Congenital Disorders

Background information on Fetal Alcohol Spectrum Disorder 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 Fetal Alcohol Spectrum Disorder?

Fetal alcohol spectrum disorder (FASD) is a non-diagnostic umbrella term used to describe the continuum of disabilities and congenital disorders resulting from prenatal alcohol exposure. Included within this spectrum is Fetal Alcohol Syndrome (FAS), which is the most clinically recognisable form and is the only clinical condition in this spectrum, recognised by the International Statistical Classification of Diseases and Related Health Problems (ICD 10). Nevertheless, there is an evolving terminology on various FASD subtypes including partial fetal alcohol syndrome, alcohol-related neurodevelopmental disorder, alcohol-related congenital disorders, and fetal alcohol effect. Factors contributing to the variation include maternal drinking pattern, differences in maternal metabolism of alcohol, timing of alcohol consumption in pregnancy and genetic factors.

The diagnosis of FAS is based on the presence of characteristic cranial/facial abnormalities, prenatal and postnatal growth deficiency, and central nervous system dysfunction. See Appendix 1 for details of clinical criteria.

FASD is regarded as the leading known cause of non-genetic developmental and cognitive disabilities in high income countries[1;2]. Individuals with FAS/FASD are affected by learning difficulties, attention problems, and poor social interactions. Studies of children affected by FAS found long term effects including high rates of disrupted schooling, trouble with the law, confinement, inappropriate sexual behaviour and alcohol and drug problems. The effects of these disorders last throughout life[3].

What are the main risk factors?

Ethanol is one of the most common substances that impact on the developing brain. Prenatal alcohol exposure causes structural alterations to the shape, volume and surface area of the overall brain and particular brain regions, as well as damage at the cellular level.

Alcohol consumption during pregnancy

Alcohol consumption during pregnancy is a risk factor for poor birth outcomes, including FAS, other congenital disorders, and low birth weight. It is one of the leading causes of preventable congenital disorders, learning disability and neurodevelopmental disorders worldwide. The timing and amount of exposure to alcohol are the primary determinants of fetal morbidity and mortality[4]. Binge drinking (the consumption of 4 or more standard drinks (56g alcohol) in one sitting) and the regular consumption of 3 or more drinks or near daily drinking have been shown to be particularly harmful[2]. However, light drinkers may also be at risk of delivering a child on the FASD spectrum, without identifiable dysmorphology but with significant cognitive and behavioural problems. As so-called 'light drinkers' constitute a larger proportion of all pregnant women than heavier drinkers, they create an important public health concern[5].

Despite research efforts, there is no information on what constitutes a safe level of drinking during pregnancy. However, there is a strong consensus that pregnant women should abstain or only drink low amounts of alcohol. Amongst those countries with policies relating to alcohol and pregnancy, Australia, Canada, Sweden, UK and the US recommend abstinence.

Risk factors for drinking in pregnancy

A strong predictor of drinking in pregnancy is alcohol use before pregnancy[3]. Women who are unmarried, smokers, or have experienced violence tend to be more likely to consume alcohol and engage in preconception binge drinking.

Alcohol intake during pregnancy and potential fetal alcohol exposure can be assessed as confirmed exposure, unknown exposure, and confirmed absence of exposure. Confirmed exposure can be divided into high risk, some risk and unknown risk[6]:

- High risk – Confirmed use of alcohol during pregnancy known to be associated with high blood alcohol levels (100 mg/dl or greater)
- Some risk – Confirmed use of alcohol during pregnancy at less than High Risk level or unknown usage patterns
- Unknown risk – Unknown use of alcohol during pregnancy
- No risk – Confirmed absence of prenatal alcohol exposure.

Risk factors for FASD

Risk factors for drinking in pregnancy include: low socioeconomic status; marginal employment; frequent and protracted binge drinking producing high blood alcohol concentrations; living within a social and cultural milieu that tolerates, condones, or is ineffective in dealing with problem drinking; association with men who are heavy drinkers; low self-esteem, depression and sexual dysfunction.

Global epidemiology

Alcohol consumption

Alcohol consumption varies markedly between different regions and countries of the world and within countries (see Figure 1). Religious beliefs, culture and self-reporting accuracy may contribute to this variation. There is also significant variation in drinking patterns within certain countries. As women are not traditionally recognised as heavy drinkers, under-

recognition of alcohol related problems may occur. In some communities gender differences in alcohol consumption are reducing, with increased alcohol consumption by female adolescents and young adults.

Global prevalence of FASD and FAS

In line with variation in alcohol consumption worldwide, there is marked variation in the prevalence of FASD. Establishing population-based prevalence figures for FASD has been a challenge due to difficulties in agreeing diagnostic criteria, in case finding and sampling. There is some data relating to FAS, with the average incidence in higher income countries reported as 0.97/1,000 children[7] - this is based on a number of studies conducted in the US, Europe and Australia.

The highest rate of FAS reported in the current literature is in the Northern and Western Cape Provinces of South Africa, with 40.5-46.4/1,000 children identified through a community and school-based screening programme[8]. High rates are also reported elsewhere in South Africa. This has been attributed to the legacy of the now illegal method of paying workers with alcohol, which has had a large intergenerational impact on drinking patterns.

Variations across ethnic groups and geographical areas have been reported. For example, in the US the overall prevalence of FAS has been suggested as approximately 0.5-2.0 cases/1,000 births[9]. However, it was higher among Native Americans where the FAS prevalence was 3.0/1,000 live births and among African Americans (6.0/10,000), compared with 0.3/10,000 live births for Asians, 0.8/10,000 for Hispanics and 0.9 /10,000 for Whites.

The lowest rates of FAS in the global literature are reported in Japan, with a prevalence of 0.05 to 0.1/1,000 births, although this rate is expected to increase due to the increase in alcohol consumption by Japanese women.

Mortality and morbidity associated with FAS and FASD

A recent review of the effect of prenatal alcohol exposure on spontaneous abortion, stillbirth, preterm delivery and sudden infant death syndrome linked moderate to heavy drinking to a five-fold elevated risk of spontaneous abortion (fetal demise prior to 20 completed weeks of gestation)[10]. Early stillbirth (fetal demise between 20-28 weeks gestation) was also associated with alcohol consumption, with an 80% increased risk compared to non-drinkers. Studies suggest that placental dysfunction is associated with prenatal alcohol exposure. The evidence for preterm birth is less clear. Nevertheless, the overwhelming burden of disease due to FASD/FAS is the lifelong morbidity of a large number of children and adults.

Reducing prevalence, morbidity and mortality

Figure 2 illustrates the determinants and interventions for FAS and FASD as they relate to key stages in life. The main interventions are discussed below. Screening for alcohol consumption before pregnancy and providing intervention programmes to enable women to reduce alcohol consumption is the key to reducing the prevalence of FAS and FASD.

Interventions before pregnancy

Globally it is estimated that approximately 41% of pregnancies are unplanned[11]. In these circumstances women do not have the opportunity to ensure that the fetus is not affected by their alcohol consumption or to take measures to reduce their alcohol consumption prior to conceiving. In addition some of these unplanned conceptions will be associated with high alcohol consumption or binge drinking and so the fetus will be at particular risk of being

affected by alcohol consumed during the pregnancy. Interventions, such as equitable access to family planning services aimed at reducing the number of unplanned pregnancies, will reduce the risk of FAS and FASD.

Screening

Alcohol-intake screening using validated screening tools is important to identify women at risk for both alcohol misuse and alcohol exposure in prospective pregnancies and to guide the choice of appropriate interventions. As up to half of these pregnancies are unplanned, it is recommended that primary care providers routinely screen women of reproductive age[12]. Screening itself coupled with brief interventions or referral for treatment of alcohol abuse disorders has been found to be an effective prevention strategy for FASD[12]. Two examples of effective screening tools are the T-ACE and TWEAK tools[12]. T-ACE sensitivity and specificity are 88% and 79% respectively, while TWEAK has 91% sensitivity and 77% specificity.

Universal intervention programmes

Universal preventive interventions educate or raise awareness of the general public or women of childbearing age about the dangers of drinking during pregnancy. Mass media campaigns have been shown to increase knowledge and awareness of the risks of alcohol use during pregnancy, but appear to be ineffective in reducing alcohol use or FASD[3]. Health education messages such as warning posters or notices on alcohol beverage containers seem to be effective in lower-risk drinking populations, but not among heavier drinkers. Their greatest value may be in changing social and cultural norms on the acceptability of drinking in pregnancy. In addition, regulation on setting a minimum unit price for alcohol, tighter control on selling of alcohol to children and adolescents, and taxation policies that discourage high alcohol consumption, as long as the illegal alcohol market is in control, will be effective in reducing overall alcohol consumption as studies have shown that when alcohol taxes increase consumption decreases[13].

Pregnant women who drink are more likely than non-pregnant women to report limiting their drinking for health reasons following exposure to health education messages.

Targeted interventions

Selective/indicated prevention is targeted to specific higher risk populations and varies in intensity depending on the severity of the problem. Interventions may be brief or intensive. The main features of brief interventions should include feedback of personal risk, responsibility for personal control, advice to change and strategies to help individuals to reduce or stop drinking. An empathic counseling style and the fostering of belief in the ability to achieve behaviour change by the individual are key attributes of brief interventions[4]. The precise duration and way that brief intervention programmes are delivered is varied but should include:

1. Clinical advice and counselling regarding the risks associated with prenatal drinking
2. Discussion of the readiness of the woman to change their alcohol consumption
3. Assistance in enabling the woman to develop strategies and goals for reducing their alcohol intake
4. Follow up should be conducted with every woman. Those who had been unable to achieve their goals should be offered more intensive support through formal treatment programmes or community initiatives to support women aiming to reduce hazardous consumption of alcohol.
5. In addition, pregnancy should be delayed and contraception offered until the planned pregnancy can be alcohol-free.

Both men and women have been shown to benefit from brief interventions, although in some trials women benefitted more than men. A recent review of the literature noted that brief interventions targeted at women of childbearing age have been effective in reducing risky drinking and alcohol affected pregnancies. For example, one study reported a 68.5% decrease in risk for alcohol-exposed pregnancies[14]. Studies have also demonstrated improved fetal growth and decreased mortality among those who had received the intervention. A study in the Western Cape in South Africa also demonstrated the efficacy of brief interventions in reducing alcohol consumption[15]. A description of the main features of brief intervention programmes is given in Appendix 2.

Intensive interventions target the highest risk individuals – those who have had a previous alcohol affected pregnancy, those who are currently pregnant and drink at high levels or are dependent on alcohol. Brief interventions are considered to be inadequate for these individuals. Long-term abstinence requires intensive management and continuing care. However there is a scarcity of information on the efficacy of interventions with this high risk group. Excessive alcohol intake is often associated with vitamin and nutritional deficiencies which can contribute to congenital disorders. The nutritional status of those who drink heavily should be assessed and vitamin supplements provided.

Interventions during pregnancy

Prenatal screening is focused on identifying alcohol consumption among pregnant women and then offering support to reduce consumption. It is not considered possible to identify FAS or FASD in the fetus before birth.

Interventions after birth

Diagnosis

FASD may be under-diagnosed due to the lack of clear diagnostic criteria, poor recognition by attending primary care providers, and subtle clinical presentation. Early diagnosis is critical for appropriate referral and targeted therapy. Due to the complex set of physiological, developmental and behavioural indicators which are unlikely to be identifiable at birth or even in early childhood (up to the age of 3) other than for more severe cases of FAS, school based studies are likely to be the most accurate means of identifying children with FASD and should be undertaken in early school years[16]. If risky levels of prenatal alcohol exposure are known to have occurred, it is recommended the child be referred for a full FASD evaluation. If the level of prenatal alcohol exposure is unknown, a child should be referred if characteristic facial features are present where there is concern by the parents or guardians, and if one or more facial features occur in combination with growth or CNS abnormalities. Some social factors may raise additional concern about prenatal alcohol exposure, such as living with an alcoholic parent, having a sibling with FASD, current or previous abuse or neglect, current or previous involvement with Child Protection Services or being in foster care. Early diagnosis is one of the strongest predictors for positive outcomes as it allows families to advocate for their children's needs[1].

Care of affected children

Care of those with FASD involves intensive educational and social skills training to remediate the deficits associated with FASD. In addition, parents need to be equipped with the skills to effectively parent their children who commonly display disruptive behaviours, impulsivity, hyperactivity and other conduct disorders associated with FASD.

A recent systematic review of interventions for children with FASD concluded that there was limited evidence for the effectiveness of specific interventions[17]. There are few high quality studies available but a number of intervention studies from both the US and South Africa are starting to yield informative results, although the long-term gains from the interventions still require evaluation[18]. There is evidence that language and literacy intervention improves spelling and pre-literacy skills and that a mathematics intervention increases maths knowledge. Attention processing training may improve attention and non-verbal reasoning. Stimulant medication may decrease hyperactivity and impulsivity but does not improve attention. Virtual reality training may facilitate learning, and cognitive control therapy in the classroom may improve behaviour. There is evidence that training in social skills improves behaviour at home but not at school[14]. Since disabilities associated with FASD persist into adulthood the long term effectiveness of interventions needs to be assessed and, in particular, the support that is required during adolescence - a critical period as substance abuse problems including alcohol abuse and illegal activities may emerge or worsen in this period.

Cost-effectiveness of interventions

There are very limited data on cost-effectiveness of interventions and the few studies that have been undertaken relate to the costs associated with FASD in high income countries, particularly in the US and Canada, and may have limited applicability to some low income settings. Costs associated with FAS in the US were estimated at $5.4 billion in 2003, and a FAS birth carries lifetime health costs of between $860,000 - $4.2 million[19]. In Canada the costs of FASD were estimated to be annually $5.3 billion in 2009[20]. Direct costs include healthcare and social system expenses. Indirect costs include morbidity, mortality, disability and incarceration. Beyond FAS there has not been any direct research into the costs of FASD to the broader community, although mental health issues, crime, and congenital disorders each carry significant community costs. These figures underline the importance of prevention initiatives.

Although there are no data on cost effectiveness of individual interventions for children with FAS, some researchers have attempted to quantify cost-effectiveness in terms of Quality Adjusted Life Years (QALYs). Assuming that one individual with FAS loses 17% of their expected quality-adjusted life years (11 years), the cost savings by preventing one case of FAS could be up to $850,000. Therefore, in this setting large scale interventions that carry initial expenses may be thought of as cost-effective in the long-term if they cost less than $850,000 per FAS case prevented to implement.

Issues of cost-effectiveness are quite specific to each country as costs can vary significantly. 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, see http://www.nice.org.uk/guidance/index.jsp?action=byID&o=11947.

Gaps in current research and knowledge of FASD

Much of the research on FAS and FASD has been performed in higher-income countries, particularly the US, with potentially more access to resources for screening and interventions. More culture- and region-specific research is needed in low and middle

income countries to assess the incidence and prevalence of FAS and FASD and benefits of interventions.

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

Universal interventions: Ethics and philosophy

It is important to ensure that the benefits of public health interventions delivered at a population-wide level outweigh the harms. The intrusiveness of population-wide public health messages on the dangers of alcohol are generally considered of minor importance compared with the potential benefits in reducing alcohol-related injuries and diseases.

Equity of access to preconception education

Preconception counselling and education is not systematically offered in most countries. Instead, it is often performed on an opportunistic level by primary healthcare providers or is targeted at particularly high-risk women who are planning a future pregnancy. Barriers to equitable access to preconception counselling may include an already over-burdened primary healthcare system, unplanned pregnancies, lack of community knowledge about the benefits of preconception counselling, lack of access to health services (i.e. due to lack of health insurance or ability to afford preconception education) and a lack of incentives for primary care practitioners and other healthcare providers to offer preconception education.

Equity of access to prenatal services

98% of women utilise prenatal care services in high income countries, compared with only 68% women in low income countries where knowledge and education about safe motherhood may be lacking, and access to healthcare facilities may be poor due to factors such as availability, quality and accessibility to health services (e.g. due to long distances, lack of transport, and cultural reasons). The quality of the prenatal services provided also varies considerably and tend to be lower in poorer countries.

Culture, gender and alcohol

Alcohol is perceived as a ‘male drink’ in many cultures. Women may be hesitant to truthfully discuss their alcohol consumption and accept education about the effects of alcohol on the developing fetus. Women may not even be offered education about alcohol at all. In addition, health care practitioners may find it difficult to raise the subject of alcohol consumption in societies where there are strong norms or taboos against women consuming alcohol.

A women’s autonomy over her body versus her unborn child’s rights

The concept of a pregnant women’s autonomy over her own body when engaging in high risk activities such as drinking is a source of contention in legal and medical communities worldwide. Respecting a woman’s right to freedom of choice versus the right of her child to be born healthy is a delicate and important balance to achieve.

Living with a disability

FASD is associated with on-going physical and behavioural disabilities which can amount to significant burden and costs to individuals, families and communities. In high income countries, the effect of severe physical or psychological disabilities may be ameliorated by support from the state. Such support may be virtually non-existent in many LMIC where

health services, social services and education are limited, and the burden of having a disabled child falls entirely on the immediate and extended family.

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KEY RESOURCES

The Global Information System on Alcohol and Health (GISAH): http://www.who.int/gho/alcohol/en/index.html

Collaborative Initiative on Fetal Alcohol Spectrum Disorder (CIFASD): http://cifasd.org/default.asp

Global Alcohol Policy Alliance: http://www.globalgapa.org/

RELATED TOPICS

Preconception care and screening

Prenatal care and screening

Newborn screening

Teratogens

Figure 1: Global alcohol consumption

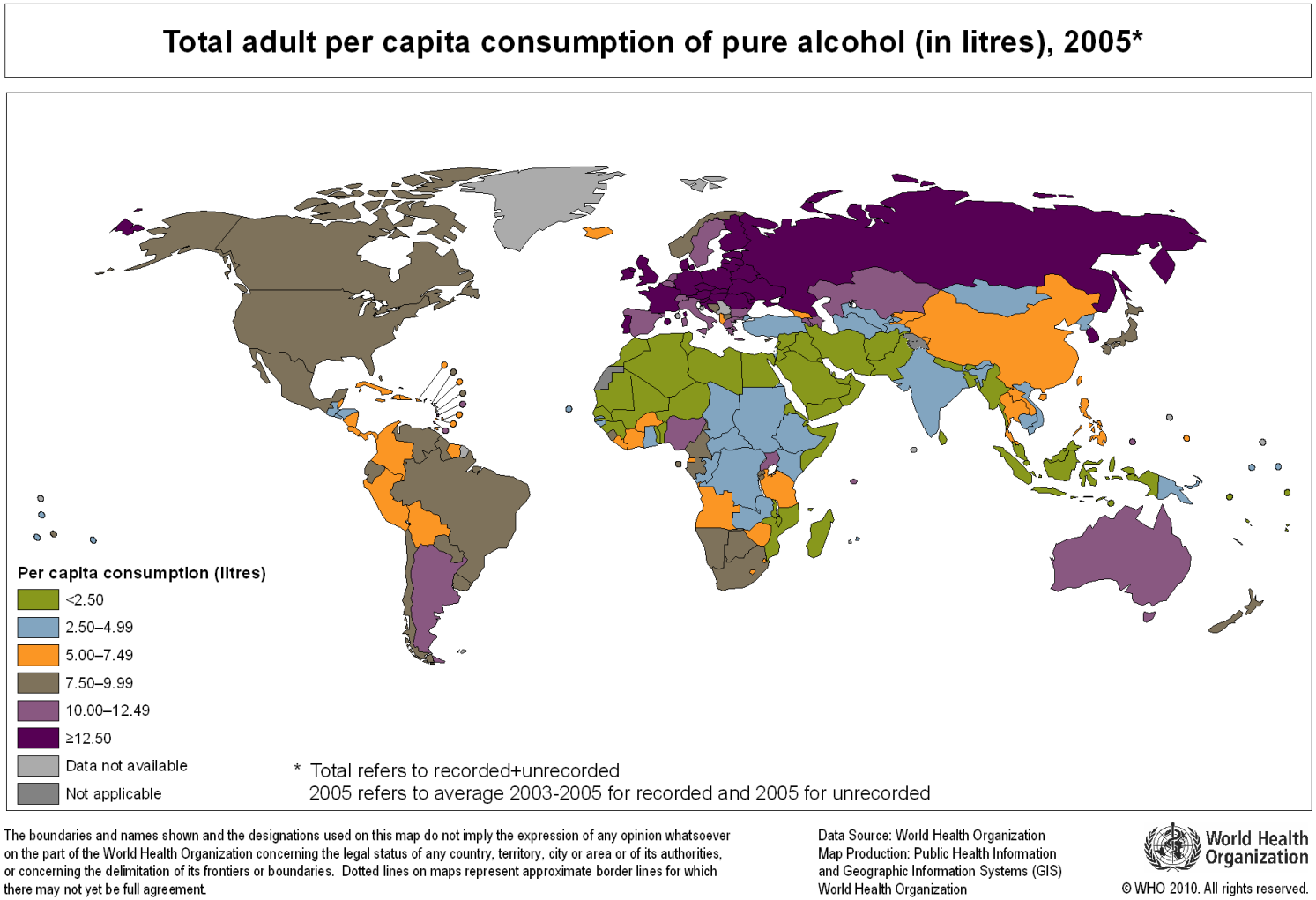
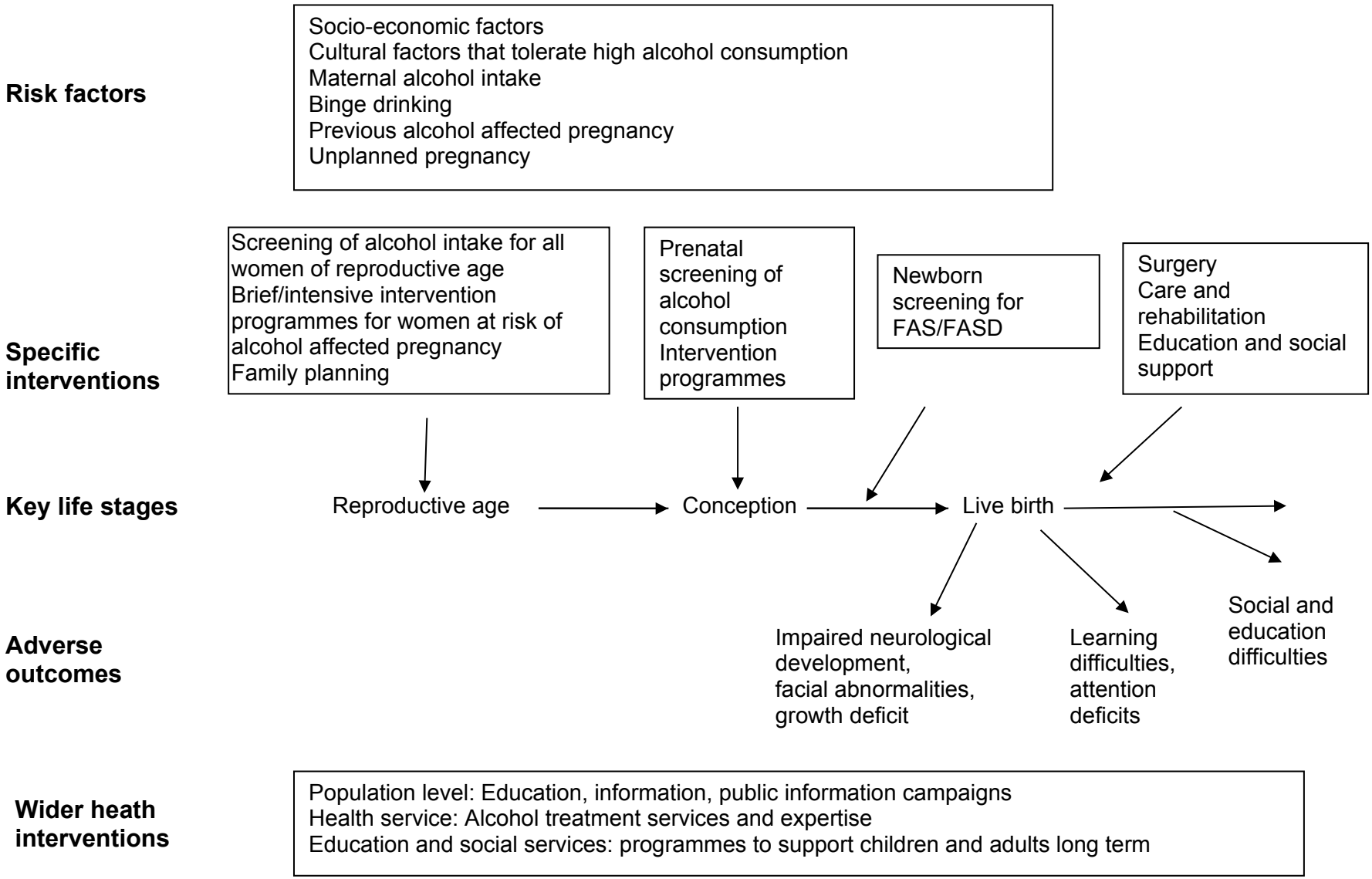


Figure 2: Needs assessment flowchart for Fetal Alcohol Spectrum Disorders



Appendix 1 Brief outline of diagnostic criteria for FAS

Facial dysmorphia
Based on racial norms, individual exhibits all 3 characteristic facial features:

- Smooth philtrum (University of Washington Lip-Philtrum Guide rank 4 or 5)
- Thin vermillion border (University of Washington Lip-Philtrum Guide rank 4 or 5)
- Small palpebral fissures (at or below 10th percentile)

Growth problems
Confirmed prenatal or postnatal height or weight, or both, at or below the 10th percentile, documented at any one point in time (adjusted for age, sex, gestational age, and race or ethnicity).

Central nervous system abnormalities

I. Structural
1) Head circumference at or below 10th percentile adjusted for age and sex.
2) Clinically significant brain abnormalities observable through imaging.

II. Neurological
Neurological problems not due to a postnatal insult or fever, or other soft neurological signs outside normal limits.

III. Functional
Performance substantially below that expected for an individual's age, schooling, or circumstances, as evidenced by:

1) *Global cognitive or intellectual deficits representing multiple domains of deficit or significant developmental delay in younger children) with performance below the 3rd percentile (2 standard deviations below the mean for standardized testing)*,

or

2) Functional deficits below the 16th percentile (1 standard deviation below the mean for standardised testing) in at least 3 of the following domains:

a) Cognitive or developmental deficits or discrepancies
b) Executive functioning deficits
c) Motor functioning delays
d) Problems with attention or hyperactivity
e) Social skills
f) Other, such as sensory problems, pragmatic language problems, and memory deficits.

Criteria for FAS diagnosis
Requires all 3 of the following findings:

I. Documentation of all 3 facial abnormalities (smooth philtrum, thin vermillion border, and small palpebral fissures)
II. Documentation of growth deficit
III. Documentation of central nervous system (CNS) abnormality

Source: Bertrand J, Floyd RL, Weber MK, O'Connor M, Riley EP, Johnson KA, Cohen DE, National Task Force on FAS/FAE. Fetal Alcohol Syndrome: Guidelines for Referral and Diagnosis. Atlanta, GA: Centers for Disease Control and Prevention; 2004.

Appendix 2 Features of brief intervention programmes

The main features of interventions should include:

- Feedback of personal risk
- Responsibility for personal control
- Advice to change and strategies to help individuals to reduce or stop drinking
- An empathic counseling style and
- The fostering of belief in the ability to achieve behavior change by the individual.

As a result the of this evidence base the Clinical Working Group of the Select Panel on Preconception Care at the CDC (US Centers for Disease Control and Prevention) recommended that all women of childbearing age should be screened for alcohol use and brief interventions should be used in primary care settings.

The brief intervention should include:

- Clinical advice and counseling regarding the risks associated with prenatal drinking
- Discussion of the readiness of the woman to change her alcohol consumption
- Assistance in enabling the woman to develop strategies and goals for reducing her alcohol intake
- Follow up should be conducted with every woman. Those who had been unable to achieve their goals should be offered more intensive support through formal treatment programmers or community initiatives.
- In addition pregnancy should be delayed and contraception offered until the planned pregnancy can be alcohol-free.