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SYSTEMATIC REVIEW AND META-ANALYSIS WITH ITS RESULT INTERPRETATION BY FOREST PLOT

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ABSTRACT

Systematic review and meta-analysis is now considered the highest level of the evidence in the field of research. The results from multiple studies may yield the different estimates of the treatment effects as sometimes a randomized clinical trial may fail to give a clear and robust result. In systematic review by identifying all published and unpublished information in a given clinical area and pooling the results in a statistically valid fashion by performing meta-analysis, it is possible to arrive at a more precise estimate of treatment effect. The presentation illustrates all pertinent steps in performing the systematic review and meta-analysis with an example. The result interpretation is also elaborated with the forest plot in which we can observe the result of individual study separately as well as the pooled result of all quantitative studies selected for the meta-analysis. The newer statistical entity like confidence interval, odds ratio and heterogeneity are also touched upon. The objective of presentation is to sensitize the scholars regarding latest strategy of research so that we can generate the precise and trusted evidences for the transparent health delivery system.

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INTRODUCTION

Now a day the high-quality meta-analysis, systematic review of RCTs are considered to be the best evidence [1,2]. The concept of confidence intervals is very well elaborated as "The correct definition of the 95% Confidence interval(CI) : If samples of the same size are repeatedly extracted from a population and their 95% CIs are calculated, then 95% of theses CIs will capture the true population mean"[2]. Forest plot is the integral part of a meta-analysis .Understanding of the interpretation of the forest plot is must while we are concluding the overall result of the meta-analysis [3,7]. A Forest plot displays effect estimates and confidence interval for both individual studies and meta-analysis. It is also known as Blobbogram, Meta-analysis plot or Odds ratio plot. At a glance, Forest plot shows the effect size of all the studies, and the results of the meta-analysis. Left- hand column consists of the names with the raw data of the studies in chronological order from top to bottom and the right column shows the measure of effects.

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Each study is represented by a block at the point estimate of intervention effect with a horizontal line extending either side of the block. The area of the block indicates the weight assigned to that study in the meta-analysis while the horizontal line depicts the confidence interval (usually with a 95% level of confidence). The bars represents the confidence interval, and the dots the mean value. The area of the block and the confidence interval conveys similar information, but both make different contributions to the graphics[3-7] (Fig.1). The size of the block draw the eyes towards the studies with larger weight (usually those with narrower confidence interval), which dominates the calculation of the pooled results. Central solid vertical line represents the null hypothesis. Where ratios (Dichotomous data) are presented (Odds ratio, risk ratio etc),Null has a value of 1 and the scales are logarithmic but in case of standardized mean difference (continuous data) its value is 0. Summary measure of the meta-analysis is shown by the center line of diamond and confidence interval by its lateral tips. The overall meta-analyzed measure of effect is often shown as dashed vertical line[6] (Fig.1). I^2 **(**Statistical Hetrogeneity)-Test seeks to determine whether these are genuine differences underlying the results of the studies (the

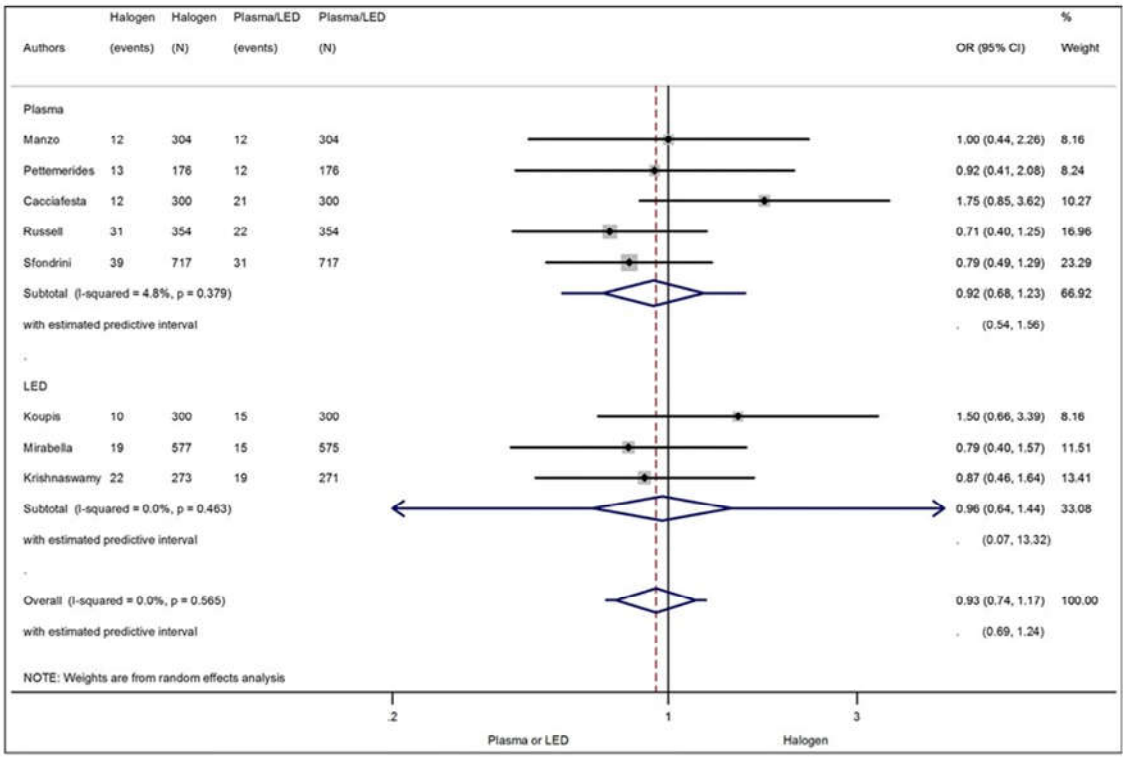
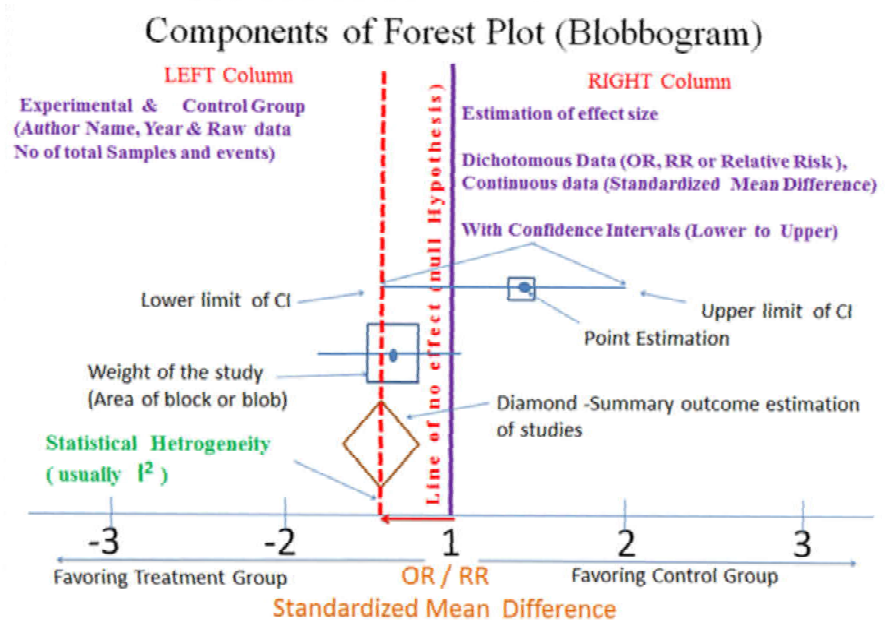


Fig 3. Random-effects subgroup meta-analysis of bracket failures with halogen and plasma arc light, and with LED and halogen lights. Pooled estimates across types of curing lights are also shown.



Fleming PS, Eldiades T, Katsaros C, Pandis N. Curing lights for orthodontic bonding: a systematic review and meta-analysis. Am J Orthod Dentofacial Orthop 2013;143[Suppl]: S92-103.

As example the statistical heterogeneity (measure of inconsistency among the included studies for quantitative synthesis) in the meta-analysis forest plot is very low (I^2 =4.8%, Plasma vs. Halogen and 0.0% LED vs. Halogen).The major contribution to the summery result of the meta-analysis is by the study of S fondrini (weight=23.29%).Overall result of the study has no statistically significant favoring the Plasma arc or LED light over the Halogen light in terms of brackets failures[7] (Fig.2).

Forest plot can be fabricated by using various software programmes (Graph Pad Prism, SAS, STATA, SPSS and Rev Man etc.)

Conclusion

Scholars must know the basic fundamental of the Forest Plot to understand the contribution of individual study contribution and to interpret of the result of the meta-analysis.

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