Prenatal biochemical screening only detects half of chromosomal abnormalities

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Prenatal biochemical screening tests are widely used to look for chromosomal abnormalities in the fetus which can lead to serious handicap, or even death during gestation or in the first few days after birth. But these tests are only able to detect fewer than half of the total chromosomal abnormalities in the fetus, a scientist will tell the annual conference of the European Society of Human Genetics today.

Dr. Francesca R. Grati, of the TOMA Laboratory, Busto Arsizio, Italy, says that these findings mean that women should be better informed on the limitations of such diagnostic tests.

The researchers studied 115,576 prenatal diagnoses carried out during the last fourteen years. 84,847 were amniocenteses, usually carried out around the 16th week of pregnancy, and 30,729 chorionic villus samplings, which can be undertaken from 12 weeks into the pregnancy. Both these tests carry an increased risk of miscarriage, so the decision on whether or not to undertake them can be difficult to weigh up.

"Since our sample included a large number of women aged less than 35 who underwent invasive prenatal diagnosis without any pathological indication to do so, we felt that the results could be useful in helping to inform pre-test counselling of such women", says Dr. Grati. "Up until now, the information we had came from smaller studies which only looked at the performance of these tests in detecting a limited number of chromosomal abnormalities."

After analysing the results of the chromosomal abnormalities from their own dataset, the researchers combined them with the official detection rates for these abnormalities published by SURUSS and FASTER consortia. These are multi-centre research groups involved in the investigation of screening and diagnostic tests performed in pregnancy, whose results are being used to optimise prenatal care for pregnant patients. They found that current screening procedures were only able to detect half the total chromosomal abnormalities in women both younger and older than 35.

The TOMA laboratory is particularly suited to carry out this kind of research, says Dr. Grati, because it was among the first in the world to deal with prenatal diagnosis, and has a vast number of prenatal diagnostic samples at its disposal.

Current tests do not detect all fetal chromosomal abnormalities, but only trisomies 21 (Down syndrome), 18 (Edward's syndrome), and 13 (Patau syndrome), monosomy X (Turner syndrome), and triploids (conceptuses with 69 chromosomes instead of 46). "These are common vital chromosomal abnormalities, but there are many others which are not picked up by these tests", says Dr. Grati. "And the tests do not even detect 100% of the common abnormalities."

At conception, 23 chromosomes from each parent combine to create a fetus with 46 chromosomes in all its cells. Trisomy occurs when the fetus has one additional chromosome (47 instead 46). The extra genetic material from the additional chromosome causes a range of problems of varying severity.

In Down syndrome, for example, where the fetus has three copies of chromosome 21, babies are usually born with impaired cognitive ability and physical growth, cardiac defects and a characteristic facial appearance. Unlike many other such abnormalities, however, babies

born with Down syndrome are able to lead relatively normal lives and their life expectancy is around 50 years.

Other than trisomy, the fetus can also have the loss of genetic material (deletions) or chromosomal abnormalities in a non-homogeneous form, where there is a mixture of two cell lines, one normal and the other abnormal. "Some of these disorders are relatively common in the fetus, which may have as much chance of surviving as children who are born with Down syndrome, and it is worrying that current biochemical tests are not always able to detect them" says Dr. Grati. "Our research confirms that it is fundamental for doctors to counsel patients about the limitations of current screening methods, so that they can make an informed decision on whether or not to undergo invasive diagnostic testing."

Source: European Society of Human Genetics