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Comparison of urinary spot protein to creatinine ratio with 12-hour urine protein in diagnosis of proteinuria in preeclampsia

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ADMINISTRATIVE INFORMATION

Support - Private ownership.

Review Stage at time of this submission - Piloting of the study selection process.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2023120031

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 07 December 2023 and was last updated on 07 December 2023.

INTRODUCTION

Review question / Objective To systematically review the diagnostic accuracy of urinary spot protein to creatinine ratio (PCR) and 12-hour urine collection and to estimate which is a preferred alternative method for 24-hour urine collection.

Condition being studied Preeclampsia is a common cause of adverse maternal and perinatal complications. Due to high mortality of patients with preeclampsia, a rapid and reliable diagnosis is mandatory. Proteinuria as one of main marker to diagnosis for preeclampsia. Traditional test for quantifying proteinuria is 24-hour urine collection, when significant proteinuria is defined as proteinuria of 0.3 g/day or more. Many guidelines suggested to use a shorter timed urine collections or spot protein to creatinine ratio (PCR) for diagnosis preeclampsia. A 12-hour urine collection shorten the diagnostic span, thereby possibly becoming another alternative test. We performed meta-analysis to evaluate the diagnostic utility of urinary spot PCR and 12-hour urine collection.

METHODS

Participant or population To identify all published studies concerning the correlation of urinary spot PCR or 12-hour urine collection with 24-hour urine collection in pregnancy, we conducted an electronic, comprehensive search on PubMed and EMBASE database (updated to March 1, 2023) using the key words “protein to creatinine ratio” or “24 hours urine collection” or “12 hours urine collection” and “Pregnancy-Induced Hypertension” or “Pre-eclampsia”. The Search was limited to “human and English”. Sources from the reference lists of both primary articles and national and

international guidelines for pregnancy hypertension were included .The included papers should meet criteria listed below: (1) study evaluate the performance of spot PCR or 12-hour urine collection compared to 24-hour urine collection in pregnant women with hypertension; (2) 24-hour urine collection is used as reference standard test for assessing proteinuria (3) the study included more than 15 patients; (4) data consists of 2×2 table can be extracted from the article (5) articles should be written in English.

Intervention We perfomed this meta-analysis using DerSimonian-Lair random effects models irrespective of existing statistical heterogeneity. Then symmetric receiver operator characteristic curves (SROC) were profiled according to pooled data and area under SROC(AUC) were calculated to evaluate the diagnostic accuracy. Fagan plot and likelihood ratio scattergram were used to predict the clinical application of these twotests.

Comparator Higgin's I2 statistic and Cochrane's Q test were applied to assess the degree of statistical heterogeneity between studies. We examined funnel plot for DORs (Deek's funnel plot) to explore the possibility of publication bias.

Study designs to be included Study evaluate the performance of spot PCR or 12-hour urine collection compared to 24-hour urine collection in pregnant women with hypertension.

Eligibility criteria The included papers should meet criteria listed below: (1) study evaluate the performance of spot PCR or 12-hour urine collection compared to 24-hour urine collection in pregnant women with hypertension; (2) 24-hour urine collection is used as reference standard test for assessing proteinuria (3) the study included more than 15 patients; (4) data consists of 2×2 table can be extracted from the article (5) articles should be written in English.

Information sources We conducted an electronic, comprehensive search on PubMed and EMBASE database.

Main outcome(s) A total of 4973 potentially relevant literatures based on our searching strategy were selected out and finally 25 primary studies were included. For the urinary spot PCR, the results of this meta-analysis demonstrated pooled sensitivity of 87% (95%CI 83–91%) and pooled specificity of 86% (95%CI 79-91%), with an area under curve (AUC) of 0.93 (0.90-0.95). For 12-hour urine collection, pooled sensitivity and specificity were 92% (95%CI 87-96%) and 99% (95%CI 75-100%) respectively, with an AUC of 0.97 (0.95-0.98). Fagan plot and Likelihood ratio scattergram showed that 12-hour urine collection yielded a better discriminatory performance on the diagnosis of significant proteinuria(≥0.3g/24hours). Significant heterogeneity existed and different test methods together with different cutoff points may be main sources of heterogeneity.

Quality assessment / Risk of bias analysis Higgin's I2 statistic and Cochrane's Q test were applied to assess the degree of statistical heterogeneity between studies. We examined funnel plot for DORs (Deek's funnel plot) to explore the possibility of publication bias.

Strategy of data synthesis We perfomed this meta-analysis using DerSimonian-Lair random effects models irrespective of existing statistical heterogeneity. Then symmetric receiver operator characteristic curves (SROC) were profiled according to pooled data and area under SROC(AUC) were calculated to evaluate the diagnostic accuracy. Fagan plot and likelihood ratio scattergram were used to predict the clinical application of these two tests.

Subgroup analysis Subgroup analysis mainly focused on whether the included population was hospitalized, whether they rested before specimen collection, specimen detection method and urinary protein quantitative cut-off value.

Sensitivity analysis Receiver operating characteristics curve for constrained estimates of sensitivity and specificity for 12-hour urine collection compared with 24-hour urine collection.

Country(ies) involved China.

Keywords preeclampsia, protein:creatinine ratio, 12-hour urine protein, proteinuria.

Contributions of each author

Author 1 - Ming Tian - data extraction and design of the study.
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Author 3 - Luyan Huang - analysis and checking the analysis data, drafting and critical revision of the manuscript.
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Author 4 - Qingquan Liu - design of the study, validated the data accuracy, supervision the final submitted version.
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