

Living donor liver transplantation versus deceased donor liver transplantation: a systematic review and meta-analysis of Pediatric Recipient Outcomes

Arianna Barbetta¹, Sarah Barhouma¹, Chant Butler¹, Rachel Hogen¹, Hannah Schillperoot², Glenda Meeberg³, A.M. James Shapiro³, Yong K Kwon¹, Rohit Kohli¹, and Juliet Emamoulee¹

¹Department of Surgery, University of Southern California, ²Norris Medical Library, University of Southern California, ³Department of Surgery, University of Alberta



Abstract

- **Liver transplantation (LT)** is a life-saving treatment for children with end-stage liver disease.
- The demand for **deceased donor** livers continues to outpace the supply, thus technical variant donation including **split liver transplantation, reduced size** and **living donor liver transplantation (LDLT)** have increasingly been used to meet deceased organ shortage, reducing the waitlist mortality.
- While LDLT requires technical expertise, it presents several advantages such as reduction of **wait time** and pre-transplant mortality, transplantation occurring prior to significant clinical deterioration and less rate of acute cellular rejection post-LT.
- Retrospective and small cohort studies reported controversial results, thus there remains uncertainty as to whether DDLT or LDLT results in better **patient and graft survival** in children.

Objectives

To compare outcomes of LDLT to DDLT by performing a systematic review and meta-analysis and assess:

Patient and graft survival

Pre- and post-LT outcomes

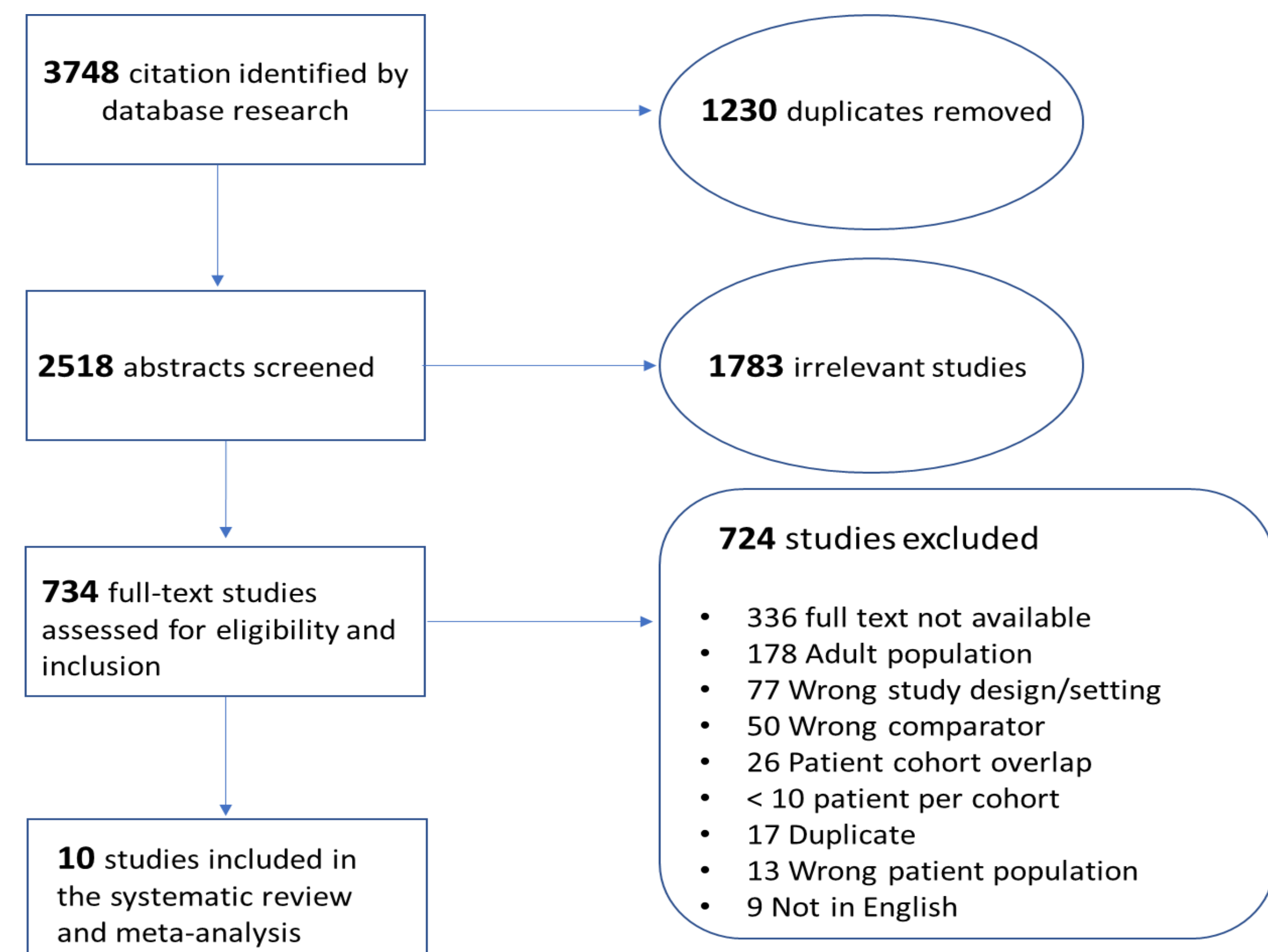
- PELD score at LT
- Time on waitlist
- biliary and vascular complications
- Rate of acute rejection

Methods

- A **systematic literature** review was conducted to identify all studies published between January 2005 and December 2019.
- **Inclusion criteria** were: studies with full text available, comparing LDLT and DDLT recipients, primary liver transplant alone recipients, age < 18 years, reporting the primary endpoint of patient survival at ≥1-year post-transplant.
- Studies including adult patients, multi-organ/re-transplant recipients, or those with overlapping cohorts were excluded
- The institutional dataset from the University of Alberta was also queried
- All variables reported in ≥3 studies were included in **the meta-analysis**

Results

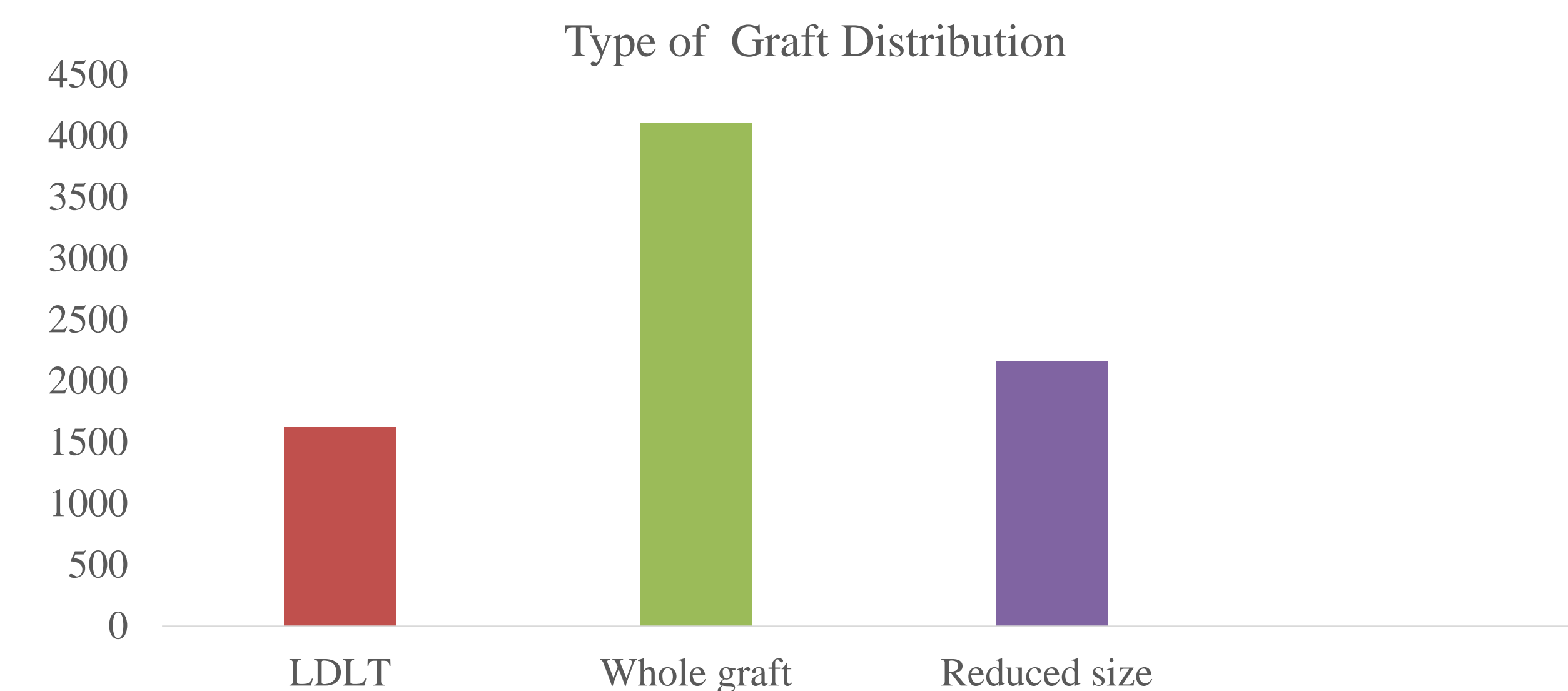
Figure 1 Prisma Diagram summarizing results of the systematic review



Results

- A total of **1,622 LDLT** and **6,326 DDLT** recipients were included in the meta-analysis

Figure2. Number of liver transplantation by graft type.



- **LDLT and reduced size graft recipients were younger** (2.54±4.24 and 2.58±3.65 year, respectively) than whole graft recipients (5.94±6.06 year, p<0.001). 50.5% of recipients were female (49.6% of LDLT vs 50.7% of DDLT, p=0.48).

Figure 3. Distribution of liver disease requiring liver transplantation

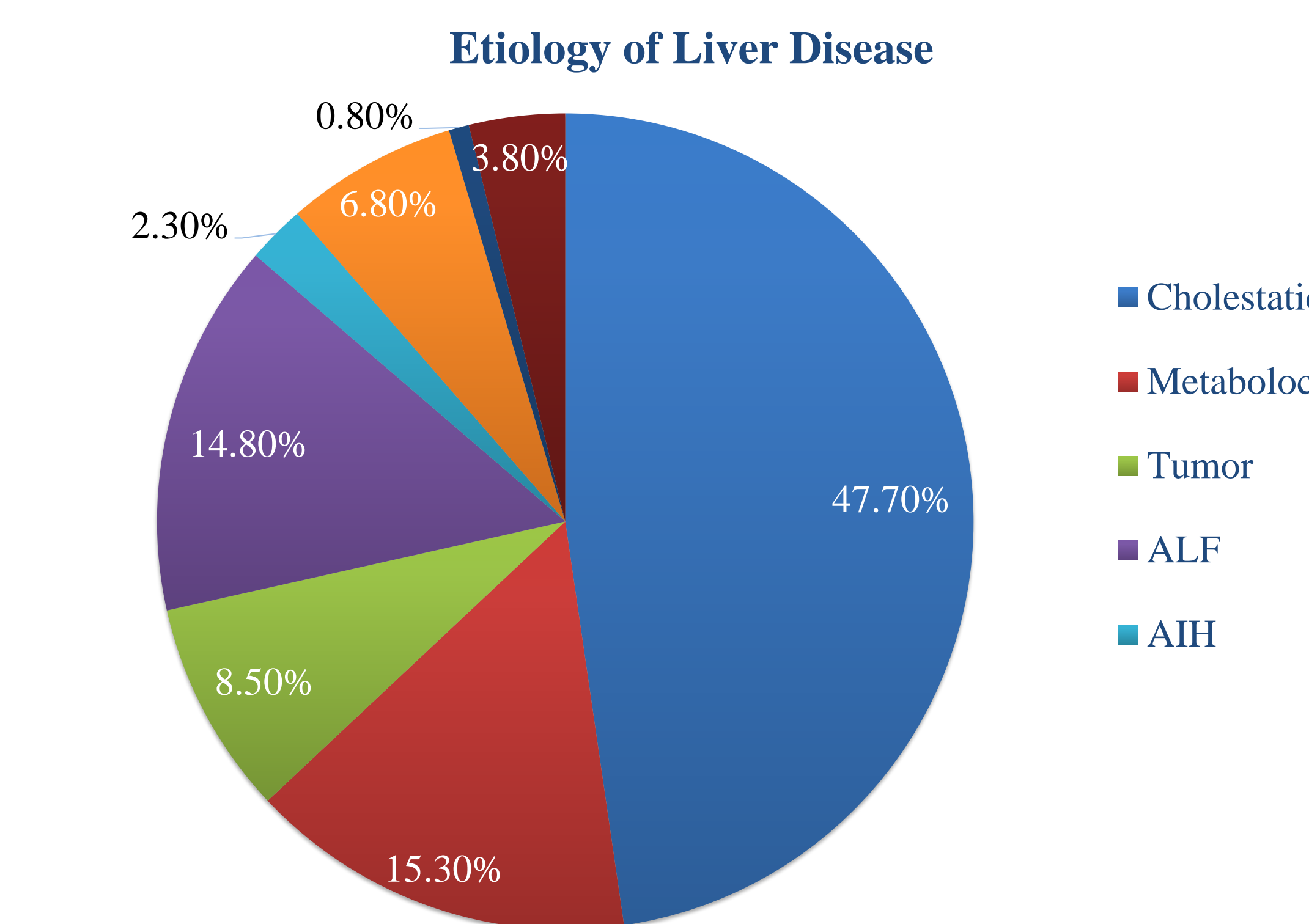
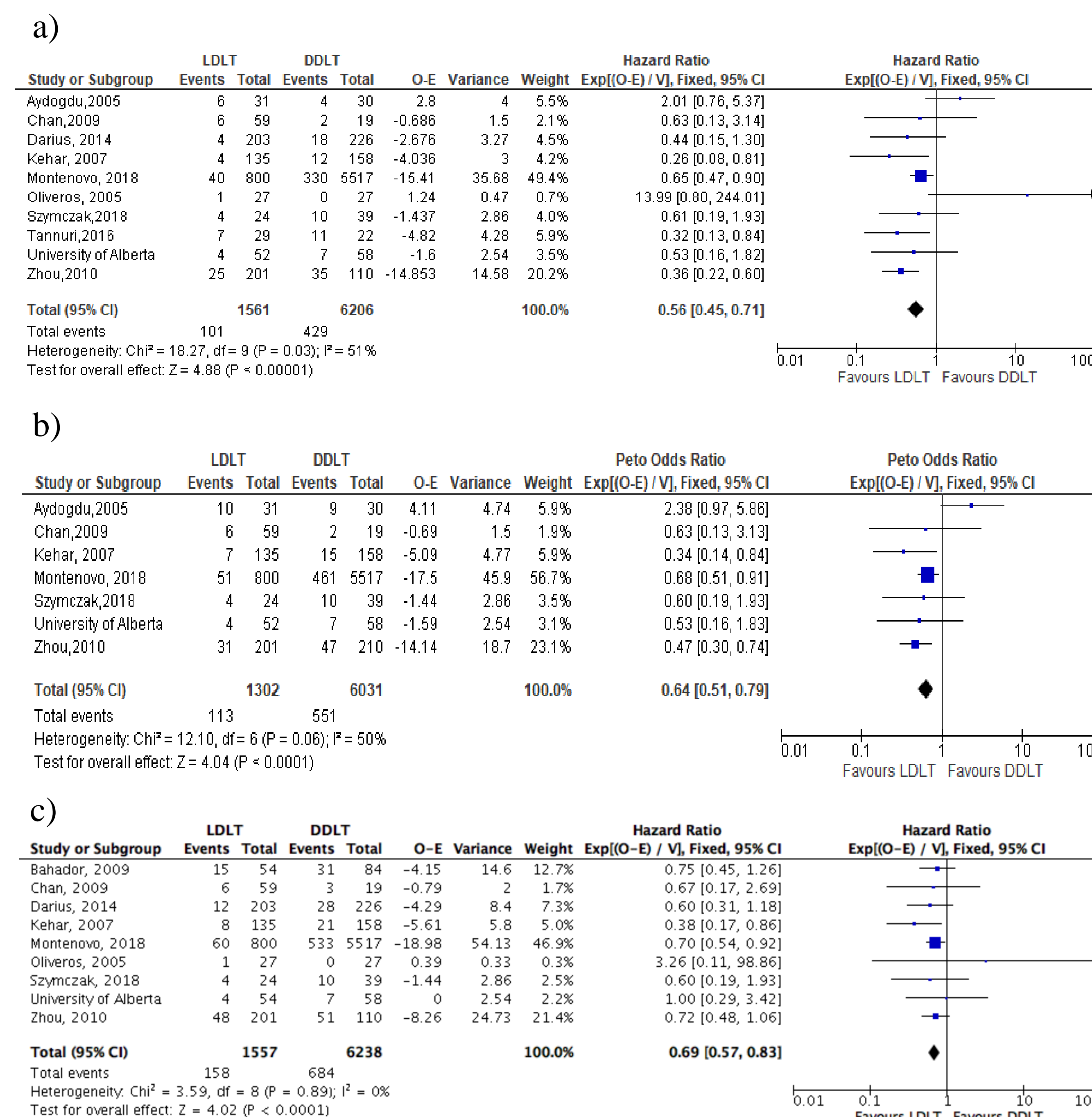
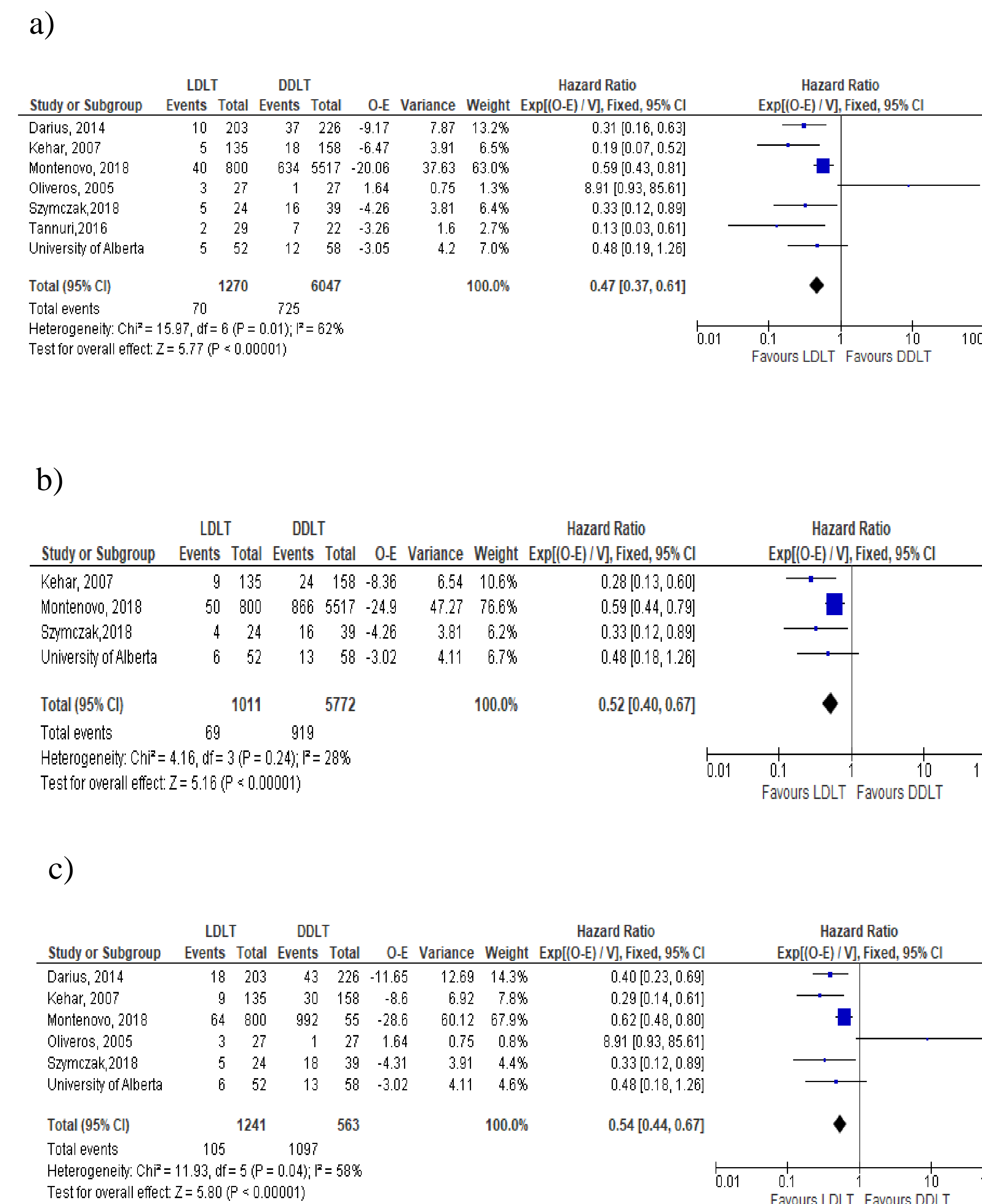


Figure3. Patient survival at a)1-year, b)3-year, and c) 5-year post-LT



Results

Figure 4. Comparison of graft survival between LDLT and DDLT at a) 1- year, b)3-year and c) 5-year post-LT



- **Analysis stratified by deceased graft type showed that LDLT had superior graft and patient survival compared to both whole liver and reduced graft size recipients**
- **Analysis of pre-operative variables showed that LDLT recipients had a higher PELD score than DDLT, a lower weight while there was no difference in time on waitlist**

Figure5. Comparison of PELD score at LT Between LDLT and DDLT

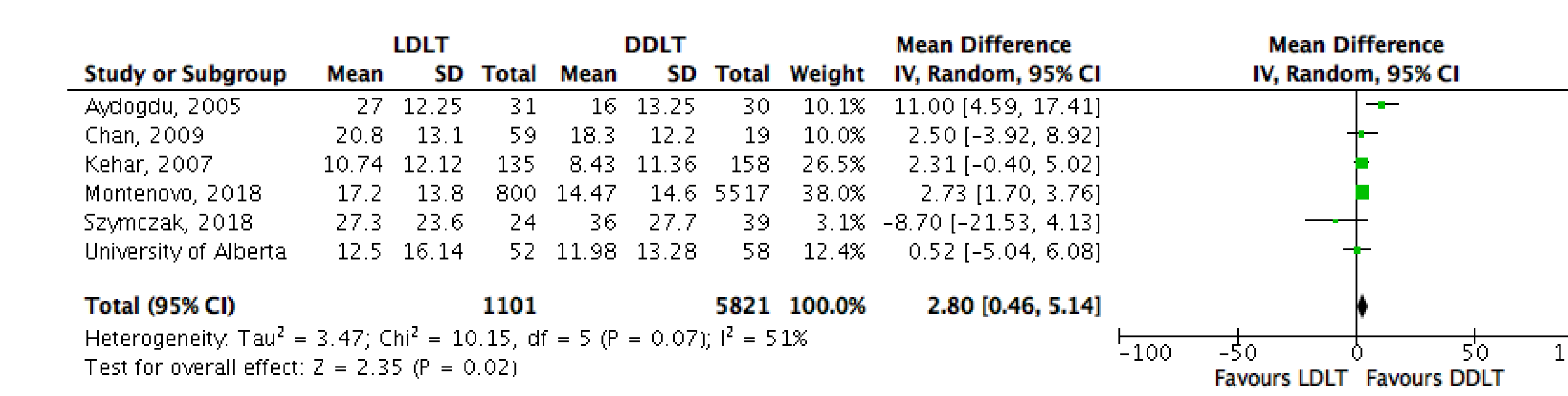


Figure 6. Comparison of Time on Waitlist

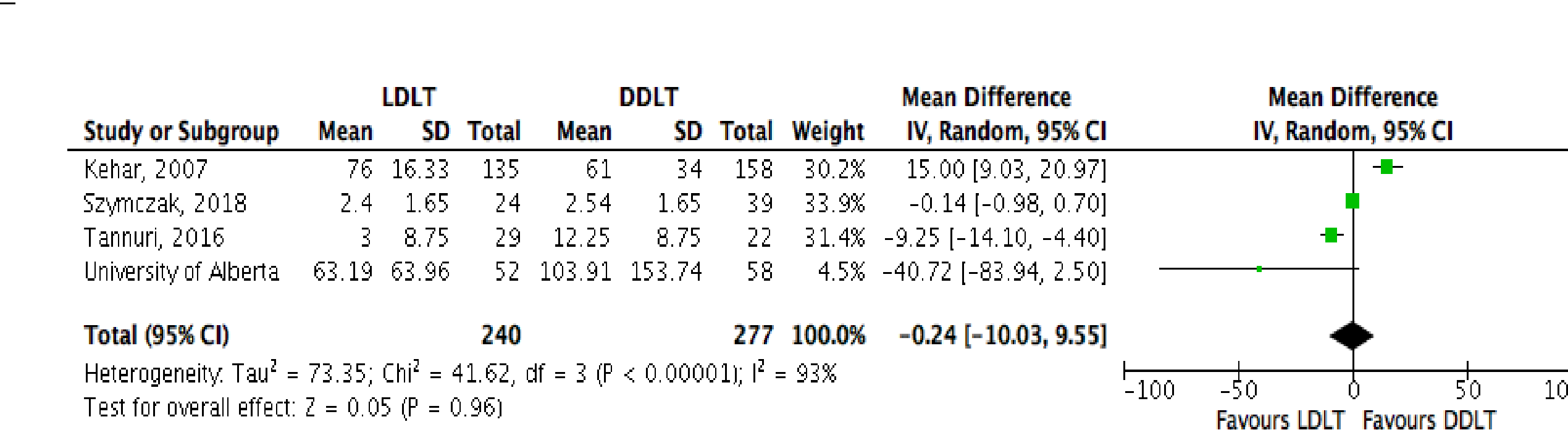
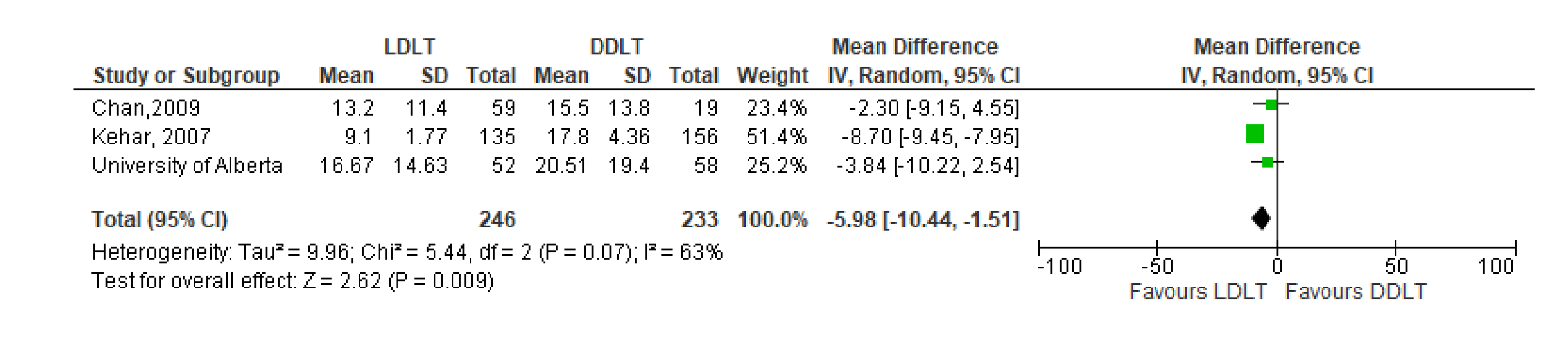


Figure 7. Comparison of weight at LT



Results

- **Meta-analysis of three post-operative outcomes, showed no differences in risk of biliary and vascular complication between LDLT and DDLT recipients, whereas LDLT had a lower risk of acute rejection than LDLT.**

Figure8. Comparison of risk of biliary complication between LDLT and DDLT

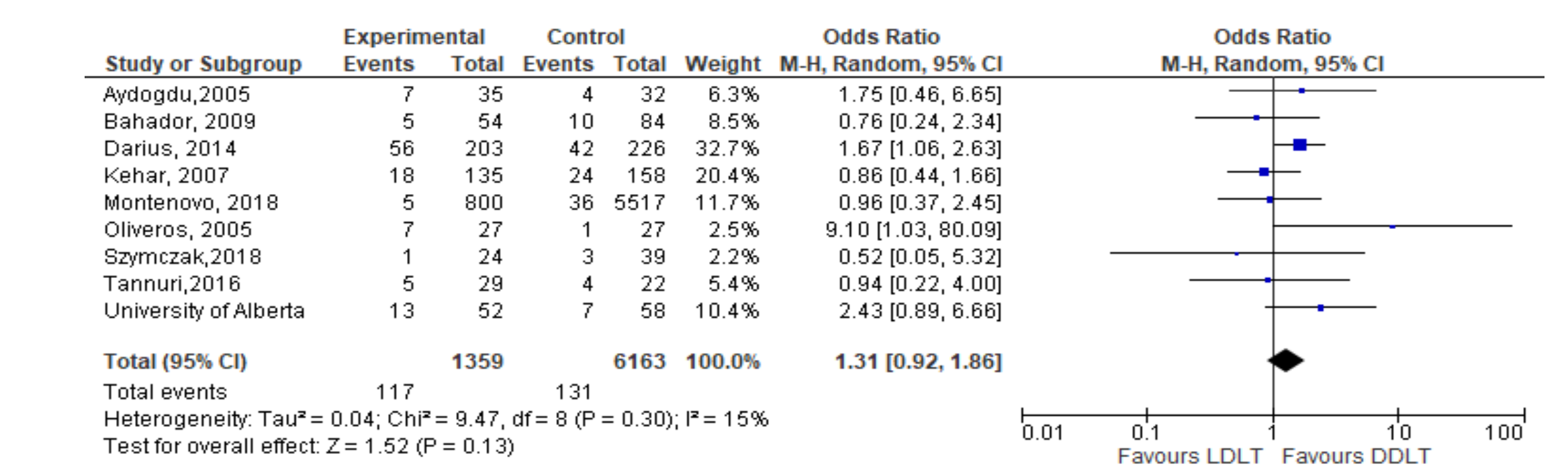


Figure9. Comparison of vascular complication between LDLT and DDLT

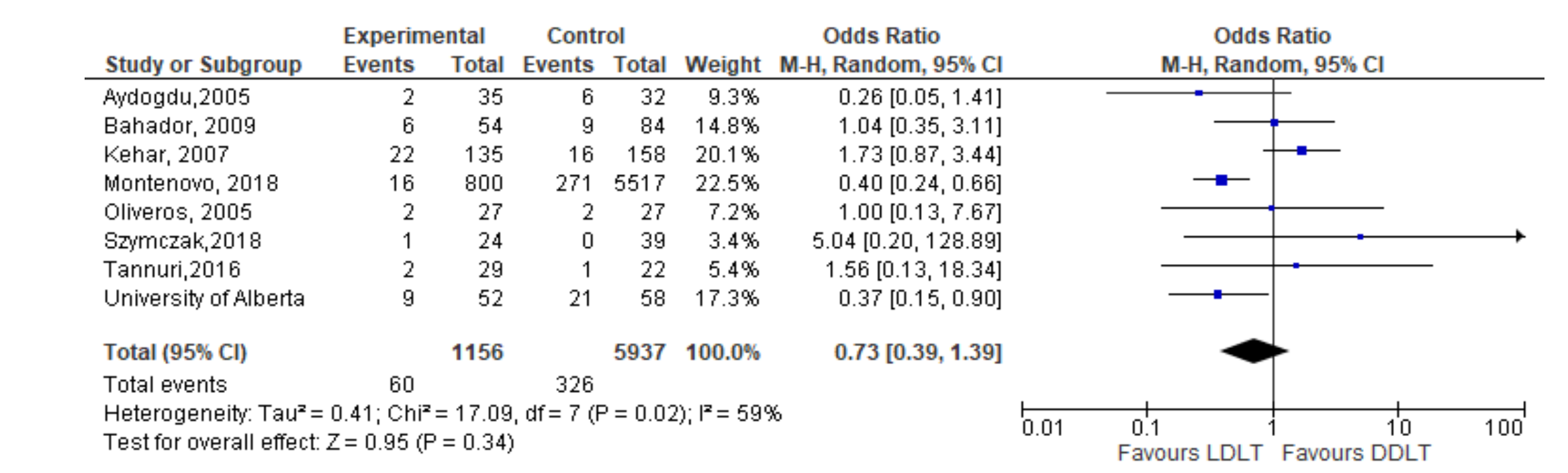
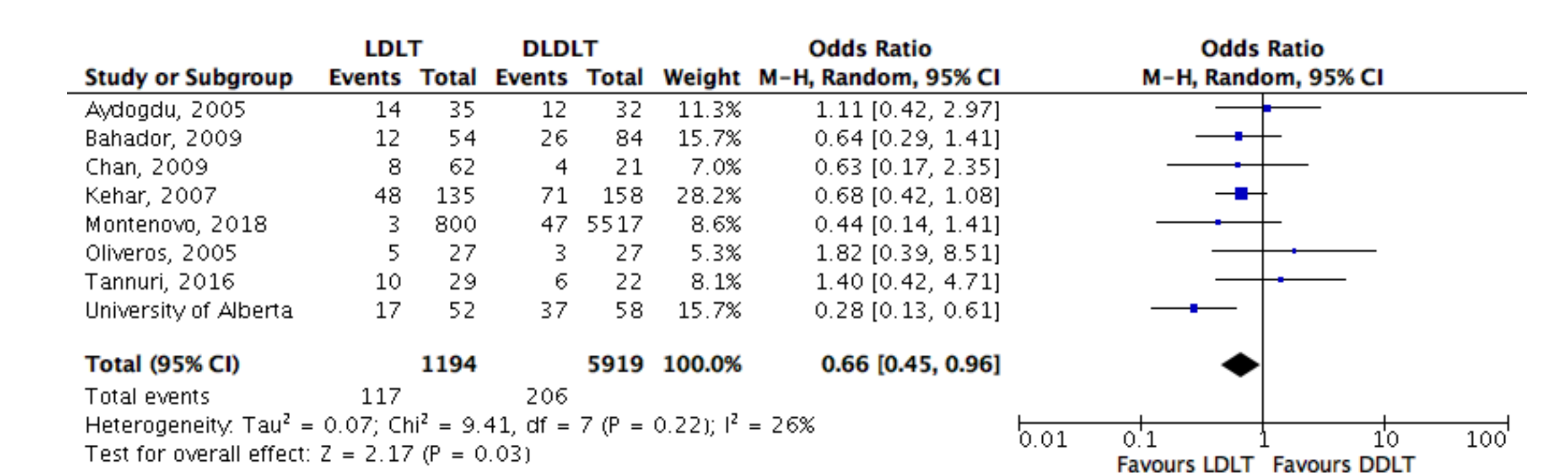


Figure10. Comparison of risk of acute rejection between LDLT and DDLT recipients



Conclusion

In this comprehensive, pediatric global meta-analysis, **LDLT** was associated with **improved patient and graft survival** post-transplant when compared to deceased graft recipients. **LDLT** had a **higher PELD score** at time of LT.

- **LDLT and DDLT showed comparable time on wait list, risk of vascular and biliary complication while LDLT had a lower risk of acute rejection.**
- **In summary, these data support the continued expansion of LDLT for pediatric LT candidates, even in regions where DDLT is currently predominant**

References

- Perito E.R, Roll G, Dodge JL, Rhee S, Roberts JP. **Split Liver Transplantation and Pediatric Waitlist Mortality in the United States: Potential for Improvement.** *Transplantation.* 2019;Mar; 103(3): 552-557. doi: 10.1097/TP.0000000000002249
- Nadalin S, Bockhorn M, Malago M, Valentin-Gamazo C, Frilling A, Broelsch CE. **Living donor liver transplantation.** *HPB.* 2006;8(1):10-21.
- Liu LU, Bodian CA, Gondolesi GE, et al. **Marked Differences in acute cellular rejection rates between living-donor and deceased-donor liver transplant recipients.** *Transplantation.* 2005;80(8):1072-1080.