Economic Assessment of Pre-eclampsia:
Screening, Diagnosis, Treatment Options, and Long Term Outcomes

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Background

Pre-eclampsia is a pregnancy complication affecting both mother and fetus. It is typically characterized by new-onset hypertension and proteinuria after 20 weeks of gestation. The pathogenesis of pre-eclampsia is not well understood and the only treatment proven to be effective is delivery. Worldwide, around 3-5% of pregnant women are affected. In developing regions, pre-eclampsia is a leading cause of perinatal death and one of the leading causes of maternal death. In the industrialized world pre-eclampsia causes around 13% of maternal deaths and is responsible for the majority of iatrogenic preterm births.

Although there is no proven effective method to prevent pre-eclampsia, early identification of women at risk of pre-eclampsia could enhance appropriate application of antenatal care, management and treatment. At present, pre-eclampsia screening consists of assessing clinical risk factors such as age, body mass index (BMI), and family history, in combination with an ultrasound scan at 20 weeks. However, the predictive power of this type of clinical screening is modest. Recently, several maternal serum markers have been assessed as novel candidates for predicting pre-eclampsia. Very little is known about the cost-effectiveness of these and other tests for pre-eclampsia, mainly because there is no clear treatment path.

The aim of this study was to provide a comprehensive overview of the existing evidence on the health economics of screening, diagnosis, and treatment options in preeclampsia.

Methods

Three electronic databases (PubMed, EMBASE and The Cochrane Library) were examined to investigate the eligible studies on screening, diagnosis, treatment or prevention of pre-eclampsia published between 1994 and 2014. Search terms for all databases were: (pre-eclampsia OR 'pre eclampsia') AND (screening OR diagnosis*) AND (prevent* OR intervention) AND (treatment OR manage*) AND ('cost of illness' OR 'cost analysis' OR 'cost effectiveness' OR 'cost benefit' OR 'cost utility' OR 'economic evaluation' OR 'economic analysis' OR 'budget impact'). We only included studies in humans and studies written in English.

After initial selection based on title and abstract, the full text of the paper was screened. Only complete economic assessments in pre-eclampsia, classified as economic evaluation and/or budget impact analysis (BIA) were included. Additionally, economic evaluation was categorized into cost analysis (CA), cost-effectiveness analysis (CEA), cost-utility analysis (CUA), or cost-benefit analysis (CBA). Irretrievable references, poster presentations and meeting abstracts were excluded. For comparability of results across studies, all costs reported in the included papers were set to 2012 US dollar values by using purchasing power parities (PPPs).

Results

From an initial total of 110 references, six papers fulfilled the inclusion criteria. Five were economic evaluations and one was a BIA. All studies were published between 2001 and 2012. Characteristics and results of the included studies are represented in the table below.

author, yr, type	Title	Comparators	Results/Conclusion
Shmueli (2012) CEA	Economic assessment of screening for pre-eclampsia	No screening versus screening with PP13, PlGF, and uterine arteries Doppler PI	Routine screening may be a cost-effective way to reduce the burden of pre-eclampsia, but further research needed with more data on long term effects
Meads (2008) CEA	Methods of prediction and prevention of pre-eclampsia: systematic reviews of accuracy and effectiveness literature with economic modeling.	No intervention versus intervention (in a wide range of different testing and treatment options)	Since accuracy levels of tests are currently insufficient, providing an effective, affordable and safe treatment to all pregnant women without prior testing seems most cost-effective
Vijgen (2010) CEA	Economic analysis of induction of delivery and expectant monitoring in women with gestational hypertension or pre-eclampsia at term	Labour induction compared with expectant monitoring in women with pre-eclampsia at term	From a societal point of view, induction of delivery is cost-effective compared to expectant monitoring in term pre-eclampsia
Simon (2006) CEA	Cost-effectiveness of prophylactic magnesium sulphate for women with pre-eclampsia in 333 countries: economic eval-uation of the Magpie trial	Magnesium sulphate for pre-eclampsia in three categories of countries grouped by gross national income (GNI)	ICER for preventing one case of eclampsia is much more favorable in low GNI countries and when treatment is restricted to severe cases
Blackwell (2001) CEA	Use of magnesium sulfate to prevent seizures in the pre-eclamptic gravida: a cost-effectiveness analysis	Seizure prophylaxis with magnesium sulfate versus control group with no prophylaxis	Universal prophylaxis using magnesium sulfate for all women with pre-eclampsia is cost-effective compared to treating only severe disease.
Hadker (2010) BIA	Financial impact of a novel pre-eclampsia diagnostic test versus standard practice: a decision-analytic modeling analysis from a UK healthcare payer perspective	Standard pre-eclampsia diagnostic practice versus standard practice + novel pre-eclampsia test using biomarkers	The novel test would save costs from an NHS perspective, assuming sensitivity and specificity of the test to be 82% and 95% respectively

Conclusion

The two studies on magnesium sulphate are equivocal on the cost-effectiveness in non-severe cases of pre-eclampsia. Novel biomarkers in screening for and diagnosing pre-eclampsia show promise, but their accuracy is a major driver of cost-effectiveness. Universal screening for pre-eclampsia using a biomarker will probably only be feasible when accuracy is significantly increased.

Pre-eclampsia is a complex disorder that requires a personalised medicine approach. The main goal of IMPROvED is to develop a clinically robust predictive blood test for pre-eclampsia, using innovative technologies and utilising novel metabolite and protein biomarkers. www.fp7-improved.eu IMPROvED.FP7 @IMPROvED_Study

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