **ΑΠΟΤΕΛΕΣΜΑΤΑ** Συμπεριλάβαμε 31 άρθρα που περιλάμβαναν 2.114 ασθενείς με ασυμβατότητα ABO και 32.287 ασθενείς με συμβατότητα ABO. Τα αποτελέσματα έδειξαν ότι οι ασθενείς με ασυμβατότητα ABO που υποβλήθηκαν σε μεταμόσχευση νεφρού είχαν 1,49 φορές υψηλότερο κίνδυνο λοίμωξης σε σύγκριση με εκείνους με συμβατότητα ABO. Πιο συγκεκριμένα, οι τύποι λοιμώξεων που ήταν αυξημένοι σε ABO-ασύμβατους ασθενείς με μεταμόσχευση νεφρού περιλάμβαναν σήψη, λοίμωξη από CMV, λοίμωξη BKV, λοίμωξη HZV και πνευμονία. Ωστόσο, δεν βρέθηκε συσχέτιση μεταξύ εμφάνισης ουρολοίμωξης και πνευμονίας από *Pneumocystis carinii* σε ασθενείς με ABO-ασύμβατη μεταμόσχευση νεφρού. **ΣΥΜΠΕΡΑΣΜΑΤΑ** Η ασυμβατότητα του συστήματος ABO σε ασθενείς με μεταμόσχευση νεφρού έχει καθοριστική επίδραση στην εμφάνιση επιπλοκών λοίμωξης.

Λέξεις ευρετηρίου: Ασυμβατότητα ABO, Επιπλοκή, Λοίμωξη, Μεταμόσχευση νεφρού

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