

Title: Prognostic Factors for Development of Acute Respiratory Distress Syndrome Following Traumatic Injury – A Systematic Review and Meta-Analysis

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Electronic Search Strategies

MEDLINE

1. Trauma.mp
2. (trauma* or polytrauma*).tw
3. Exp acute respiratory distress syndrome
4. Exp acute lung injury
5. (ARDS or respiratory distress syndrome).mp
6. (ARDS or respiratory distress syndrome).tw
7. (predict* or model* or utility* or scor* or validat* or risk* or prognos* or associat* or factor*).ti
8. Or/1-2
9. Or/3-6
10. And/7-9

480 references

EMBASE

1. Trauma.mp
2. (trauma* or polytrauma*).tw
3. Exp respiratory distress syndrome
4. Exp ARDS
5. (ARDS or respiratory distress syndrome).mp
6. (ARDS or respiratory distress syndrome).tw
7. (predict* or model* or utility* or scor* or validat* or risk* or prognos* or associat* or factor*).ti
8. Or/1-2
9. Or/3-6
10. And/7-9

876 references

QUIPS Quality Assessment for Risk of Bias

Study	Study Participation	Study Attrition	Prognostic Factor Measurement	Outcome Measurement	Confounding Adjustment	Statistical Reporting
Afshar 2016	Low	Low	Low	Low	Moderate	Moderate
Aisiku 2016	Moderate	Low	Low	Low	Low	Low
Avci 2019	Low	Low	Low	Low	Low	Moderate
Becher 2012	Moderate	Low	Low	Low	Low	Moderate
Chaiwat 2009	Low	Low	Low	Low	Low	Moderate
Chan 2012	Moderate	Low	Low	Low	Low	Moderate
Daher 2018	Low	Low	Low	Low	Low	Moderate
Daurat 2016	Moderate	Low	Low	Low	Low	Low
Fremont 2010	Low	Low	Low	Low	Moderate	Moderate
Heffernan 2011	Low	Low	Low	Low	Moderate	Moderate
Hendrickson 2016	Moderate	Low	Low	Low	Low	Low
Holena 2012	Low	Low	Low	Low	Moderate	Moderate
Johnston 2003	Low	Low	Low	Low	Low	Moderate
Killien 2019	Low	Low	Low	Low	Low	Low
Kornblith 2019	Low	Low	Low	Low	Low	Moderate
Leblanc 2014	Moderate	Low	Low	Low	Moderate	Moderate
Lou 2013	Moderate	Low	Low	Low	Low	Moderate
Martin 2005	Low	Low	Low	Low	Low	Low
Miller 2002	Moderate	Low	Low	Low	Moderate	Moderate
Navarrete-Navarro 2001	Low	Low	Low	Low	Low	Moderate
Navarrete-Navarro 2006	Low	Low	Low	Low	Low	Moderate
O'Leary 2016	Low	Low	Low	Low	Low	Moderate
Park 2016	Moderate	Low	Low	Low	Low	Low
Plurad 2011	Low	Low	Low	Low	Low	Moderate
Rainer 1999	Moderate	Low	Low	Low	Low	Moderate
Recinos 2009	Low	Low	Low	Low	Low	Moderate
Reilly 2014	Low	Low	Low	Low	Moderate	Moderate
Rincon 2012	Moderate	Low	Low	Low	Low	Low
Robinson 2018	Low	Low	Low	Low	Low	Low
Robles 2018	Low	Low	Low	Low	Moderate	Moderate
Ryb 2010	Low	Low	Low	Low	Low	Low
Senekjian 2020	Low	Low	Low	Low	Moderate	Moderate
Thiara 2018	Moderate	Low	Low	Low	Moderate	Moderate
Tignanelli 2019	Low	Low	Low	Low	Low	Low
Treggiari 2004	Low	Low	Low	Low	Low	Moderate
Van Wessem 2018	Low	Low	Low	Low	Low	Moderate
Watkins 2012	Low	Low	Low	Low	Low	Low
Wu 2012	Low	Low	Low	Low	Low	Moderate
Zielinski 2014	Moderate	Low	Low	Low	Low	Moderate

GRADE (ARDS Development – Unadjusted Analyses)

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Male vs Female (unadjusted analysis)									
30	observational studies	serious ^a	serious ^b	not serious	serious ^c	none	Pooled OR = 1.14 (95% CI 1.00 to 1.30)	⊕○○○ VERY LOW	CRITICAL
Caucasian Race vs other (unadjusted analysis)									
11	observational studies	serious ^a	not serious ^d	not serious	not serious	none	Pooled OR = 1.22 (95% CI 1.11 to 1.34)	⊕⊕⊕○ MODERATE	CRITICAL
Blunt vs Penetrating Mechanism (unadjusted analysis)									
19	observational studies	serious ^a	not serious ^d	not serious	not serious	none	Pooled OR = 1.59 (95% CI 1.34 to 1.89)	⊕⊕⊕○ MODERATE	CRITICAL
Head injury vs No Head Injury (unadjusted analysis)									
11	observational studies	serious ^a	not serious ^d	not serious	not serious	none	Pooled OR = 2.57 (95% CI 1.63 to 4.08)	⊕⊕⊕○ MODERATE	CRITICAL

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Pulmonary contusion vs No Pulmonary contusion (unadjusted analysis)									
5	observational studies	serious ^a	not serious ^d	not serious	not serious	none	Pooled OR = 4.42 (95% CI 2.78 to 7.02)	⊕⊕⊕○ MODERATE	CRITICAL
Rib fracture vs No Rib fracture (unadjusted analysis)									
6	observational studies	serious ^a	not serious ^d	not serious	not serious	none	Pooled OR = 2.39 (95% CI 1.75 to 3.28)	⊕⊕⊕○ MODERATE	CRITICAL

Explanations

- a. Unadjusted analysis, and as such residual confounding is a significant concern lowering our certainty in the evidence.
- b. High Isquared and important inconsistency on visual inspection of the forest plot
- c. Despite point estimate suggesting an effect, the 95% confidence interval crosses line of no effect.
- d. High Isquared however inconsistency all on the side of an association.
- e. 95% confidence intervals do not exclude important association or lack of association

GRADE (ARDS Development – Adjusted Analyses)

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Male vs Female (adjusted)									
6	observational studies	not serious ^a	serious ^b	not serious	serious ^c	none	Pooled OR = 1.33 (95% CI 0.90 to 1.97)	⊕⊕○○ LOW	CRITICAL
Age (for every 10-year increase) (adjusted)									
7	observational studies	serious ^d	not serious	not serious	not serious	none	Pooled OR = 1.13 (95% CI 1.07 to 1.21)	⊕⊕⊕○ MODERATE	CRITICAL
Blunt vs Penetrating Mechanism (adjusted)									
4	observational studies	serious ^d	not serious ^e	not serious	not serious	none	Pooled OR = 1.94 (95% CI 1.21 to 3.12)	⊕⊕⊕○ MODERATE	CRITICAL
Pulmonary Contusion vs No Pulmonary Contusion (adjusted)									

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
2	observational studies	serious ^d	serious ^b	not serious	very serious ^c	none	Pooled OR = 4.33 (95% CI 0.76 to 24.54)	⊕○○○ VERY LOW	CRITICAL
Chest Injury Severity by AIS (based on each 1-point increase) (adjusted)									
3	observational studies	not serious	not serious	not serious	not serious	none	Pooled OR = 1.37 (95% CI 1.22 to 1.54)	⊕⊕⊕⊕ HIGH	CRITICAL
Early Packed Red Blood Cells (based on each 1-unit increase) (adjusted)									
2	observational studies	not serious	not serious ^e	not serious	serious ^c	none	Pooled OR = 0.96 (95% CI 0.90 to 1.03)	⊕⊕⊕○ MODERATE	CRITICAL
Late Packed Red Blood Cells (based on each 1-unit increase) (adjusted)									
2	observational studies	not serious	not serious	not serious	serious ^c	none	Pooled OR = 0.99 (95% CI 0.88 to 1.11)	⊕⊕⊕○ MODERATE	CRITICAL
Early Fresh Frozen Plasma (based on each 1-unit increase) (adjusted)									

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
2	observational studies	serious ^a	serious ^b	not serious	serious ^c	none	Pooled OR = 1.22 (95% CI 0.67 to 2.24)	⊕○○○ VERY LOW	CRITICAL
Late Fresh Frozen Plasma (based on each 1-unit increase) (adjusted)									
2	observational studies	not serious	serious ^b	not serious	serious ^c	none	Pooled OR = 0.97 (95% CI 0.80 to 1.18)	⊕⊕○○ LOW	CRITICAL
Early Platelets (based on each 1-unit increase) (adjusted)									
2	observational studies	not serious	serious ^b	not serious	very serious ^c	none	Pooled OR = 1.36 (95% CI 0.57 to 3.22)	⊕○○○ VERY LOW	CRITICAL
Late Platelets (based on each 1-unit increase) (adjusted)									
2	observational studies	not serious	serious ^b	not serious	very serious ^c	none	Pooled OR 2.19 (95% CI 0.40 to 11.85)	⊕○○○ VERY LOW	CRITICAL
Early Crystalloid (based on each 1L increase) (adjusted)									

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
2	observational studies	not serious	not serious	not serious	not serious	none	Pooled OR = 1.19 (95% CI 1.15 to 1.24)	⊕⊕⊕⊕ HIGH	CRITICAL
Late Crystalloid (based on each 1L increase) (adjusted)									
2	observational studies	not serious	not serious	not serious	serious ^c	none	Pooled OR = 1.08 (95% CI 1.02 to 1.14)	⊕⊕⊕○ MODERATE	CRITICAL
Early Hypotension vs No Early Hypotension (adjusted)									
2	observational studies	serious ^a	serious ^b	not serious	serious ^c	none	Pooled OR = 1.36 (95% CI 0.76 to 2.43)	⊕○○○ VERY LOW	CRITICAL

Explanations

- a. The majority of studies (and corresponding weight in pooled analysis) were from studies at low risk of bias.
- b. High Isquared and important inconsistency when examining the forest plot
- c. Wide 95% confidence intervals that do not exclude possibility of an association or no association.
- d. The majority of studies (and corresponding weight in pooled analysis) were from studies at moderate risk of bias.
- e. Although a relatively high Isquared, visual inspection reveals estimates which are all on the side of an association.

GRADE (ARDS Mortality – Adjusted Analyses)

№ of studies	Certainty assessment						impact	Certainty	Importance
	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Elderly vs Non-Elderly (adjusted)									
3	observational studies	not serious ^a	not serious ^b	not serious	not serious	none	Pooled OR = 4.79 (95% CI 2.75 to 8.35)	⊕⊕⊕⊕ HIGH	CRITICAL
Trauma Coagulopathy vs No Trauma Coagulopathy (adjusted)									
3	observational studies	serious ^c	not serious ^b	not serious	not serious	none	Pooled OR = 1.95 (95% CI 1.22 to 3.12)	⊕⊕⊕○ MODERATE	CRITICAL
Early Hypotension vs No Early Hypotension (adjusted)									
2	observational studies	not serious ^a	not serious	not serious	not serious	none	Pooled OR = 1.73 (95% CI 1.28 to 2.36)	⊕⊕⊕⊕ HIGH	CRITICAL

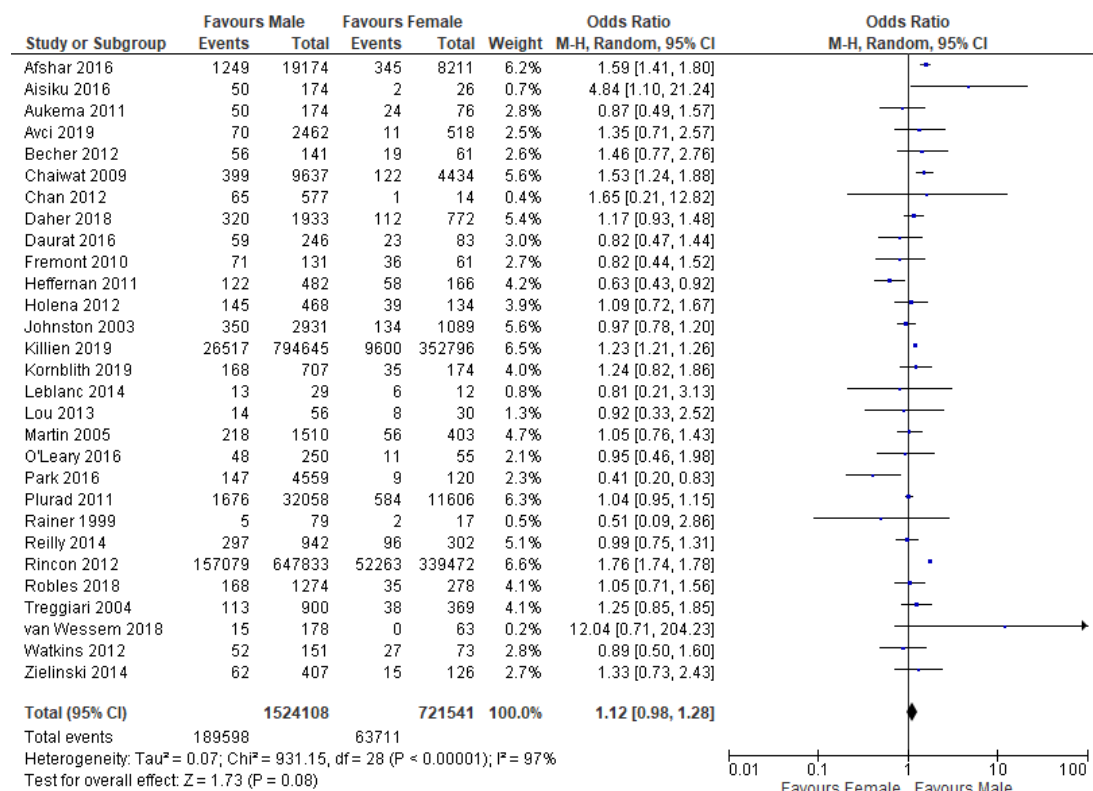
Explanations

- a. The majority of included studies (and weight in the pooled analysis) are at low risk of bias.
- b. Although a high Isquared, visual inspection of the forest plot suggests all variability is on the side of an association.
- c. The majority of included studies (and weight in the pooled analysis) are at moderate risk of bias.

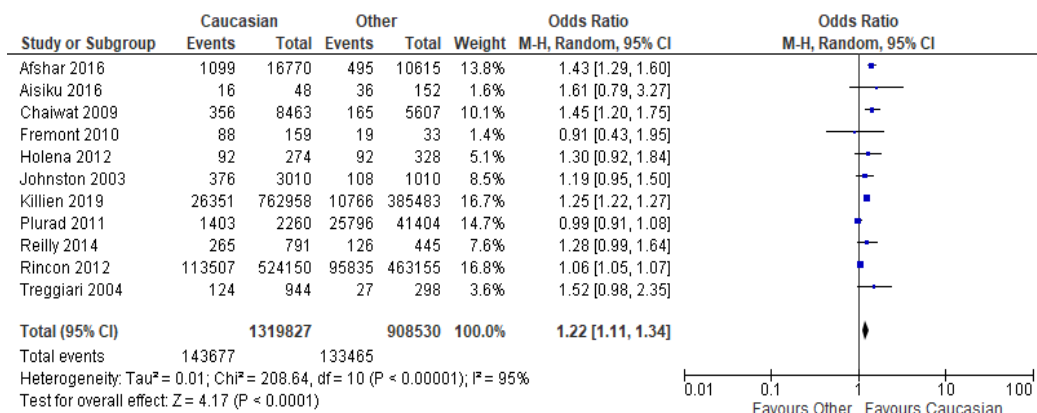
Unadjusted Analyses

Patient Factors

Male vs Female Gender

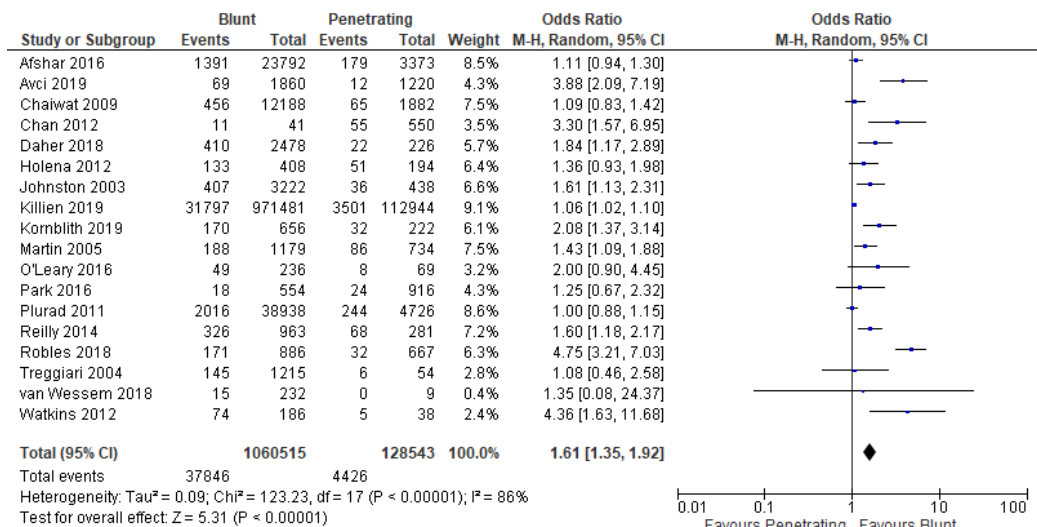


Caucasian Race vs Other

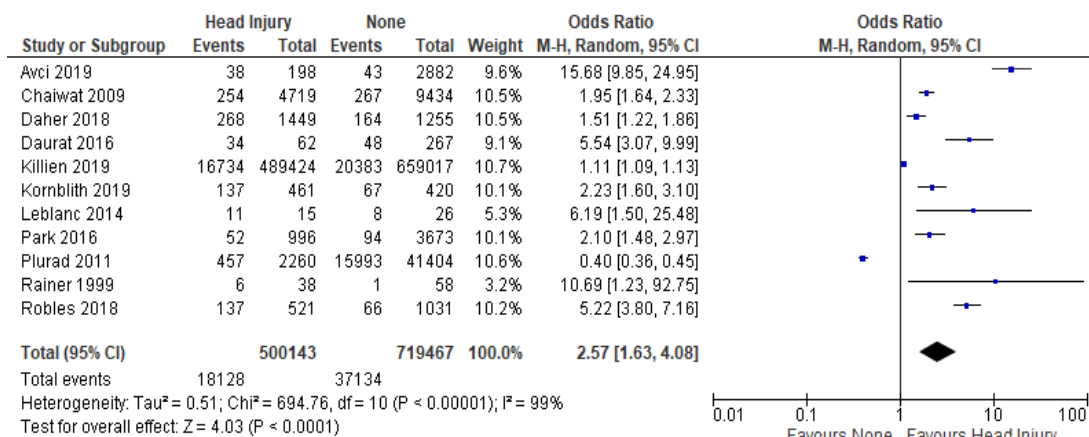


Injury Factors

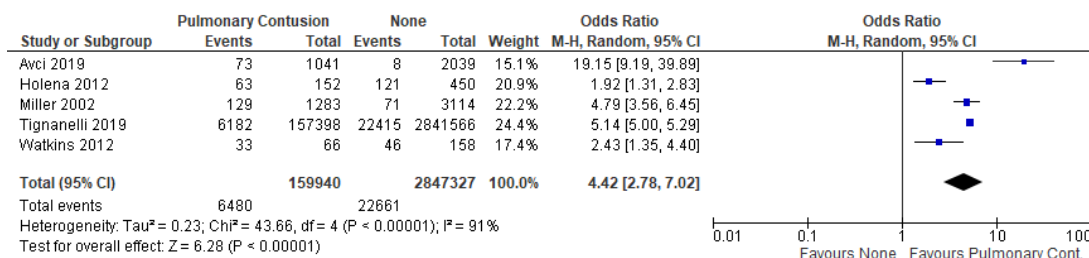
Blunt vs Penetrating Mechanism



Head Injury vs None



Pulmonary Contusion vs None



Rib Fracture vs None

