Meta-Analysis

The Role of Procalcitonin in the Prognosis of Patients with Ischemic Stroke

Methodology

This document provides the results of meta-analysis conducted to synthesize the results of various research studying procalcitonin as a prognostic biomarker for stroke. Random effects model was used since each study was conducted independently violating the assumption of the fixed model having a common true effect size. In the provided results below, two separate meta-analysis were performed – one for studies associated with mortality, and one for studies associated with poor functional outcomes of stroke patients. Specifically, effect sizes were summarized and necessary heterogeneity- and publication bias assessments were made.

Measurement of Treatment Effect

In meta-analysis, forest plot is being used to easily visualize individual and summary effect sizes. To help you be guided in making sense of the plot, you should know of the following pieces of information:

1. The size of each box represents the weight given in computing the summary effect. Studies with larger boxes were given more weight in computing the summary effect since they are deemed to be more precise than others.
2. In the plot, precision can be easily seen through the length of the confidence interval. The shorter the interval, the higher the precision of the results. High precision means lower standard error.

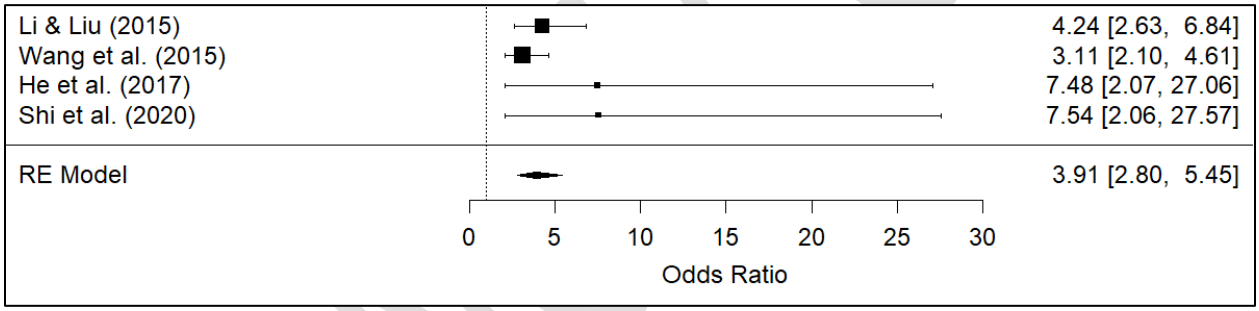

Figure 1. Effect Sizes Associated with Mortality

In terms of studies associated with mortality, results show that summary effect (odds ratio) of the three studies is 3.91. This implies that synthesized results of three studies show that exposure to high procalcitonin levels is highly associated with mortality. This is expected, on the other hand, since the forest plot shows that odds ratios of individual studies are all greater than 1. Meanwhile, one good observation to look at is despite having two studies with OR around 7.5, the summary effect was pulled down to lower side of the scale due to giving more weight to Wang et al (2015)'s results.

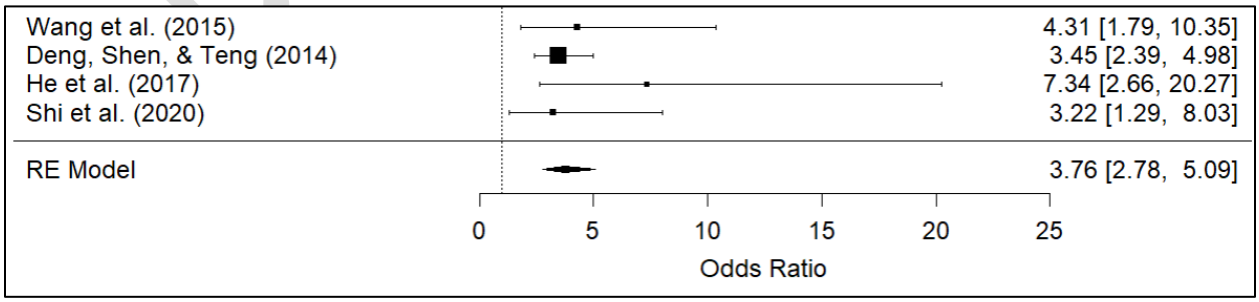

Figure 2. Effect Sizes Associated with Poor Functional Outcome

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In terms of studies associated with poor functional outcomes, results show that summary effect (odds ratio) of the three studies is 3.76. This implies that synthesized results of five studies show that exposure to high procalcitonin levels is highly associated with poor functional outcome. This is expected as well since the forest plot shows that odds ratios of all studies are all greater than 1.

Assessment of Heterogeneity

Checking the heterogeneity is necessary in the analysis to check whether effect sizes vary from study to study. Results show that for both cases, p-value of the conducted Cochran's Q test are greater than 0.05, which then implies that there is no significant heterogeneity among studies considered. This then supported by the computed τ^2 and I^2 (nearing zero for both), which indicates low dispersion in observed effect sizes and low inconsistency in variance across studies' effect sizes. Hence, it can be concluded that results are consistent across all studies.

Table 1. Heterogeneity Results of Studies Associated with Death

Measure	Value	Df	p-value
Cochran's Q	3.3414	3	0.3419
τ^2	0.0176	-	-
I^2(%)	13.48%	-	-

Table 2. Heterogeneity Results of Studies Associated with Poor Functional Outcome

Measure	Value	Df	p-value
Cochran's Q	2.0825	3	0.5555
τ^2	0	-	-
I^2(%)	0.00%	-	-

Assessment of Publication Bias

In the analysis, publication bias was assessed using funnel plot and Egger's Test. Results of the Egger's test show that both cases have no significant publication bias since computed p-values are all greater than 0.05. This, on the other hand, cannot be easily seen in the funnel plot of studies associated with mortality due to low number of studies considered, as compared to the other one which's symmetry is more noticeable.

Note: In funnel plot, the goal is to visualize whether the distribution of studies is symmetrical in the plot. The more symmetrical it is, less evidence of publication bias. However, interpreting plots are subjective so we proceed to using the formal test using Egger's. We suggest not reporting the funnel plot as it can mislead readers on presence of publication bias.

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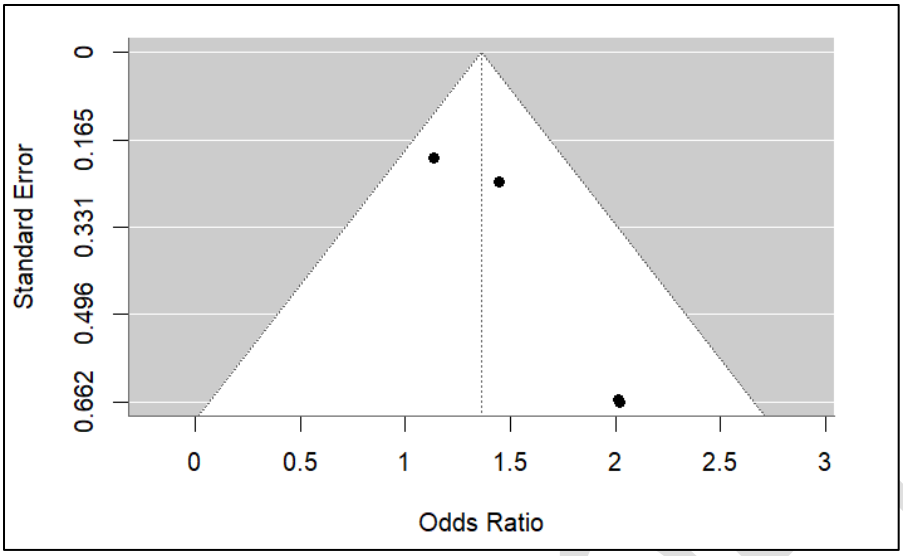

Figure 3. Assessment of Publication Bias for Studies Associated with Death

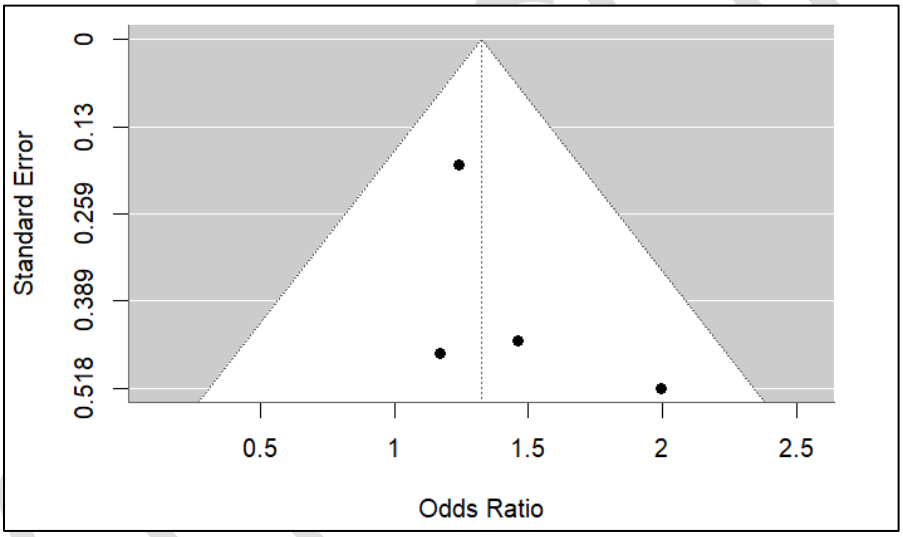

Figure 4. Assessment of Publication Bias for Studies Associated with Functional Outcomes

Table 3. Egger's Test Results for Studies Associated with Death and Poor Functional Outcome

Variable	Z value	p-value
Death	1.6737	0.0942
Poor Functional Outcome	0.9230	0.3560