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Review

# Definitions and reporting of placental insufficiency in biomedical journals: a review of the literature

Kathryn Hunt[a,*], Stephen H. Kennedy[b], Manu Vatish[b]

[a] Oxford University Medical School, John Radcliffe Hospital, Oxford OX3 9DU, UK
[b] Nuffield Department of Obstetrics & Gynaecology, University of Oxford, Oxford, UK

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ABSTRACT

Placental insufficiency is a major problem worldwide for both mothers and babies. However, we have demonstrated in a review of the biomedical literature, that both the terminology used to describe, and techniques used to measure suboptimal placental function, are remarkably varied and inconsistent in both clinical and scientific studies. We, therefore, present a case for the development of a standardised approach to studying placental insufficiency.



**Contents**



## Introduction

Poor placental function is implicated in a diverse range of pregnancy-related disorders, including intrauterine growth restriction (IUGR) and pre-eclampsia, that predispose to preterm birth, the leading cause of perinatal morbidity and mortality worldwide [1,2]. Monitoring the clinical manifestations and sequelae of suboptimal placental function throughout pregnancy is, therefore, an important component of antenatal care. However, "placental insufficiency", the term most commonly used in the biomedical literature to describe poor placental function, is imprecisely defined and there is seemingly no internationally agreed consensus regarding its pathognomonic features.

The lack of diagnostic criteria is disappointing given the clinical importance of the condition and the progress made towards standardising the classification of other women's health problems. For example, recognition of the need for standardisation has previously brought together international consensus groups to develop definitions and diagnostic criteria for polycystic ovarian syndrome, pre-eclampsia and stillbirth [3–5].

Although it has been recognised that the term placental insufficiency should be standardised, how it is actually used in the biomedical literature has, to the best of our knowledge, never been examined systematically [6]. This review is, therefore, an attempt to evaluate the variability in how placental insufficiency is defined, measured and reported.

## Methods

Publications between May 2004 and May 2015 that mentioned any terms related to poor placental function were identified by

* Corresponding author.
*E-mail address:* kathryn.hunt@gtc.ox.ac.uk (K. Hunt).

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searching the Scopus database using the index term "placental insufficiency". Only publications that appeared in peer-reviewed journals with a 2013 Scientific Journal Ranking (SJR) indicator (http://www.scimagojr.com/journalrank.php) greater than 2.3 over the time period were included in the analysis.

Two authors (KH and MV) independently extracted information from the articles concerning the precise terminology used to describe placental insufficiency; whether and how the term was defined; whether and how placental function was measured, and whether the measurement parameters to define placental insufficiency were provided. In articles describing animal models of placental insufficiency, the type of model was also noted.

## Results

Of the 1171 articles retrieved, 87 met the inclusion criteria (basic science studies = 43, observational studies = 10, randomised control trial = 1, correspondence = 15, reviews = 13 and clinical practice guidelines = 5). The sample contained publications from 26 different peer-reviewed journals (see Appendix A).

### *Terminology*

As shown in Fig. 1, the terminology used to describe suboptimal placental function was highly variable. We found a mean of 1.4 different terms (range 1–4) per article, the most frequently used being "placental insufficiency" ($n = 64$, 74% of articles), "uteroplacental insufficiency" ($n = 22$, 25% of articles), "placental dysfunction" ($n = 11$, 13% of articles) and "placental restriction" ($n = 10$, 11% of articles). In total, 17 different terms were found.

Of the 87 articles identified, 70% ($n = 61$) made no attempt to define the term(s) used to describe suboptimal placental function. Amongst the remaining 26 articles, most ($n = 21$, 81%) provided a definition relating to placental physiology, whilst the others ($n = 5$, 19%) did so in relation to fetal growth or development as clinical outcomes.

Some papers attempted to provide quantitative definitions ("*placental efficiency . . . is commonly defined as the grams of fetus that can be supported by each gram of placenta and simply calculated as the ratio between fetus and placenta weight*" [7]) or definitions based on specific clinical criteria ("(*i*) *abnormal or non-reassuring fetal surveillance test*(*s*), *e.g. a non-reactive non-stress test*,*suggestive of fetal hypoxemia*, (*ii*) *abnormal Doppler flow velocimetry waveform analysis suggestive of fetal hypoxemia*, *e.g. absent end-diastolic flow in the umbilical artery*, (*iii*) *oligohydramnios*, *e.g. an amniotic fluid index of 5 cm or less*, *or* (*iv*) *a postnatal birth weight less than the 10th percentile for the gestational age*" [6]).

However, the definitions provided were usually much vaguer: for example "*inadequate placental function*", "*reduced uterine perfusion*", "*fatal arrest of placental morphogenesis*" or "[*pregnancies*] *in which either fetal or placental growth*, *or both*, *are reduced*" [8–11].

### *Measurement of placental function*

We identified 49 articles that referenced one or more methodologies used to detect or measure suboptimal placental function. These were grouped into the categories shown in Table 1.

**Table 1**
The frequencies of the methodologies used to measure placental function within the study sample.

| Measurement characteristic | Number of articles |
|---|---|
| Doppler ultrasound measurement of uterine artery flow | 3 |
| *In vivo* placental MRI parameters | 2 |
| Morphological analysis of the placenta | 10 |
| Doppler ultrasound measurement of umbilical artery flow | 5 |
| Measurement of fetal nutrient uptake | 6 |
| Measurement of fetal growth and development | 33 |
| Measurement of biochemical markers in maternal serum | 1 |

### *Animal models of altered placental function*

We identified 42 articles that reported the use of one or more animal models to study suboptimal placental function (Table 2).

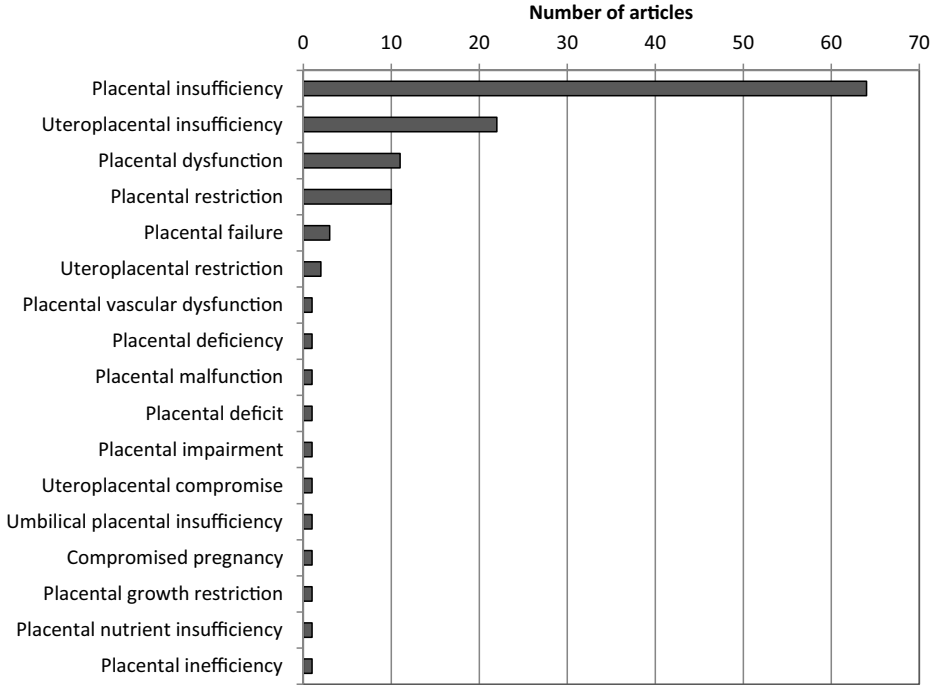


**Fig. 1.** Variation in terms used to describe suboptimal placental function in biomedical literature.