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Published in:
Journal of Reproductive and Infant Psychology

Document Version:
Peer reviewed version

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This is an Accepted Manuscript of an article published by Taylor & Francis in Journal of Reproductive and Infant Psychology on 09 Mar 2016, available online: http://www.tandfonline.com/doi/full/10.1080/02646838.2016.1149346

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Download date:08. Sep. 2017
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The biopsychosocial model is built on the premise that psychological and social processes are integrally and interactively involved in physical processes, and as such provide an important overarching framework in the development of theory and research in the field of health. However, advancement of our knowledge on the underlying processes that link biological, psychological and social systems is not well developed and has been limited by our approach to research. For example, an early review by Suls and Rothman (2004) showed that papers in Health Psychology over a 12-month period showed researchers only used indicators from all four domains they were measuring (psychological, social, (including social economic status, and ethnicity) and biological) in 26% of studies and even then the physical indicator often reflected the presence of disease to define a sample. This remains a challenge.

The interplay between systems in the perinatal period is particularly fascinating and complex. In recent decades there has been considerable interest in the biopsychosocial model in relation to the maternal-fetal interface (Rubin, 2015), and its relationship to poor obstetric and infant outcomes, supported by the emergence of new paradigms and fields of study such as psychoneuroendocrinology (Ray, 2004; Christian, 2011). However, the biological mechanisms that underlie the aetiology of mood and attachment disorders remain poorly understood. This has led to a surge in studies using exploratory analysis of biomarkers derived from saliva, hair, urine and plasma of pregnant women during the gestational period and post-partum to detect changes in biomarkers. Such analysis aims to determine the degree to which biopsychosocial alterations at the maternal-fetal interface may be profiled by biomarkers in order to predict risk or to further elucidate mechanistic aspects underlying the biopsychosocial model that can illuminate pathways of adverse pregnancy and infant outcomes, for example, the relationship between maternal inflammatory biomarkers, maternal stress and premature birth with the ultimate goal being prevention.

The challenge of safely mitigating the detrimental effects of maternal depression, anxiety and stress during pregnancy is gaining momentum amongst the global research community. Confirmation of a pathway from prenatal stress to shortened gestational age at birth via elevated inflammatory cytokines has recently been established (Coussons-Read et al., 2012), however many biomarker studies that have focused on maternal depression, anxiety and stress during pregnancy have revealed limited correlation between psychometric indices and biological ones (Glover, 2014). Much research remains to be done in this priority area. In relation to this pursuit, it is often not well enough acknowledged that biomarkers are inherently dynamic markers influenced by a plethora of multi-faceted and synergistic endogenous and exogenous mechanisms at an individual level. In women of reproductive age the dynamics of biomarkers are even further compounded by the influences of pregnancy including but not restricted to pregnancy-induced changes in the neuroendo-immune environment, functional changes to support pregnancy, the physiological stress of pregnancy, even the sex of the fetus in addition to maternal psychobiological determinants such as stress, nutrition, BMI, race/ethnicity, sleep, pre-existing conditions, medication exposures, and genetic predispositions. Despite considerable resource and effort, no single biomarker has yet been identified that can predict later pregnancy complications with sufficient specificity and sensitivity (Kane et al., 2014).

A 2011 systematic review of biomarkers of spontaneous preterm birth by Menon et al. emphasised that there remains considerable heterogeneity amongst existing biomarker studies (in relation to study design, sampling issues, assay methods, and analyses) rendering systematic review extremely challenging and meta-analysis all but impossible. Other areas of concern include poor phenotype definition of outcomes of interest, non-ideal study designs and poor rationale for biomarker selection and assays and population stratification issues. With the advent of high through put
multiplex analysis platforms and omic technologies biomarker discovery is increasingly turning to the simultaneous analysis of multiple biomarkers and their complex interactions (McDermott et al. 2013), raising additional methodological challenges, heterogeneity of studies and even more ambiguity in relation to the rationale for biomarker selection. In addition, it has been our observation that biomarker studies involving pregnant women rarely if at all comment on the influence of selected biosampling methodologies on recruitment, compliance and attrition and on the general feasibility and acceptability of the sampling methods selected in pregnancy. There is much knowledge to be gained from improved reporting of these issues, due to the diverse nature of sampling methodologies utilised, which range from one-off invasive methods to obtain amniotic fluid and fetal blood, to non-invasive sampling of cervicovaginal fluid and longitudinal repeat venepuncture to obtain maternal blood samples. Many studies involving pregnant participants are also exploring self-sampling techniques.

Furthering our understanding of the underlying pathways and linkages between systems requires us to include a diverse set of indicators within the same study. We also need to use more advanced designs that allow use to explore interconnections between factors. Both of these are challenging but an interdisciplinary approach can help us learn from each others’ strengths and limitations. Developments in biomarker research provide an opportunity to move forward with a standardised and cost-effective approach which can facilitate an evolution of biopsychosocial models in reproductive and infant psychology.

References


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