

in this study. Small study numbers may explain our failure to replicate the findings of Wachman et al, in whose study SNPs in both *OPRM1* and *COMT* predicted NAS.⁹

The strengths of this small pilot study are that mothers and babies were cared for in one facility, with a practiced and consistent approach to management of NAS. Persons caring for the babies were unaware of the infant's genotype. Even within a small number of patients, genomic variation in *CYP2B6* between treated and untreated babies was significant.

Future studies should consider maternal genotype and its relationship to infant genotype and/or the prediction of NAS as well as associated maternal polydrug use.

Conclusion

Genomic variation in *CYP2B6* in the newborn is associated with severity of NAS; this has not previously been reported. Better understanding of the role of pharmacogenetics in the etiology of NAS may result in improved care for mother and baby.

Note

This study was undertaken as part of a PhD cosponsored by Bournemouth University and Randox. Royal Bournemouth Hospital donated the space for sample analysis.

Authors' Contributions

Helen Mactier was involved in study concept and sample collection and wrote the manuscript. Poppy McLaughlin analyzed samples and data, contributed to manuscript revisions, and approved the final version. Cheryl Gillis recruited patients and collected samples, contributed to manuscript revisions, and approved the final version. Michael David Osselton conceived the study, oversaw analysis of samples, contributed to manuscript revisions, and approved the final version.

Conflict of Interest

None.

References

- 1 Abdel-Latif ME, Pinner J, Clews S, Cooke F, Lui K, Oei J. Effects of breast milk on the severity and outcome of neonatal abstinence syndrome among infants of drug-dependent mothers. *Pediatrics* 2006;117(6):e1163–e1169
- 2 Dryden C, Young D, Hepburn M, Mactier H. Maternal methadone use in pregnancy: factors associated with the development of neonatal abstinence syndrome and implications for healthcare resources. *BJOG* 2009;116(5):665–671
- 3 Cleary BJ, Donnelly JM, Strawbridge JD, et al. Methadone and perinatal outcomes: a retrospective cohort study. *Am J Obstet Gynecol* 2011;204(2):139.e1–139.e9
- 4 Lewis T, Dinh J, Leeder JS. Genetic determinants of fetal opiate exposure and risk of neonatal abstinence syndrome: knowledge deficits and prospects for future research. *Clin Pharmacol Ther* 2015;98(3):309–320
- 5 NCBI database of Short Genetic Variations (dbSNP). Available at: <https://www.ncbi.nlm.nih.gov/snp>; Accessed December 15, 2016
- 6 Bunten H, Liang WJ, Pounder DJ, Seneviratne C, Osselton D. *OPRM1* and *CYP2B6* gene variants as risk factors in methadone-related deaths. *Clin Pharmacol Ther* 2010;88(3):383–389
- 7 Dennis BB, Bawor M, Thabane L, Sohani Z, Samaan Z. Impact of *ABCB1* and *CYP2B6* genetic polymorphisms on methadone metabolism, dose and treatment response in patients with opioid addiction: a systematic review and meta-analysis. *PLoS One* 2014;9(1):e86114. Doi: 10.1371/journal.pone.0086114
- 8 Gadel S, Crafford A, Regina K, Kharasch ED. Methadone N-demethylation by the common *CYP2B6* allelic variant *CYP2B6.6*. *Drug Metab Dispos* 2013;41(4):709–713
- 9 Wachman EM, Hayes MJ, Brown MS, et al. Association of *OPRM1* and *COMT* single-nucleotide polymorphisms with hospital length of stay and treatment of neonatal abstinence syndrome. *JAMA* 2013;309(17):1821–1827
- 10 Lipsitz PJ. A proposed narcotic withdrawal score for use with newborn infants. A pragmatic evaluation of its efficacy. *Clin Pediatr (Phila)* 1975;14(6):592–594
- 11 Tolia VN, Patrick SW, Bennett MM, et al. Increasing incidence of the neonatal abstinence syndrome in U.S. neonatal ICUs. *N Engl J Med* 2015;372(22):2118–2126
- 12 Doberczak TM, Kandall SR, Friedmann P. Relationships between maternal methadone dosage, maternal-neonatal methadone levels, and neonatal withdrawal. *Obstet Gynecol* 1993;83:936–940
- 13 McGlone L, Hamilton R, McCulloch DL, et al. Neonatal visual evoked potentials are altered in infants born to mothers prescribed methadone in pregnancy. *Pediatrics* 2013;131:e857–e863
- 14 Koren G, Cairns J, Chitayat D, Gaedigk A, Leeder SJ. Pharmacogenetics of morphine poisoning in a breastfed neonate of a codeine-prescribed mother. *Lancet* 2006;368(9536):704. Doi: 10.1016/S0140-6736(06)69255-6