phg hna toolkit | Congenital Disorders

# Background information on Down's Syndrome and the impact of interventions

This document gives a brief overview about the condition, its epidemiology and specific interventions that may reduce its burden.

## What is Down's Syndrome?

Chromosomal disorders are caused by changes in either chromosome number or structure usually occurring during the formation of sex cells. They usually result in spontaneous abortion or miscarriage; however, some such as Down's syndrome (DS) are compatible with life. DS or trisomy 21 occurs when the fetus inherits an extra copy of chromosome 21. DS is associated with variable intellectual impairment, learning difficulties and excess mortality caused by long-term health problems as a result of cardiac, gastrointestinal, immunological, respiratory and orthopaedic anomalies. Approximately 1% of cases are mosaic, i.e. the chromosomes divide incorrectly resulting in a mixed population of aneuploid and normal cells. These individuals have milder symptoms and may be difficult to diagnose.

## What are the main risk factors?

Advanced maternal age (AMA) is associated with an increased risk for most but not all chromosomal disorders. The incidence of DS is increased in mothers older than 35 years. This higher risk is associated with as yet unidentified biological factors.

## Global epidemiology

### Birth prevalence

The birth prevalence of Down's syndrome varies globally and ranges from 1.2-2.3/1,000 live births. The Modell Database of Constitutional Congenital Disorders (MGDB) has estimates suggesting that every year at least 193,206 people are born with Down's syndrome.

### Population prevalence

Approximately 2.6 million people in the world live with Down's syndrome. The population prevalence varies globally as it is influenced by access to diagnosis and care. Of those born alive with DS and other chromosomal disorders, some 49,760 are expected to die in the first year of life, and 95,684 in the first 5 years of life.

### Mortality

In a supportive environment, individuals with Down's syndrome who survive childhood may remain relatively well for long periods, even with limited medical care, until premature ageing sets in.

### Disability and quality of life

Surviving infants with DS have a range of severities from mild to severe cognitive and physical disability, depending on the condition and postnatal management. However, they will require follow-up and care throughout life to address complications and associated physical and intellectual disability, which may influence their integration into society.

## Reducing prevalence, morbidity and mortality

Figure 1 illustrates the determinants and interventions for Down's syndrome as they relate to key stages in life. The main specific interventions are discussed below.

### Interventions before pregnancy

Family planning and incorporation of information on maternal age-related risks may influence individual choice and decrease the proportion of older mothers. However, there is little information on the effectiveness of these interventions.

### Interventions during pregnancy

Prenatal care for Down's syndrome involves prenatal screening and diagnosis. Such programmes may be able to identify a proportion of other chromosomal disorders. Prenatal diagnosis may allow planning for a future affected baby, or in places where it is legal and acceptable, may lead to a choice of pregnancy termination.

Worldwide, prenatal screening usually has high coverage. However, the quality of the services is variable and often poor. State funded screening for disorders is not common practice in many areas with less developed health services. Prenatal screening may involve different methods, based on maternal blood tests and/or fetal ultrasound scan (USS). Screening is usually carried out towards the end of the first trimester or during the second trimester. For details on types of tests for chromosomal anomalies, please see Chapter on prenatal care.

Diagnostic confirmation involves laboratory tests on fetal cells obtained either by amniocentesis or chorionic villus sampling (CVS). These procedures, which involve sampling amniotic fluid or chorion by inserting a needle through the mother's abdominal wall, typically result in a miscarriage rate of 1-2% respectively (this figure may be reduced if the procedure is performed by a skilled and experienced practitioner). Laboratory tests to detect DS include fluorescent *in situ* hybridisation (FISH), karyotyping and quantitative fluorescent polymerase chain reaction (QF-PCR).

In countries where there are programmes of universal prenatal screening, Down's syndrome tends to be detected as part of an established programme. Care pathways may document access to supplementary tests or interventions, including access to termination of pregnancy, where legal.

### Interventions after birth

Diagnosis of Down's syndrome is possible at birth through the recognition of associated clinical features. Care will be dependent on available resources and may involve appropriate treatment of associated disorders, e.g. surgery for correction of structural defects, routine health monitoring/follow-up and early identification and treatment of medical conditions for which these individuals may be at increased risk (e.g. leukaemia, heart disease, obesity etc.). There are no cures for Down's syndrome and affected individuals and their families

require varying degrees of long-term support, including lifelong medical care, rehabilitation and counselling. The Down Syndrome Medical Interest Group has developed guidelines for care throughout life (see end of document for link).

# Cost-effectiveness of interventions

A number of strategies can be adopted for prenatal screening of DS and comparison of their cost-effectiveness is available in the general literature. Analysis is based on assessing the efficacy of the method and the costs of screening per DS pregnancy averted. Although the main conclusion of such studies is that screening is cost-effective, conclusions vary as to which strategy to adopt. Issues of cost-effectiveness are quite specific to each country as costs can vary tremendously depending on factors such as access to and use of services, cost of services for care and perceived burden of the disease. Cost-effectiveness is highest in countries with the highest prevalence, given that there is access and uptake of prenatal screening and diagnosis.

Care of individuals with DS can vary from simple interventions such as health monitoring and providing social support to more costly treatment of associated complications such as heart disease. The cost of care is likely to vary in countries depending on available resources and the extent to which it is provided.

For cost-effectiveness cut-off points for different regions of the world, go to http://www.who.int/choice/costs/CER_levels/en/index.html, and for costs for specific items by region and county, go to http://www.who.int/choice/costs/en/.

For information on cost-effectiveness analysis of prenatal screening based in the UK, go to http://www.nice.org.uk/guidance/index.jsp?action=byID&o=11947.

# What are the main ethical legal and social issues (ELSI) to consider?

## Acceptability of prenatal diagnosis and termination of pregnancy

In many low and middle income countries (LIMC), legal termination of pregnancy is unavailable or severely restricted to cases where termination is necessary to protect the woman's life. In some countries access to procedures to terminate a pregnancy may also depend upon parental or spousal consent. In practice, in many countries, procedures are often offered illegally, and these tend to lead to higher maternal morbidity and mortality than legal termination. In countries where termination of pregnancy is legal in cases of fetal abnormality, opinions may vary on the ethical justification of termination for chromosomal abnormalities that are not lethal, such as Down's syndrome.

Some people regard programmes of prenatal screening as eugenic programmes that devalue the lives of disabled people. Others hold the view that such programmes are ethically acceptable as long as they are restricted to conditions that cause serious disability and the programmes are not coercive: parents undergoing screening must make an autonomous choice to do so, must give their formal consent, and must be free to continue with an affected pregnancy if they choose to do so. However, issues such as autonomy may be considered more important in individualistic cultures than in those in which a larger entity such as the extended family or community has a wider role in decision-making, and in which duty to community may trump individual wishes.

### Equity of access to services

Economic development may be linked with increasing incidence of DS because of a trend towards higher maternal age. Access to effective family planning services and preconception care are important to inform women about these risks.

Parents with limited financial resources may not be able to afford prenatal screening and diagnostic services unless state or charitable funding is available. Timely prenatal screening (before the middle of the second trimester) is vital to avoid late terminations; those in charge of screening programmes should ensure that women from poorer socioeconomic backgrounds receive information about, and access to, services early in pregnancy.

### Psychosocial issues

Diagnosis of DS, whether prenatally or after birth, is likely to cause shock and distress in the parents and the wider family. There may be shame or stigma associated with such conditions.

False-positive results in prenatal screening programmes cause anxiety, both because of the possibility that the fetus is affected and because diagnostic testing involves the risk of miscarriage. Those with a false-negative result from prenatal screening may be falsely reassured and are likely to experience even greater shock on the birth of an affected child.

### Living with a disability

Those who are born disabled often have a very poor life expectancy, especially in low and middle income countries. This is due to a combination of factors: lack of access to relevant health and social services compounded by social determinants of ill health such as poverty and malnutrition. Whilst in developed countries, the effect of severe physical or psychological disabilities may be ameliorated by substantial support from the state, this may be virtually non-existent in other settings, where the psychological and economic burden of having a handicapped child falls mostly or entirely on the immediate and extended family.

## KEY REFERENCES

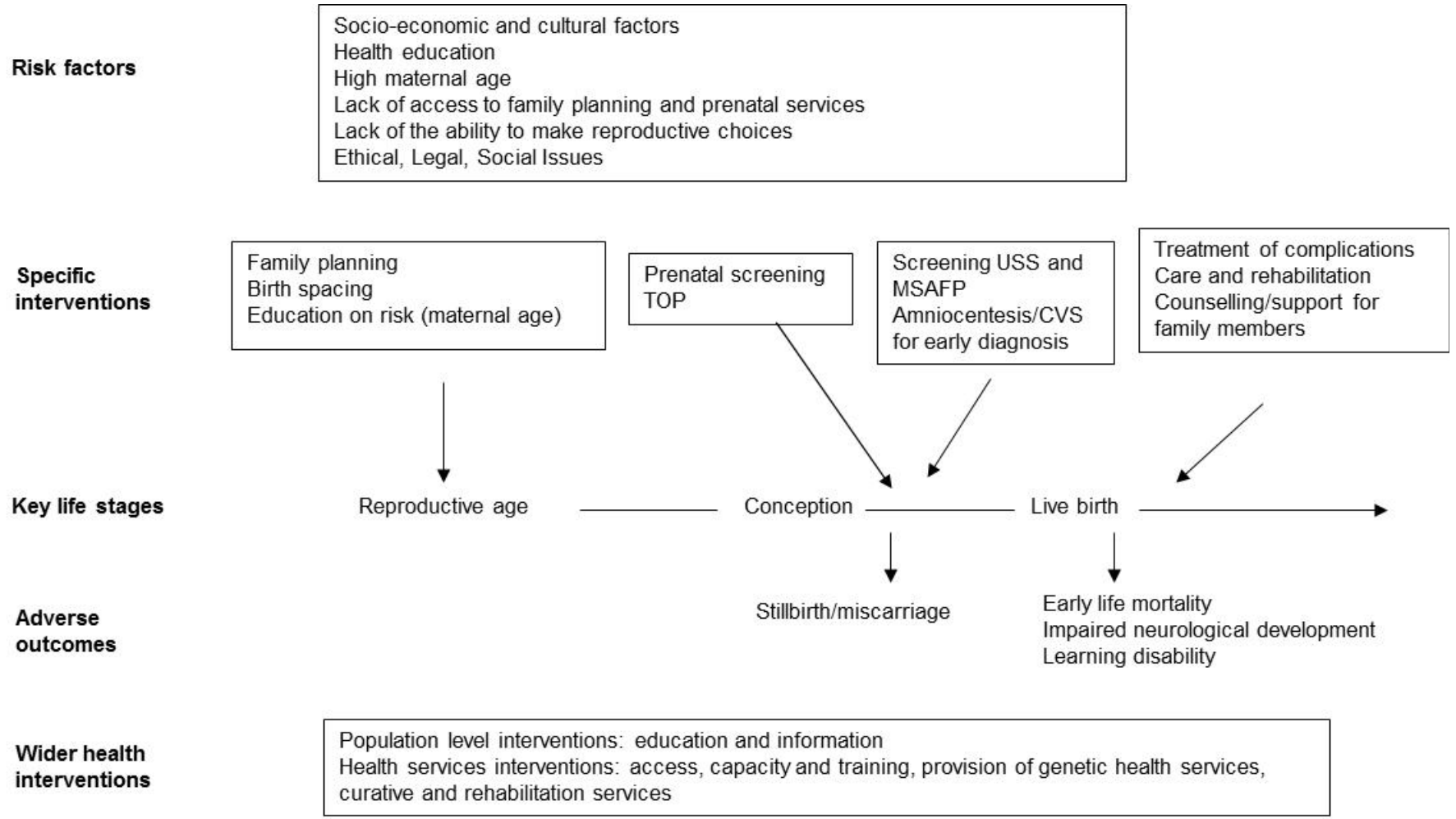
Cohen WI (ed) for The Down Syndrome Medical Interest Group (DSMIG). Health care guidelines for individuals with Down Syndrome (Down syndrome preventative medical checklist). *Down Syndrome Quarterly* 1996.

Wald NJ *et al.* First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine and Ultrasounds Screening Study (SURUSS). *Health Technol Assess* 2003; **7**.

## RELATED TOPICS

Preconception care and screening
Prenatal screening
Newborn screening
Health services

**Figure 1:** Needs assessment flowchart for Down's syndrome




TOP: Termination Of Pregnancy, USS: Ultra Sound Scan, MSAFP: Maternal Seruam Alpha FetoProtein, CVS: Chorionic Villus Sampling