Mapping the frequency of CYP2C19 *2/*3 alleles in global ethnic populations

Yusra Batool¹, Mary Roederer², Howard L. McLeod², Sharon Marsh³

¹Department of Biological Sciences, Faculty of Science, University of Alberta, Edmonton, AB, Canada
²Institute for Pharmacogenomics and Individualised Therapy, University of North Carolina, Chapel Hill, NC, USA
³Faculty of Pharmacy and Pharmaceutical Sciences, University of Alberta, Edmonton, AB

Background

Genetic variability can explain differences in response to medications, but the cost of individual genetic testing is prohibitive for developing countries. PGENI (the Pharmacogenomics for Every Nation Initiative) is a non-profit, worldwide organisation that will develop innovative strategies for country-specific integration of genomics into public health decision-making without increasing the burden on sparse healthcare funds.

Pharmacogenomics

Inter-ethnic genetic differences can greatly impact the effect of therapeutic drugs on patients from different ethnicities, causing adverse or sometimes even toxic reactions to standard doses. Even though published research exists on the frequencies of different genetic variations in many world populations, this data is largely uncompiled, and thus not useful for healthcare practitioners.

CYP2C19

CYP2C19 metabolises over 40 drugs on the WHO essential medicines list, including clopidogrel, a commonly prescribed anticoagulant agent. There are multiple genetic polymorphisms in CYP2C19 that could affect clopidogrel metabolism.

Aim of the study

How do the published frequencies of CYP2C19 variant alleles vary in different ethnicities, as compared to the Caucasian population?

Methods

Text mining using keywords including CYP2C19, variant, genomic, pharmacogenomic, polymorphism and population generated a list of 1230 references from the NCBI PubMed database. References were individually screened and frequencies of CYP2C19 polymorphisms, country, number of samples and ethnicity were recorded in a database. This database was used to generate world maps using the US Caucasian frequency as a reference population.

Results

The world map shows there is a range of frequencies for CYP2C19 genetic variation. Using the US Caucasian population as a reference sequence, areas of Africa were lower (blue) or higher (yellow) frequencies, indication these countries would have a lower or higher rate of clopidogrel metabolism. The Solomon Islands and Vanuatu reported extremely high frequencies (0.77 compared to 0.13 US). Genetic variability was also seen within countries and similar ethnicities.

Future Research

By compiling this information and adding to it using genomics screening in populations not already covered in the literature, PGENI will define the role of common genetic variations in CYP2C19 for clopidogrel dosing (and other CYP2C19 metabolised drugs) and develop population-specific medical decision trees that will be distributed to the Ministries of Health of each country to improve medication selection and use worldwide.

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Further Information

For further information, please contact: ybatool@ualberta.ca

Literature