In Focus

Bernadette Modell

The ethics of prenatal diagnosis and genetic counselling

Doctors are often censured for the aborting of severely abnormal fetuses after prenatal diagnosis. But, where parents have been left in ignorance and have produced an abnormal child, there has been a very strong sense of injustice. The moral responsibility must ultimately rest with the parents, who must have control of their own health and that of their families.

Scientific progress is rapidly increasing our understanding of human genetics, but up to now this knowledge has been more useful for diagnosis than for treatment. Its application in prenatal diagnosis, leading to selective abortion of severely abnormal fetuses, is often viewed with strong reservations and considered a distasteful and temporary alternative to improved treatment or "primary prevention" (i.e., identifying and avoiding the causes of congenital disorders). However, primary prevention is not possible for inherited diseases because the genetic carrier status of the parents cannot be changed. Treatment, too, is often impossible, and where it is not it is burdensome, expensive, and unsatisfactory. It is unlikely that medical science will ever be able to overcome all these limitations, so there will be a place for prenatal diagnosis for a long time to come.

The general objective of prenatal diagnosis is to allow couples to make an informed choice and to increase their control over their own health and that of their families. The choice of abortion when the fetus is severely abnormal raises numerous ethical questions. Experience of prenatal diagnosis in the programmes that have reduced births of thalassaemic children by 60–90% in the Mediterranean area *(1)* now makes it possible to review some of these ethical questions in practical and even statistical terms.

The principal conclusion is that many problems arise from inadequate information, and there is a strong moral case for improving community and medical

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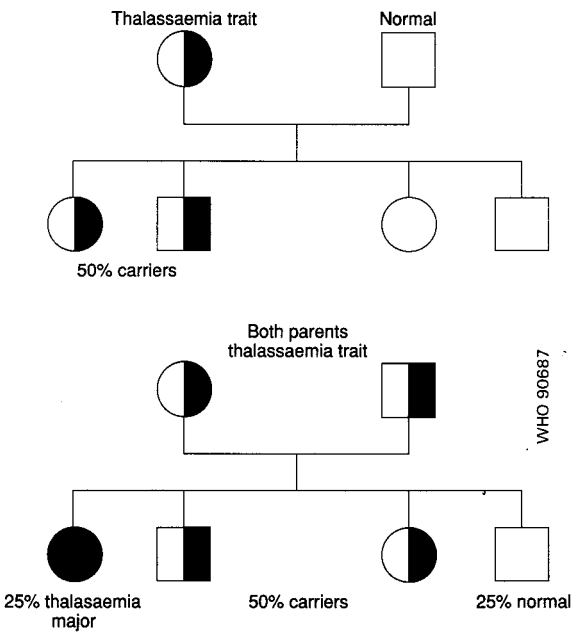
education about the nature and frequency of genetic risks and the role of prenatal diagnosis.

The haemoglobin disorders: inheritance and frequency

Most people are healthy carriers of one or more inherited disorders. We inherit a genetic risk from our parents and pass it on to some of our children. At present it is difficult or impossible to identify carriers of most inherited diseases reliably, but for the haemoglobin disorders (thalassaemia and sickle-cell disease) there are cheap, simple, and reliable methods of detecting carriers *(2)*.

"Recessive" inheritance of thalassaemia



When a carrier marries a non-carrier, on average half their children will be carriers and half will not. There is no possibility of a child with thalassaemia major. However, if two carriers marry, in each pregnancy there is a 25% chance of a child with thalassaemia major, a 50% chance of a carrier, and a 25% chance of a normal child. The outstanding characteristic of the haemoglobinopathies, by contrast with most other recessively inherited diseases, is that the symptomless carriers can be detected simply, cheaply, and reliably.

From 3% to 25% of people in the tropics and subtropics are healthy carriers of thalassaemia or sickle-cell disease *(3)*. Their inheritance is typical of many other inherited diseases. When a carrier marries a non-carrier, on average half their children are carriers and half are not, but no one has the disease. However, when two carriers marry, on average one in four of their children inherits the disorder from both parents, and so suffers from a major inherited anaemia (see figure). Treatment for thalassaemia requires monthly blood transfusions and daily subcutaneous infusions of an iron-chelating drug, but the course of sickle-cell disease is less predictable *(2)*. Couples with a defined genetic risk of this kind are referred to as "at-risk" couples. All at-risk couples are also capable of having healthy children.

At-risk couples can be informed of the genetic risk and offered prenatal diagnosis before they start to reproduce. Most couples at risk for thalassaemia and some at risk for sickle-cell disease use prenatal diagnosis and selective abortion of affected pregnancies to ensure a healthy family. So when screening and counselling are provided, births of affected children can be prevented.

Possible choices and who should make them

The possible actions open to at-risk couples depend on the stage in life at which they learn of their genetic risk (see table), but all of them have important moral implications. Even the apparently simple decision not to reproduce depends on the availability of contraception and back-up termination of pregnancy. Since at-risk couples are forced to think things through in order to reach the best decision for themselves, they need help through the process of genetic counselling *(4)*.

The recognized ethical principles of genetic counselling are: the autonomy of the individual or the couple, their right to full information, and the highest standard of confidentiality *(5)*. These principles are designed to protect individuals with a genetic problem from external pressures or abuses. Once accepted, however, they have wider implications.

It is not easy to guess how one would act in an at-risk situation, and a study from Canada *(6)* shows that it is even more difficult to judge how other people would. A small group of carriers of Tay-Sachs disease,[a] identified by screening in high school, and a group of non-carrier controls were followed up 7 years later with a questionnaire that included the following inquiry. "If a couple planning to marry found they were both carriers of Tay-Sachs disease, do you think it would alter their marriage plans? If the couple were yourselves, would it alter your marriage plans?" Neither the carriers nor the controls expected this important genetic information to affect their own choice of marriage partner, but the majority of both groups thought it would alter other people's. Clearly, everyone needs to be informed about genetic disease and its implications, and the decisions involved, being so difficult and personal and having such profound and lifelong consequences, must be made by the affected couples themselves.

Therefore to develop an appropriate service we need to know which of the available options is preferred, and under what circumstances, by the couple at risk.

[a] Tay-Sachs disease is carried by 3–4% of some groups of Jews and in a particular population of French extraction in Canada. It is inherited in the same way as the haemoglobinopathies. Affected children, though normal at birth, gradually become paralysed and regress mentally and physically before dying at about 5 years of age. Carriers can be detected and advised, and most at-risk couples make use of prenatal diagnosis.

Possibilities open to carriers of inherited diseases

	Possible action
Before marriage	1. Not to marry 2. Not to marry another carrier 3. Marry in the usual way
After marriage	4. Not to reproduce 5. "Take the chance" 6. Reproduce with fetal diagnosis 7. Reproduce with a substitute partner (e.g., artificial insemination by donor) 8. Divorce and marry another partner
After birth of an affected child	9. Accept infant and treatment 10. Accept infant but not treatment 11. Reject infant

Fortunately, we can obtain answers by noting their reproductive behaviour.

A few facts

Effect of genetic knowledge on choice of partner

It is sometimes thought that genetic education and screening should be used to persuade carriers not to marry each other: but in fact, genetic information rarely affects people's choice of marriage partner. For example, in Cyprus, the church insists on premarital screening for thalassaemia, but less than 5% of couples who find they are both carriers decide not to marry. The same is true in Greece and Italy, where premarital screening has been carried out for many years, even before prenatal diagnosis was available *(7)*. People feel it is important to know their carrier status early, so that they can make their life choices responsibly.

Pressure on carriers to alter their marriage behaviour would amount to objective stigmatization and would be completely unacceptable. The approach was briefly tried in Cyprus but hastily abandoned "because of evasions" *(8)*.

Effect of genetic knowledge on reproduction

When prenatal diagnosis is not available, many couples who know they are at risk of producing a child with serious genetic disorders "take the risk" at least once, but if they do have an affected child, many stop reproducing. For example, before prenatal diagnosis was available for thalassaemia, couples with one thalassaemic child who understood the recurrence risk, tried not to conceive and terminated 70% of accidental pregnancies indiscriminately. Though they avoided having further sick children, their ambitions for a normal family were frustrated. The advent of prenatal diagnosis allowed couples to ensure that their children were healthy and to achieve the families they wanted *(9)*.

The other possibilities mentioned in the table are taken up very infrequently. Divorce is not a common solution, and artificial insemination by donor is not popular.

Prenatal diagnosis depends on obtaining fetal cells for analysis. Until recently, fetal cells could be obtained (by amniocentesis or fetal blood sampling) only at 16–18 weeks of pregnancy. It took time to reach a diagnosis, so abortion, when requested, could be done only after about 20 weeks of pregnancy. Though 98% of British Cypriot couples at risk of thalassaemia made use of this form of prenatal diagnosis, only about 20% of British Pakistani (Muslim) couples did. However, it is now possible to perform prenatal diagnosis by chorionic villus sampling (CVS) and DNA analysis at 9 weeks of pregnancy *(10)*, and about 80% of British Pakistanis accept it—provided they are adequately counselled and have enough time to think things over. CVS has spread rapidly because for most people abortion is morally more acceptable in early pregnancy.

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The implication is that at-risk couples should be identified early enough to take advantage of early prenatal diagnosis. It is therefore no longer enough to confine testing to the antenatal clinic: it is important to inform those at risk before pregnancy, and preferably before they choose their partners.

Delivery of existing services

Services for the prevention of thalassaemia are not yet comprehensive, even in the most developed countries. This is also true of other prenatal diagnosis services *(11)*. The follow-up of thalassaemic children born despite the existence of prevention programmes shows that most residual births are not due to rejection of prenatal diagnosis but to persisting ignorance of risk and to unawareness of the existence of the service among patients and doctors *(1)*. Poor service delivery is a key ethical issue because it deprives couples of informed choice. It underlines the need for improved community and medical genetic education.

Society, the law, and money

The law impinges on the practice of prenatal diagnosis in three important areas. Firstly, it creates the framework within which the service must operate, by setting

the legal limits for medical abortion. The ethical issues discussed here take on a different complexion where abortion is illegal, though even under these circumstances it is often permitted in early pregnancy for risk of severe fetal abnormality, as when a pregnant woman has been exposed to rubella infection.

Secondly, there is the matter of lawsuits. Parents who have not been advised of an avoidable genetic risk, and so bring a severely affected child into the world, sometimes take their case to court. Usually the law upholds their right to information and prenatal diagnosis.

Thirdly, there is the possibility of legislating for mandatory genetic screening, which may appear to be an infringement of individual liberty but is a very efficient way of ensuring that people at risk are not missed. In Cyprus, mandatory premarital testing for thalassaemia was rejected as unconstitutional, and because of limited resources primary emphasis was placed on screening pregnant women in the antenatal clinic. However, in 1984 the Greek Orthodox archbishop pointed out that it is unethical to confine screening to the antenatal clinic since it does not allow couples at risk the full range of choice. He therefore introduced a ruling that only couples with a certificate of testing and appropriate counselling issued by a government centre could be married in church. Since nearly all Cypriot marriages take place in church, this amounted to mandatory premarital testing without a law actually having been passed. It has certainly contributed to the extraordinary effectiveness of the Cypriot thalassaemia control programme *(1, 8)*. In some other countries, authoritative professional guidelines have had a similar effect *(11)*. More such guidelines are needed to protect the interests of couples at risk.

Cost-benefit analysis of medical procedures, an increasingly important aspect of health care planning, also has important ethical implications. In general, the treatment of congenital disorders is expensive and lifelong. Existing analyses show that prenatal diagnosis programmes usually save substantial health resources. Therefore, to the extent that families want prenatal diagnosis, there is every financial as well as ethical reason to provide it. The more slender the financial resources, the stronger the reasons *(3)*. People are often afraid that such analyses will lead governments to apply pressure in favour of screening and prenatal diagnosis because it is cheaper than treatment, but in reality prenatal diagnosis services are overloaded, underfunded, and inadequately delivered almost everywhere.

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Some general considerations

Responsibility

The moral problems of clinical genetics centre on the fact that since what is known cannot be unknown, there is an inescapable responsibility for both parents and the medical service.

The best point to start tracing the thread of responsibility is with the parents. The commonest single saying of couples at risk of thalassaemia is: "We have no choice. We cannot knowingly bring a child into the

world to suffer." The parents mean that if they bear a thalassaemic child in full knowledge of their risk, they would feel that every transfusion, every needle prick, and every scream was a direct consequence of their conscious choice. The critical word is "knowingly". The other face of responsibility is guilt.

The parents' dilemma raises the question of whether it is better to leave people in ignorance, in order to spare them the heavy responsibility for life and death. The answer is very clear. In London, at-risk couples who bear a thalassaemic child in ignorance because they have not been identified and counselled during pregnancy generally want to sue the obstetrician for negligence. Their complaint is that they have been deprived of information and choice, and this increases their difficulties because their child's suffering is now perceived as an injustice rather than as a simple misfortune. They are expressing a natural and passionate conviction that since knowledge is available, someone, somewhere, is responsible for the birth of their affected child and that the responsibility that should have been their own has been taken from them.

It is true that, from the time severe diseases become avoidable through the application of medical knowledge, a new social responsibility is generated for every subsequent birth. This responsibility can be discharged only by handing it to the parents through adequate information and genetic counselling. In practice, because of the large numbers now involved, this counselling must be incorporated into the primary health care system. However, few primary health workers have any training in genetics, and many still believe that genetic diseases are rare conditions that must be handled by specialists. It is therefore a priority to develop accurate, practical information resources, so that primary health care workers can provide basic genetic counselling.

With a highly emotional subject like prenatal diagnosis, it is also extremely important to help the public to clarify the moral issues, otherwise public doubts and difficulties can obscure the need for the service.

Common misconceptions

There are several grounds for popular anxiety about prenatal diagnosis. The memory of Nazi abuses arouses fears of "eugenics" (i.e., forcible selection of the population to suit political ends), which should be addressed mainly by improving genetics teaching in schools, so that people will understand that everyone is at genetic risk. Clear and simple information for patients, families, and the community about genetic disease and prenatal diagnosis are needed to generate an open atmosphere. The ethical code governing genetic counselling *(5)* should be publicized, and primary health care workers as well as specialists should be trained to follow it.

Another source of misunderstanding is the perceived antagonism between treatment and prevention. It is sometimes feared that the prevention of congenital disease and the elimination of the disabled from society will lead to discrimination against handicapped people. But in fact in countries where prenatal diagnosis is practised there is increased rather than decreased interest in the welfare of the handicapped as a result of increased medical and social awareness of their problems.

The relationship between treatment and prevention is complementary rather than antagonistic. Where medical resources are limited, a commitment to treatment can be undertaken only if prevention is started at

the same time *(8)*. On the other hand, the existence of prevention actually makes things worse for couples who have an affected child because they have been "missed", so prevention deepens the medical obligation to care for affected children. Some affected children are born because informed parents chose not to undergo prenatal diagnosis or to terminate a pregnancy with an affected fetus. Such children should also be treated as well as possible because the parents' decision was made on deeply moral grounds, and the families deserve the full support of society. The positive relationship between treatment and prevention is best perceived when both are administered by the same unit, as is the case in most Mediterranean thalassaemia centres.

In the future it will become possible to detect a very wide range of inherited characteristics, normal as well as abnormal. This raises some apprehension that couples will make frivolous requests, such as to select the colour of their children's hair or eyes, but experience shows that parents make responsible and conservative decisions about prenatal diagnosis, so frivolous requests are unlikely to be a major issue. Another question is whether prenatal diagnosis should be offered for conditions of intermediate severity. According to the principles of genetic counselling, this decision should be made by counselled couples, whose choices will provide the best guide to the range of prenatal diagnosis that should be available.

Finally, there is a common misconception that medical genetics is important only in highly developed countries, yet the greatest numerical challenge exists in developing countries, where the haemoglobin disorders are so common *(3)* and where improved primary health care now allows increased numbers to survive. Inevitably, attempts are made to treat them, so congenital and genetic diseases are becoming a worldwide problem. The issues of prenatal diagnosis are thus relevant in most countries.

Information and education

There are additional reasons for promoting improved general education about genetics. Perhaps the most important public anxiety about genetic screening is that social stigma will be added to genetic disadvantage and could limit marriage, education, and work opportunities. Public prejudices do exist, but they arise from ignorance and can be corrected by education. For instance, in Nigeria 20% of the population carry the sickle-cell trait, so in 40% of marriages one or other partner is transmitting the gene. When such facts are widely known, stigmatization becomes impossible, especially when there is a good reason for the high frequency (in this case protection of carriers against malaria). The diagnosis of the thalassaemia trait or the sickle-cell trait now appears to be associated with little or no social stigma in the Mediterranean area *(8)*.

Like many other preventive health messages directed to a healthy population, the genetic message needs to be personal enough to break through the "invulnerability" barrier. A comprehensive educational strategy is needed to get people to realize "this means me".

Poor service delivery is a key ethical issue because it deprives couples of informed choice.

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Community health workers' functions must be clearly defined

Community health workers should not be regarded as generalists who know everything or can do everything from providing first aid to promoting community development. Instead, their role could be that of a focal point for various health-sector and other resources and services, with responsibility for ensuring the community's access to them. The concept of a multipurpose community health worker must not be equated with that of an all-purpose worker. ...The definition of the functions of community health workers should leave room for individual creativity and sufficient flexibility to allow the health worker and community groups to take action beyond prescribed tasks to meet new and unforeseen situations.

— *Strengthening the performance of community health workers in primary health care.* Report of a WHO Study Group. Geneva, World Health Organization, 1989 (Technical Report Series, No. 780), p. 22.

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