

**Neonatal Abstinence Syndrome**  
**A New Intervention: A Community**  
**Based, Structured Health**  
**Visitor Assessment**

**Substance Misuse Research**

# **SUBSTANCE MISUSE RESEARCH**

## **Neonatal Abstinence Syndrome**

### **A New Intervention: A Community Based, Structured Health Visitor Assessment**

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## Glossary of terms

Coloboma	A defect in the structure of the eye, most commonly in the iris (the coloured part of the eye) that results in an irregularly shaped pupil, often keyhole shaped (coloboma is Latin for keyhole)
Infant	A child in the first year of life
NAS	Neonatal abstinence syndrome
Neonatal	Pertaining to a newborn infant
Neonatal abstinence syndrome (NAS)	A group of symptoms affecting a newly born infant whose mother has been misusing substances, usually heroin
Neonate	A newborn infant
Neonatologist	A physician who specialises in the care of newborn infants
Nystagmus	Inappropriate repetitive eye movements, usually but not always in a horizontal direction
Pre-term	Used to describe an infant who has been born before completing 37 weeks gestation. The term 'premature' is less precise, as it was originally defined by the WHO in term of birth weight. There is however no noun derived from 'pre-term,' and 'prematurity' is usually used
Squint	A condition in which the eyes point in different directions; also known as boss eye



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# Neonatal Abstinence Syndrome: Development of a New Service

## Introduction

This Study was undertaken in the Grampian Health Board Area, based at the Aberdeen Maternity Hospital and Royal Aberdeen Children's Hospital. The lead investigators were Dr D.J. Lloyd, Consultant in Perinatal Medicine and Dr E.J. Myerscough, Consultant Paediatrician (Designated Doctor for Child Protection). Both consultants have a long-standing clinical interest in the children of substance misusing mothers and have provided collaborative services for many years. For this project, they were joined by two Study Nurses (Ms N. Sim and Ms N. Black) whose terms of office ran consecutively.

Neonatal Abstinence Syndrome (NAS) occurs at birth, because, with the separation of the foetal and maternal circulations, the baby's supply of misused substances stops abruptly. In the case of opiates such as heroin this is then followed by symptoms of withdrawal in the infant. The progress of this withdrawal suggests that it is not a simple pharmacological process, and in addition there may be further future effects on the growing brain. NAS resolves slowly and some infants will still need medication when discharged home – these are described as having "continuing NAS." Others have no signs initially and then go on to develop NAS. When this occurs after eight days of age, this is defined as "delayed onset NAS."

The Aberdeen Maternity Hospital is the regional referral centre for the Grampian Area and Orkney and Shetland Islands. Approximately 10% of Scotland's births are delivered in the Grampian Area. The regional protocol for substance misusing mothers recommends that all their infants should be delivered in Aberdeen where specialist obstetric and neonatal care is available. The clinical services in Aberdeen Maternity Hospital have developed gradually since 1985, when the first two infants with NAS were identified in Grampian.

## Development of the current NAS service

- In 1996, a dedicated multidisciplinary service for substance misusing mothers began to develop. The team included obstetricians, midwives, social workers, drug misuse agencies, a neonatologist and a paediatrician.
- In 1997 a 'drop-in' antenatal clinic was started in a city centre women's health centre.
- Additional clinics are now held at the Aberdeen Maternity Hospital and in a peripheral GP maternity hospital.

Pregnant mothers can be referred to the specialist antenatal service by their general practitioner, midwife, health visitor or substance misuse counsellor, but an important alternative route is self-referral.

The multidisciplinary team holds regular discussions to share information regarding general issues of maternal drug use, management of individual pregnancies and issues of child protection. All the consultants who look after newborn infants share the clinical care of the infants, but one consultant (Dr Lloyd) attends most pre-delivery case discussions and overviews the service.

The infants are referred for out-patient follow-up to one Consultant Paediatrician who is also the designated Doctor for Child Protection (Dr Myerscough), thereby providing consistency in management. The existence of this team was a prerequisite for the introduction of the new interventions described in this report.

Frequent non-attendance at out-patient appointments means that there is a failure of service delivery to a number of children and their parents. At that time this service could

not always identify those with delayed onset/continuing NAS, and therefore the extent of this problem was not known.

The establishment of early health and social support in pregnancy and the postnatal period with working between agencies may prevent some of these difficulties. These recommendations are supported by the *Scottish Executive Response to Hidden Harm* (2004: p7) while guidance on planning services is to be found in Good Practice Guidance for working with Children and Families affected by Substance Misuse "Getting Our Priorities Right" (Scottish Executive, 2003).

### **Aims and objectives of the study**

We therefore decided to improve the service for NAS to provide a comprehensive, structured, community-delivered programme of care for infants up to six months of age, using existing health professionals and skills. The NAS service was already well developed in the Grampian Health Board area, and we were able to use our knowledge of the local epidemiology of NAS as a basis for undertaking a study with the following objectives:

- to develop and deliver a community-based health visitor intervention that could be used to:
  - determine the prevalence of continuing and delayed onset NAS in infants of substance misusing mothers;
  - produce recommendations for service developments;
- to measure the prevalence of delayed visual maturation in this group of infants;
- to evaluate the community-based structured health visitor assessment by comparing it to data from the existing service, and by canvassing the views of the professionals involved.

### **The structure of the report**

The next chapter outlines current relevant evidence on parental substance misuse and its effect on infants, with Chapter 2 focusing on the study and new community-based health visitor assessment. Chapter 3 investigates the prevalence of delayed visual maturation and Chapter 4 looks at the health visitors' views of the new community-based service. The final chapter, Chapter 5, concludes the report by providing a brief summary of the main points from each chapter.

## Chapter 1: Background

In this chapter current evidence on parental substance misuse and its effects on infants is summarised. This information provides the background to the study.

### Effects of Maternal Substance Misuse on the Pregnancy and the Foetus

#### Mechanisms by which harm is caused

Substances misused by the mother are present in her circulation and cross the placenta to the foetus in approximately the same concentration as that in the maternal blood stream. The effects on the pregnancy and the baby depend on the particular substance misused, on the presence of multiple substance misuse, on periods of maternal intoxication and withdrawal and on the effects of substance misuse on the mother's general nutrition and health. It is important to be aware that a mother may be unwilling to give an accurate substance misuse history, because of the perceived risks of stigmatisation, and criminal or child protection proceedings.

There are several effects of maternal substance misuse on the pregnancy and foetus and, as described below, the consequence is an unpredictable outcome for the individual infant. Pre-term infants are exposed to substances for a shorter time than are those born at full term. Drug withdrawal is therefore less common in the pre-term infant, reflecting not only a differing degree of central nervous system maturation but also a shorter exposure to the total intake of drugs, although there are other effects of premature birth which are undesirable. Other effects on the pregnancy and foetus include the following.

#### 1. Viability of pregnancy

The consequences for the pregnancy include increased miscarriage and stillbirth rates. Slattery and Morrison (2002) estimated that about 25% of women who misuse multiple substances have a preterm delivery, with cocaine being especially implicated.

#### 2. Socio-economic associations of substance misuse

*Hidden Harm* (2003) (p10, 30-33) highlights that the infants of substance misusing mothers are frequently exposed to other unfavourable circumstances, which may lead to pregnancy complications e.g. poor health and nutrition, smoking, alcohol misuse, and injury from violence to the mother. The developing foetus is also at added risk from infection from maternal septicaemia secondary to infected injection sites and from the transmission of Hepatitis B, C and HIV, from the mother sharing injecting paraphernalia or from unsafe sexual intercourse.

#### 3. Neonatal Abstinence Syndrome

At birth, with the separation of the foetal and maternal circulations, the baby's supply of misused substances stops abruptly. In the case of opiates such as heroin this may then be followed by signs of withdrawal in the infant. The progress of this withdrawal suggests that it is not a simple pharmacological process, and in addition there may be further effects of substances on the growing brain. There is some evidence to show that higher levels of substance misuse and polydrug use increase the risk and severity of withdrawal (Fulroth *et al*, 1989). Newborn infants may start to withdraw within 12 hours of birth, but signs may not appear until the second week of life or, occasionally, even later.

The signs of withdrawal are collectively named neonatal abstinence syndrome (NAS). The signs include fever, irritability, high-pitched cry, disruption of normal sleep pattern, sweating, stiffness, diarrhoea, sneezing, insatiable appetite, weight loss, fast breathing and skin excoriation from constant movements (Finnegan *et al*, 1975). In a severe case

a baby may develop seizures (Herzlinger *et al*, 1997). In 30% to 80% of cases of infants exposed to opiates in utero, the symptoms are sufficiently severe for the newborn baby to require treatment (van Baar *et al*, 1989) dependant on the extent of maternal drug use. Untreated there is a 20% risk of infants dying from NAS (Lam *et al*, 1992).

Maternal methadone treatment has advantages to the foetus over heroin misuse, in that it may stabilise substance misuse, decrease injecting and promote access to appropriate health care. However, it is associated with longer withdrawal, lower birth weight and smaller head circumference in the newborn (Johnson *et al*, 2003a; Kaltenbach and Finnegan, 1989; Wilson *et al*, 1981). Heroin may be associated with shorter withdrawal but it cannot be prescribed in pregnancy and therefore its intake cannot be controlled or titrated (as happens with methadone). If injected, the use of heroin increases the risk of maternal thrombosis, and septic and viral complications. Many mothers who enrol in the methadone programme top up with heroin, either by injecting or smoking.

A discussion of the effects of maternal misuse of cocaine and other substances is beyond the scope of the present study, as they do not cause well defined abstinence syndromes. However, although maternal cocaine misuse does not cause withdrawal in the newborn, it may cause significant damage to the developing brain because of its ability to constrict blood vessels (King *et al*, 1995; Delaney-Black *et al*, 1996; Napiorkowski *et al*, 1996).

Many infants with NAS require admission to a neonatal unit (NNU) for medication, observation and expert medical and nursing care. Recommended treatment for opiate (including heroin) withdrawal is with morphine (Osborn *et al*, 2002; Greene *et al*, 2003; Johnson *et al*, 2003b), although some infants will need additional drugs. The aim of treatment is to moderate the signs of withdrawal, with a gradual controlled reduction in medication. The duration of stay may be several weeks (from 4-10 weeks on average). This frequently causes stress to parents, disrupts family life and places significant demand on NNU services (Kelley, 1992; Kelly *et al*, 2000).

### **Continuing and delayed onset NAS**

NAS resolves slowly. Some infants will still need medication when discharged home, and are described as having "continuing NAS." Others have no signs initially and then develop NAS. Where this occurs after eight days of age, this is defined as "delayed onset NAS." These continuing or delayed signs are important because irritability, feeding difficulties and failure to sleep place additional burdens on carers. Medication can be helpful but little evidence exists to direct the choice of medication for community use. Phenobarbitol is used by the services in Grampian; its side effects include drowsiness, lethargy, hyperactivity and possible long term behavioural and developmental problems, (The British National Formulary for Children 2005, p247-248). However, these potential side-effects of phenobarbitol, which in practice are seldom troublesome, are outweighed by its benefits in terms of efficacy, ease of administration, lack of 'street' value, and value in treating infants exposed to polydrug use.

### **4. Visual problems**

Poor visual responsiveness has been reported in infants exposed to stimulant drugs (Hansen *et al*, 1993). Its prevalence is unknown. There can be delayed visual maturation that completely resolves (known medically as Delayed Visual Maturation subtype 1b), however some of the infants in this subgroup will show neurological and developmental problems (Russell-Eggitt *et al*, 1998).

The consequence of this poor visual responsiveness is that infants with NAS may show impaired "fixing and following". These are developmental skills normally seen in the early weeks of life. The infant fixes his eyes and looks at an object of interest e.g. a face or a bright light. If the object is moved, the infant continues to look at it, following it with his eyes. Reduced social responsiveness may be another manifestation of impaired visual development. Infants will, by about the age of eight weeks make good eye contact

and smile in response to an adult's smile. These responses may be impaired in infants with NAS, so that the mother may have to care for an irritable, poorly feeding baby who neither looks at her nor smiles, thus incurring the risk of impaired parent-child attachment. In addition to this lack of visual response there is an increase in squint (another eye problem); Gill *et al* (2003) found a ten-fold increase in squint in a selected group of infants with NAS. If these findings are confirmed in a total population study, there are important implications for service development.

## **5. Sudden unexpected death in infancy**

Kandall *et al* (1993) found a three-fold increase in the incidence of Sudden Unexpected Death in Infancy in substance-misusing mothers compared to controls. This complication, although devastating for the families affected, is rare.

## **6. Child development**

Studies of the affects of maternal substance misuse on longer-term child development have produced conflicting results that are difficult to interpret because of the multiplicity of adverse influences, such as child neglect and under-stimulation, to which these children can be exposed (Kaltenbach & Finnegan, 1989).

Generalised developmental delay may present in the first 6-9 months of life, and thereafter appears to improve. Van Baar *et al* (1989) found that there were no significant differences in motor, cognitive or behaviour developments at 6-18 months age, although early language development was impaired at 24-30 months (van Baar & de Graaf, 1994). Wilson *et al* (1979) reported that children aged 3-5 years showed impaired cognitive skills. Ornoy *et al* (2001) studied schoolchildren born to heroin dependent mothers and found an excess of attention deficit disorder with hyperactivity. Impaired language, and deficits in attention control, may also reflect poor parenting skills and under stimulation.

## **7. Social effects**

The social effects of parental substance misuse are extensively described by Barnard and McKeganey (2004). They describe the children in their study as being subject to multiple disadvantages, such as varying parenting capacity dependent on the "status of the substance misuse" (McKeganey 2004), poor parental education, poverty, chaotic household routines, child neglect and abuse, confirming numerous previous findings (Ammerman *et al*, 1999; Famularo *et al*, 1992; Fraser and Cavanagh, 1991; Jaudes *et al*, 1995; Murphy *et al*, 1991). These problems are aggravated as family size increases. Family support is complex when more than one generation misuse substances.

## **Children of substance misusing parents: The size and the scope of the national problem**

There is growing public and professional awareness of the profound effects of parental substance misuse on the wellbeing of Scotland's children. The extent and severity of the problem was recognised in a publication from the Home Office in 2003: "Hidden Harm, The Report of the Inquiry by the Advisory Council on the Misuse of Drugs".

The Scottish Executive's Good Practice Guidance for Working with Children and Families affected by Substance Misuse "Getting our Priorities Right" (2003) emphasised the importance of agencies and individual professionals working together. This guidance document recommended the development of new procedures and practice, allowing sharing of information about parents, in order to support children. "The Scottish Executive Response to "Hidden Harm" published in 2004, describes both the issues and proposed actions concerning parental substance misuse in the Scottish context.

These government guidelines are essential in directing and supporting new interventions in care for children. The published guidance (and this study) focuses primarily on infants of heroin misusing mothers, and includes those who take additional substances such as cocaine, amphetamines, ecstasy, and methadone. Infants of mothers who used cannabis or benzodiazepines alone are usually excluded because of the complex overlap between occasional substance use and problem substance misuse.

Based on three separate data sources, *Hidden Harm* (2003) estimated that there are between 41,000 and 59,000 children of problem drug users in Scotland. This represents 4-6% of all children in Scotland under the age of 16 years. Many of these children are in alternative care: the report estimated that between 10,000 and 19,000 children in Scotland are living with a problem drug misusing parent i.e. 1-2% of all children under the age of 16 years. Data from the Scottish Drug Misuse Database quoted in *Hidden Harm* (2003) suggests that among problem drug misusers, 42% of women and at least 16% of men were living with at least one dependent child. These figures are important when planning new health interventions for children. Services need to be structured, delivered with consistency to a large number of children, and included within existing core services. Whilst most children will be living with their mothers (rather than their fathers), others will be in the care of other family members or in foster care, and interventions also need to be directed to these other carers.

### **NAS in Grampian, 2000-2003**

An audit of NAS in Grampian was undertaken in the years 2000 and 2001. This was possible as 83% of all infants born in the Grampian Health Board Area, including all with antenatally identified risk factors, are delivered in the Aberdeen Maternity Hospital. The audit included mothers who either attended the 'drop-in' clinic or were known to other agencies. Only mothers who were using heroin or had been enrolled in a methadone programme were included in the audit. In certain cases where drug misuse was not known at delivery, opiate withdrawal was recognised in the first few days of life. These infants and their mothers were included in the audit. Mothers rarely volunteer their use of recreational drugs and unless urine surveillance was being undertaken because of a known opiate habit, polydrug use (cannabis, benzodiazepines, amphetamines, ecstasy, cocaine and crack cocaine) would not be detected.

In the two-year audit period (2000-2001) all infants with NAS were from the Neonatal Unit referred on discharge to Dr Myerscough at the Royal Aberdeen Children's Hospital. There was a high 'failure to attend' rate for this service, despite flexibility in appointments and extensive efforts by health and social work staff to contact parents to support their attendance. The reasons for non-attendance were not formally evaluated, but comments from parents indicated the following factors:

- geographical (families may live up to 60 miles from the hospital and are badly served by public transport);
- socio-economic problems (lack of money for travel);
- imprisoned;
- drugs related (continuing problem use of drugs);
- child protection problems (neglect);
- child staying with carers other than the parents.

The failure to keep appointments and the effect on the waiting list of having to make repeat appointments meant that infants were often not seen until a few months of age. As a result of these delays signs of withdrawal had often resolved by the time of the visit and the opportunity for intervention and support had been missed.

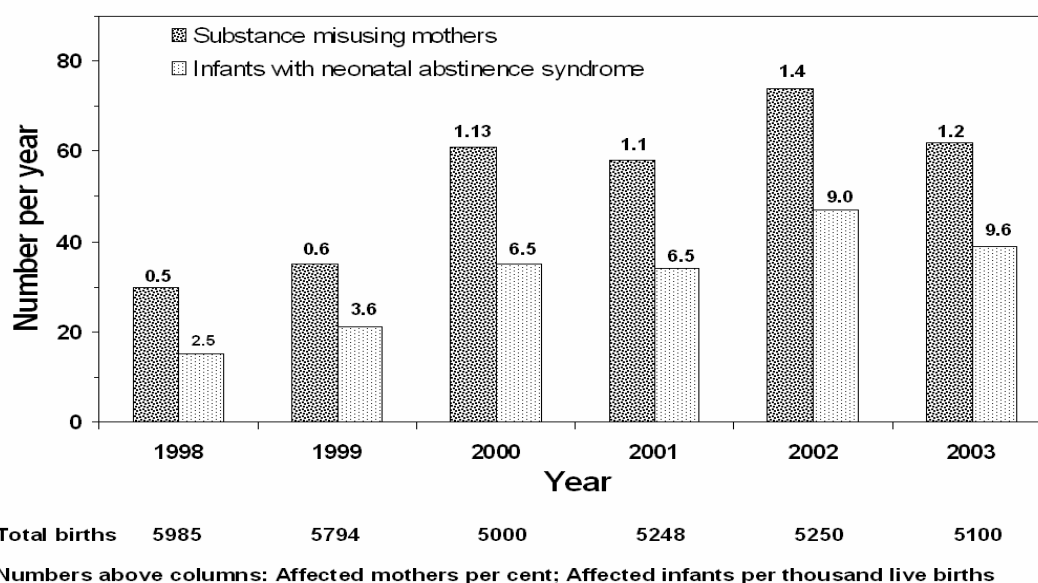
A number of children never attended the service and little was known of their progress. Given the possibility of continuing NAS and the vulnerability of these children and parents, this was highly unsatisfactory and, in view of the known hazards of NAS, potentially dangerous.

Data were available on all these aspects of the previous service from the audits of 2000 and 2001: these will be compared with results from this study. In the years 2000 and 2001, 35 of 61 and 34 of 58 infants born to substance misusing mothers developed NAS. Continuing and/or delayed onset withdrawal was identified in 7 and 17 of these infants for the years 2000 and 2001 respectively. No attempt was made to differentiate between continuing or delayed withdrawal in these two years.

There was concern that the figures from the earlier audit were an underestimate, with more mildly affected children being missed. Most known infants came from Aberdeen city. National figures (Hay *et al*, 2001) suggest that substance misuse behaviour in rural areas is similar to that in urban areas, and thus the Grampian figures might have been unrepresentative of the population served.

As shown in Figure 1, the number of NAS infants has increased, and in 2002 and 2003 affected almost 1% of all live births in the Grampian Health Board area. However, in the past, substance misusing mothers were often unrecognised by health professionals and there was a lack of awareness of the existence of NAS (Boer *et al*, 1994).

**Figure 1: Prevalence of NAS**



There was an upward trend in the numbers of drug-misusing mothers, which did not quite reach statistical significance (trend  $X^2 = 2.953$ ,  $df = 1$ ,  $p = 0.0859$ ). However, the trend for NAS was highly significant (trend  $X^2 = 29.307$ ,  $df = 1$ ,  $p < 0.0001$ ). This is attributed to the increased incidence of NAS associated with polydrug use, which increased in mothers during this period.

## Summary

- There are various affects of maternal substance use on the pregnancy and the foetus, including increased risk of miscarriage; visual problems; socio economic associations with substance misuse; and Neonatal Abstinence Syndrome (NAS).
- In Grampian in 2000 and 2001, 35 of 61 and 34 of 58 infants (one of the 58 was lost to follow up) born to substance misusing mothers developed NAS. Continuing and/or delayed onset withdrawal was identified in 7 and 17 of these infants in 2000 and 2001 respectively.
- Signs of infant withdrawal were not always identified (and therefore untreated) due to a high rate of non-attendance at out-patient appointments. Reasons for this included distance from the hospital, lack of money for transport, child protection problems and continuing parental problem use of drugs.
- The number of NAS infants increased in 2002, and this increase might reflect in part an increase in professionals' awareness of NAS.



## Chapter 2: The Prevalence of Neonatal Abstinence Syndrome

This chapter looks at the methods used to recruit infants of substance misusing mothers to the study and the rates of NAS found using the new community based health visitor assessment.

### Recruiting to the study and measuring rates of NAS

#### Methods:

##### *Identifying substance misusing mothers:*

- Any infant born to an opiate using mother fulfilled the criteria for recruitment to the study. Active case finding of mothers was used to identify (more completely) infants born to substance misusing mothers. Eligible mothers were identified by their referrers, their own admission of substance misuse, urine screening or by the clinical diagnosis in the baby.
- Many of these mothers also took additional substances such as cocaine, amphetamines, ecstasy and methadone. Infants of mothers who used cannabis or benzodiazepines alone were excluded because there was little means of their being identified and if known, to distinguish between the complex overlap between social substance use and problem substance misuse.
- Notifications (of maternal substance misuse) continued to be shared by the multidisciplinary antenatal service and were also provided to the Study Nurse. The Study Nurse visited the neonatal unit and the postnatal wards on a daily basis (and developed a close working relationship with the maternity hospital staff). The peripheral maternity units were visited to explain the study and make personal contact. Links were made with health visitor groups, community midwives meetings, and substance misuse services. All GPs were provided with written information and contact numbers. These links were essential in case finding and for the next phase of the study, namely delivering the new intervention.

##### *Recruitment to the study:*

- Once an eligible mother was identified, a carefully planned recruitment process followed. Difficulties in recruitment were anticipated because of sensitivities about stigmatisation, confidentiality, criminal issues and child protection. To ensure consistency in the approach to the family, information given and receiving consent, only the Study Nurse recruited.
- The mother's own midwife informed her about the study and advised that the Study Nurse would offer to see her. The midwife confirmed with the mother that the Study Nurse could be given the mother's name. Fathers were included if they were available or wished at a later date to participate: in most cases parental rights resided with the mother. Once the Study Nurse was informed of an eligible infant, she visited the parent(s) in the postnatal ward or Neonatal Unit. The parent(s) were given the information sheet, the study was described and questions answered. The parent(s) were given 24 hours to consider the study, unless the infant was being discharged and the parents were willing to give consent that day. Two consent forms were obtained: one was filed in the infant's medical notes and one was given to the parent(s).
- Parents who did not wish to participate in the study were reassured that their infant would be offered an appointment at clinic, and would receive exactly the same hospital service as that available before the inception of the study. Prevalence was recorded for all infants irrespective of whether the parents agreed to participate in the study.

### *Identifying infants with NAS:*

- In order to determine the prevalence of continuing and delayed onset neonatal abstinence syndrome in infants of substance misusing mothers, a community based structured health visitor assessment was developed (see Appendix 1). Recruitment of infants into the study took place between June 2002 and December 2003; all infants were followed up to the age of six months.
- Infants with NAS were identified in the Aberdeen Maternity Hospital and the prevalence compared to previous audit data. The diagnosis was made by the nursing and medical staff using the scoring system developed by Finnegan *et al* in 1975, modified in 1986.
- The Study Nurse recorded information about infants with NAS on her daily visits to the NNU and the postnatal wards. The infant's medication was also noted: this was initially morphine, with phenobarbitol being added as required.

The project team met weekly to discuss individual infants and their follow up, to address issues about recruitment or assessment, and to review the overall progress of the study.

## **Results**

### **Prevalence of infants of substance misusing mothers**

- 110 infants fulfilled the study criteria during the recruitment period from June 2002 to the end of December 2003. 72 infants were recruited to the study giving a recruitment rate of 65.5%.

### **Rate of NAS**

110 infants of substance misusing mothers were born during the 18 month recruitment period, of whom 84 were admitted to the Neonatal Unit<sup>1</sup>. Of these 9 were preterm<sup>2</sup> and showed no signs of NAS and the other 75 were admitted because of NAS. These figures, when compared with those for the years 2000 and 2001 (see Table 1), suggest an increasing trend.

The problem of mothers misusing substances in the Grampian area would appear to be a contributor to the higher rate of preterm births. Maternal drug use should be considered when planning future neonatal services for the area. Maternal substance misuse is known to contribute to the prematurity rate, with Slattery and Morrison (2002) reporting a rate of 25%. In the study group the rate was 21.8% compared with the overall preterm birth rate of 8.5% which occurred in the two overlapping years of the study.

Table 1 shows that the proportion of study infants of substance misusing mothers who develop NAS has increased from 57.3% to 68.2% when compared with the 2000 year cohort. The reasons for this are likely to be complex. As access to antenatal services continues to improve, better and earlier identification may occur. Mothers with a continuing and deteriorating drug habit and who are known to the paediatric service because of a previously affected infant are having further infants. There may also be an increasing severity of maternal substance misuse in the Grampian population.

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<sup>1</sup> The other 26 infants did not have signs of NAS and received routine care on the postnatal wards in addition to regular assessment for drug withdrawal.

<sup>2</sup> Preterm birth is defined as birth at less than 37 weeks of gestation, is associated with maternal substance misuse. There were 24 preterm infants in the study cohort. No infant in the study born before 30 weeks gestation had signs of NAS.

**Table 1: NAS incidence in the study period compared with previous years**

Year	No. with NAS	NAS %
2000	35/61	57.3%
2001	34/58	59.6%
2002	47/74	68.9%
2003	39/62	62.9%
Study	75/110	68.2%

## Measuring the incidence of continuing NAS

### Methods

The identification of infants of substance misusing mothers, including those with NAS, provided the basis for the next phase of the study, namely the use of a new assessment tool to determine Continued or Delayed Onset NAS in the community.

Prior to discharge from the neonatal unit or the postnatal wards the Study Nurse discussed the infant's follow up (whether or not recruited) with the relevant consultant. The most usual criterion for hospital review was discharge on medication or continuing mild NAS. Parents of all non-recruited infants were offered a hospital follow-up clinic appointment which was made and the parent(s) notified prior to discharge.

During the study period there was a gradual change in practice in the neonatal unit, with more infants being prescribed phenobarbitol as an adjunct to morphine, and more being discharged home on treatment. This was intended to promote earlier discharge from the neonatal unit and to reduce any continuing symptoms of NAS.

For all families that had consented to participate in the study, the Study Nurse contacted the family health visitor to implement the new assessment. The protocol was explained (and equipment and forms provided) and a joint home visit arranged with the Study Nurse and family health visitor (this allowed for family health visitor training on the assessment tools). Continuing and Delayed Onset NAS were evaluated in the community using a further modification of the Finnegan score (Appendix 1). This community NAS score excluded the signs specific to the neonatal period or to technical hospital observation. It is a subjective tool, which required information from parental reporting in addition to direct nursing observation. Only one statement was chosen from each section on the form (Appendix 1) with the exclusion of 'Feedings', 'Fluid Intake' and 'Excoriations' where it could be necessary to choose more than one statement.

Infants were assessed by the family health visitor using the community NAS score at 2, 4, 8, 12 and 24 weeks from the date of birth. (If the infant was still in the maternity hospital the Study Nurse completed the early assessments). Once assessments and the relevant forms had been completed, they were posted to the Study Nurse and entered on to the database. The Study Nurse continued to advise and support the family health visitors.

If the Study Nurse or family health visitor identified an infant with a community NAS score of >8, Continuing or Delayed Onset NAS was suspected. An urgent appointment was offered at the hospital follow up clinic, usually for the next working day. The

community score was repeated in the hospital follow up clinic, a database form completed, and treatment adjusted or if necessary prescribed. During the hospital appointment the infant was examined, growth and development were checked and, if needed, referrals made to other services. A plan for future reviews was agreed with the parent(s).

## Results

### Attendance rates for NAS services

All recruited infants were seen by their own health visitor. 17 of the non-recruited (38) group, were never seen at the hospital follow up clinic. 8 of these were either discussed with their health visitor or follow up was arranged at other specialist clinics. One baby had died and 2 had moved away from the area. The corrected rate of infants never seen was 5.5% (6/110).

### At specialist NAS follow-up hospital out patient appointments

A total of 61 infants were offered appointments in hospital clinics for follow up. 202 appointments were arranged and 115 were attended, an attendance rate of 57% (compared with an attendance rate of 51% in 2001). Half of these infants were discharged after their first visit. Of those infants who were offered Royal Aberdeen Children's Hospital clinic visits, only 23% required more than two visits.

At the first outpatient visit:

- Several parents gave a history of continued NAS, which had resolved, meaning the opportunity for intervention and support had been missed.
- Other infants showed no signs of NAS at first hospital follow up; these infants were discharged i.e. their visit was probably unnecessary.

A considerable number of children were not seen by the follow up service and little was known of their progress. Given the possibility of continuing NAS and the vulnerability of these children and parents, this was not satisfactory (Oei et al, 2001). Data were available on all these aspects of the previous service from the audits of 2000 and 2001: these were compared with results from this study.

### Health Visitors assessments

In contrast, out of the 72 recruited infants in the study, only 10 were involved in missed appointments: of 360 HV assessments required, 346 were completed (a completion rate of 96%).

### Prevalence of continuing NAS

- 42/110 infants were discharged home on treatment with phenobarbitol<sup>3</sup>. This is 42 of the 75 infants who initially had NAS.

Using the new intervention of the structured community follow up for these infants, 42 out of the whole study group (110) were found to have continuing NAS after being discharged home. The rate had increased in the study period compared with previous years. This could be due either to better identification of clinical signs as a result of the use of an assessment tool, or to more prolonged withdrawal due to more serious maternal drug problems. The study figures provide a secure baseline against which to evaluate future trends.

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<sup>3</sup>Community phenobarbitol medication was usually sufficient at 5 mg per kg per day; occasionally the dose had to be increased as the infant gained weight. When more than the standard dose was required, drug levels were checked and the diagnosis reviewed. Phenobarbitol was stopped when the Community NAS Score was less than 8, or earlier if carers felt the child's symptoms had settled sufficiently for them to manage without medication. This was regarded as the end point of NAS.

## Delayed onset NAS

- Of the 26 infants who were asymptomatic initially 12 developed delayed onset NAS, and 7 required treatment. The high scores found by the health visitor assessments were confirmed by the hospital follow up clinic in all infants, confirming the accuracy of the assessment tool when used by nursing staff (or possibly by non-medical personnel) working in the community. The infants were identified at different assessment points as shown below in Table 2.

Identification of these infants with Delayed Onset NAS allowed prompt referral to the hospital follow up clinic. Parents or foster parents (carers) were able to join professionals in deciding whether or not treatment was needed. Medication was not prescribed in 5 cases as the carers felt the symptoms were improving and did not warrant treatment.

**Table 2: Infants with Delayed Onset NAS and assessment point when identified**

Assessment point	Number of infants
Week 4	1
Week 8	3
Week 12	7
Week 24	1

**Table 3: Rates of Continuing /Delayed NAS in the study period compared with previous years**

	2001-2	Study period	P (Fisher's exact)
Total population	118	110	
Continuing NAS	24	42	0.0035*
Delayed NAS	1	12	0.0010**

\* Statistically, very significant

\*\* Statistically, highly significant

The new tool therefore increased very significantly the diagnosis rate of both delayed and continuing NAS.

## Duration of Treatment for Continued or Delayed onset NAS

In this group of 54 infants only 49 needed treatment. The majority of treated infants (37/49) had ceased treatment and were asymptomatic by the age of 20 weeks. A significant proportion did require longer treatment and follow up (12/49). The longest period of treatment was 151 days.

## Summary

- During the study period (June 2002-December 2003) 110 infants were born to substance misusing mothers; 75 of these were admitted to the neonatal unit with NAS symptoms;
- 72 of the 110 eligible infants were recruited to the study;
- The new community based assessment developed for this study was completed by the family health visitor (or the Study Nurse if the infant was still in hospital) on the

72 infants recruited to the study. This was completed at 2, 4, 8, 12 and 24 weeks after birth and provided a community NAS score;

- For the study period, attendance rates at hospital appointments for infants identified as being born to substance misusing mothers was 57%; completion of Health Visitor community assessments was 96%;
- The new community assessment identified (and therefore offered appropriate treatment to):
  - i. 42 infants with continuing NAS
  - ii. 12 infants with delayed onset NAS.

### Chapter 3: The prevalence of delayed visual maturation

This chapter looks at the use of a vision screening assessment for infants born to substance misusing mothers.

#### Method

Vision screening was discussed by the Study Nurse with the family health visitor at the time of initial contact. The health visitor was provided with the protocol, equipment and completed the data forms. Training for the health visitor was arranged at the first joint home visit.

The vision screen was developed in consultation with the specialist pre-school functional vision assessment team, based at the Raeden Regional Child Development Centre (Raeden Centre Assessment Charts, revised 2000). The criteria were developed from several sources and used principles of functional visual assessment (The Oregon Project, 1991; Orr, 1999; Sonksen *et al*, 1991, 1995; Sheridan, 1997). The study required three observations or simple tests at each assessment as shown on the form (Appendix 2). The equipment used was a standardised plastic ball and small brightly coloured sweets ("Smarties"). The introduction of the assessment in the community did not involve great expenditure as the skills required were already within the training and expertise of health visitors. Any additional training was in regard to the precise application of the structured tests, the vision screening and the NAS screening i.e. this was a low cost health visitor intervention.

As vision development is related to gestational maturity, the date of assessment was corrected for preterm birth. Infants were therefore assessed at 2, 4, 8, 12, and 24 weeks from the expected date of delivery.

If any of the three visual tasks on each assessment was not achieved, the infant was seen within one week at the hospital follow up clinic. The vision screen was repeated, the eyes examined and a full neurodevelopmental examination undertaken. Infants with eye problems were referred to the paediatric eye clinic for confirmation of the diagnosis.

#### Results

Infants were screened by the health visitors using the vision assessment (but may not have undergone all three tests). The number and timing of the failed tests is as shown in Table 4 below. The number not assessed at each stage is small.

**Table 4: Vision tests and fails by age of infant**

Age weeks	No. tested	Not assessed	No. failed
8	69	3	9
12	68	4	6
24	67	5	7

19 of the 72 recruited infants were seen in the hospital follow up clinic because of failed vision screening (26.4%)

- 14 failed once

- 4 failed twice
- 1 failed four screens (one of which was at either 2 or 4 weeks)

8 infants (8/72) were referred to the eye clinic where the following diagnoses were confirmed:

- 3 nystagmus
- 4 squints
- 1 coloboma

## Summary

- The health visitor aimed to complete the vision screen test on the 72 infants recruited to the study at 2, 4, 8, 12 and 24 weeks following expected date of delivery (a small number were not assessed).
- 19 of the 72 infants were referred to the hospital outpatient clinic because they failed the test, and 8 of these were diagnosed with eye problems (nystagmus, squint or coloboma).

## **Chapter 4: Health Visitor and Parent Views on a New Community-based Service**

This chapter summarises the experiences of the Health Visitors in administering the assessment and the views of some of the parents who were asked to participate in the study.

### **Health Visitor Questionnaire**

In May 2004 it was decided to assess the views of Health Visitors with a simple eight question, qualitative, questionnaire. All the responses were in free text form. 50 questionnaires were sent to the named health visitors of the recruited infants. 31 were returned completed.

Most of the health visitors appreciated the structured assessment protocol, the extra knowledge, and the confidence gained from using the new form. The extra knowledge included an awareness of the special care needed for these infants and the impact on the parents. They felt that the study helped them establish more open communication with parents and they also valued the prompt reviews by the Consultant Paediatrician in the hospital follow up clinic and the support offered by the Study Nurse. Some were concerned about the extra time needed for the assessments but most felt this was outweighed by the benefits.

The majority of responders said they would miss the support of the study team and the shared specialist knowledge. Some of them expressed concerns about the potential loss of the good relationships with the families and the close monitoring that was achieved through using the new assessment method.

19 of the health visitors said there had been no negative effects in their professional relationship with the parents. As the study progressed there was some uncertainty about the diagnosis of NAS in three families but this did not lead to withdrawal from the study. All the other responses supported the benefits of the new assessment, enabling them to understand and communicate the full extent of the problem.

The Study Nurse was an essential part of the study. Only 10 of the health visitors gave no response when asked if they had used the Study Nurse as a resource. The majority of the others had contacted the Study Nurse for general advice, to check that they were using the assessment tools correctly, and to obtain more knowledge about NAS which was provided.

For the project to succeed, the assessment tools needed to be acceptable to Health Visitors. When asked about the community NAS score, typical comments were 'comprehensive'; 'satisfactory'; 'easy to use'; 'good assessment tool'; 'fine'. Several health visitors drew attention to the benefit of the tool for parents in increasing their knowledge of NAS.

The comments on the Vision Screen were more mixed with some suggesting more training needed. When asked if they had any ideas for working with this group in the future, 17 offered no suggestions. The rest asked for the new assessment to continue, citing its benefits in terms of their improved knowledge and skills when working with the families. Mention was made of ensuring more inclusion of GPs and there were requests for additional training in the recognition, management and child protection issues of infants who have either withdrawn or are continuing to withdraw from heroin and/or methadone.

### **Influences on Recruitment to the Study**

- These parents influenced each other in many areas of contact with professionals, including in recruitment and participation in the study.

- *Influence of Study Nurse:* At approximately the midpoint of the study, there was a change of Study Nurse. Both were experienced health visitors and brought different expertise to the study.

## **Confidentiality**

Initial engagement with substance misusing parents is essential to service provision and research. There were problems in securing confidentiality in the neonatal unit as other family members were often present, and they were not always aware of the mother's substance misusing status. Other parents could be present nearby in the unit and a private room was not always available. With time, the Study Nurse was "known" by a wide group of substance misusing parents and was quickly identified by parents in the neonatal unit.

## **Liaison with parents**

Timing a visit to the neonatal unit was not easy, and several attempts were often necessary before the Study Nurse succeeded in speaking to the parents. Problems in liaising with parents arose because parents had unpredictable visiting patterns either arriving late at night, not at all or for only short periods. If parents were obviously under the influence of drugs consent to participate in the study was invalid.

## **Parental feedback**

Ethical Committee approval to ask parents the reasons for refusing to participate in the study was not available. Where parents volunteered their reasons, this information was recorded. In some cases, parents expressed disinterest; there were some direct refusals, and on occasions parents changed their minds. Some parents said they wanted to forget that their baby had NAS, other parents denied this diagnosis, or claimed to have stopped using drugs prior to the pregnancy.

On the grounds of confidentiality we were also not allowed to contact parents at the end of the study to find out their longer term views of the care they received. However some parents volunteered their reasons for participating in research. Some expressed an interest in helping improve services. Others recognised the benefits of the new service to their infant (extra assessments, follow-up) and expressed guilt at causing their infant's problems. Some parents were undergoing parenting assessments by Social Work, and stated they 'needed to be seen to be working with health professionals'.

As each case was closed, the parents were sent a thank you letter; verbal reports indicate that this was greatly appreciated. Many parents wished to know the outcome of the study suggesting they felt some ownership of the project. The Study Nurse was perceived as being independent of the main health systems and therefore non judgemental.

## **Summary**

- Of the 31 health visitors who offered their opinions on the community assessment, most felt if provided them with an increased awareness of NAS which they valued;
- Most were less sure about the vision screen test and felt they needed more training;
- The health visitors felt supported by the Study Nurse and were unsure how the loss of this role would impact on their work in this area;
- In general, those parents who volunteered to participate in the research were very appreciative of the improved service.

## Chapter 5: Summary and conclusions

The **aims** of this study were:

- to develop and deliver a community-based health visitor intervention that will be used to:
  - determine the prevalence of continuing and delayed onset NAS in infants of substance misusing mothers;
  - produce recommendations for service developments;
- to measure the prevalence of delayed visual maturation in this group of infants;
- to evaluate the community-based structured health visitor assessment by comparing it to data from the existing service, and by canvassing the views of the professionals involved.

### Summary

#### *Grampian 2000-2001*

- In Grampian in 2000 and 2001 35 of 61 and 34 of 58 infants born to substance misusing mothers developed NAS. Continuing and/or delayed onset withdrawal was identified in 7 and 17 of these infants in 2000 and 2001 respectively;
- Signs of infant withdrawal were not always identified (and therefore untreated) due to a high rate of non-attendance at out patient appointments. Reasons for this included distance from the hospital, lack of money for transport, child protection problems and continuing parental problem use of drugs.

#### *The study period*

- During the study period (Jun 2002-Dec 2003) 110 infants were born to substance misusing mothers; 75 of these were admitted to the neonatal unit with NAS symptoms;
- 72 of the 110 eligible infants were recruited to the study;
- For the study period, attendance rates at hospital appointments for infants identified as being born to substance misusing mothers was 57%; completion of health visitor community assessments was 96%;
- The new community assessment identified (and therefore offered appropriate treatment to):
  - i. 42 infants with continuing NAS
  - ii. 12 infants with delayed onset NAS.

#### *The vision test*

- The health visitor aimed to complete the vision screen test on the 72 infants recruited to the study at 2, 4, 8, 12 and 24 weeks following expected date of delivery (a small number were not assessed);
- 19 of the 72 infants were referred to the hospital outpatient clinic because they failed the test, and 8 of these were diagnosed with eye problems (nystagmus, squint or coloboma).

#### *Views of the community assessment*

- Of the 31 health visitors who offered their opinions on the community assessment, most felt if provided them with an increased awareness of NAS which they valued.

### Conclusion

- The study has provided information on the prevalence and incidence of infants born to substance misusing mothers and the rate of initial NAS in a defined population area.
- The study identified children with Continuing or Delayed Onset NAS. This facilitated support to parents and prompt hospital follow up, where appropriate.

- The new assessment identified infants with continuing and delayed onset NAS who might otherwise not have been identified.

## Appendix 1

### Study of Infants with Neonatal Abstinence Syndrome

#### COMMUNITY SCORING SYSTEM FOR WITHDRAWAL

Infants Name:		D.O.B. ___ / ___ / _____	
Date seen: ___ / ___ / _____		Contact time: _____	
DNA		CAN	
Place Seen: Please circle	NNU	Other Hospital	Child Health Clinic
		Home	Other
Seen by: Please circle	Specialist clinic	<b>Health Visitor</b>	Study Nurse
		Other	
Age of infant at assessment (chronological age): <b>2</b> <b>4</b> <b>8</b> <b>12</b> <b>24</b> weeks (Please circle) (Other _ _ weeks)			
Cry:	High Pitch	<b>2</b>	
	Continuous	<b>3</b>	
Sleep Hours	1 hour	<b>3</b>	
after feed:	2 hours	<b>2</b>	
	3 hours	<b>1</b>	
Tremors when disturbed:	Mild or Marked	<b>3</b> <b>4</b>	
Muscle tone increased:	Mild or Marked	<b>3</b> <b>4</b>	
Sneezing		<b>1</b>	
Convulsions:		<b>8</b>	
Feedings:			
Frantic sucking	of fists	<b>1</b>	
Poor feeding ability		<b>1</b>	
Regurgitation		<b>1</b>	
Projectile vomiting		<b>1</b>	
Stools:	Loose	<b>2</b>	
	Watery	<b>3</b>	
Excoriation :	Nose	<b>1</b>	
	Knees	<b>1</b>	
	Toes	<b>1</b>	
Fluid Intake: 200 – 250ml/kg/24hr.		<b>2</b>	
≥ 250 ml/kg/24 hr.		<b>3</b>	
No. of feeds per 24 hr ≥ 8		<b>3</b>	
Weight			
<b>Total score</b>			
Medication	√ on treatment x off treatment		
Referred to specialist clinic with score of 8 or above: (please circle)		YES / NO	



## Appendix 2

### Study of Infants with Neonatal Abstinence Syndrome

#### VISION ASSESSMENT (Please ensure age is corrected)

<b>Infant's name:</b>					
<b>Unique code:</b>		DoB: ___ / ___ / ___		Gestation: _____ weeks	
<b>Date seen:</b> ___ / ___ / ___		Did not attend:		Could not attend:	
<b>Place seen:</b> (Please circle)	NUU	Other hospital	Child Health Clinic	Home	Other
Seen by: (please circle)	Specialist clinic	Health Visitor	Study Nurse	Other:	
Age of infant at assessment (corrected if 36 or less gestation): <b>8 12 24</b> weeks ( <b>Other</b> _____ weeks)					
<b>Please tick appropriate box</b>				<b>Pass</b>	<b>Fail</b>
<b>8 weeks</b> follows and fixes near face					
<b>8 weeks</b> social smile					
<b>8 weeks</b> watches adult (75 cm)					
<b>12 weeks</b> watches adult (75 cm)					
<b>12 weeks</b> fixes and follows 6 cm dangling ball (25 cm)					
<b>12 weeks</b> fixes and follows face beyond midline					
<b>24 weeks</b> fixes and follows face 180°					
<b>24 weeks</b> watches adult (<3 metres)					
<b>24 weeks</b> fixates 1 cm Smartie (1/3 metre)					
<b>Referred to specialist clinic</b> (please circle)				Yes	No



## References

- Ammerman RT, Kolko DJ, Kirisci L, et al (1999). *Child abuse potential in parents with histories of substance use disorder*. Child Abuse Negl 23:1225-38.
- Barnard M, McKeganey N, (2004). *The impact of parental problem drug use on children: what is the problem and what can be done to help?* Addiction 99 (5): 552-9.
- Boer K, Smit BJ, van Huis AM, Hogerzeil HV (1994). *Substance Use in Pregnancy: do we care?* Acta Paediatr Suppl 404:65-71.
- British National Formulary for Children (2005). BMJ Publishing Group Ltd.
- Delaney-Black V, Covington C, Ostrea E, et al (1996). *Prenatal cocaine and neonatal outcome: evaluation of dose-response relationship*. Pediatrics 98:735-40.
- Famularo R, Kinscherff R, Fenton T (1992). *Parental substance abuse and the nature of child maltreatment*. Child Abuse Negl 16:475-83.
- Finnegan LP, Connaughton JF, Emich JP (1975). *Neonatal Abstinence Syndrome: assessment and management*. Addict Dis 2:141-58.
- Finnegan LP. *Neonatal abstinence syndrome: assessment and pharmacotherapy*. In: Neonatal Therapy : an update. Excerpta Medica, New York, 1986, pp 122-46.
- Fraser AC, Cavanagh S (1991). *Pregnancy and drug addiction - long-term consequences*. J R Soc Med 84:530-2.
- Fulroth R, Phillips B, Durand DJ.(1989) *Perinatal outcome of infants exposed to cocaine and/or heroin in utero*. American Journal of Diseases of Children. 143(8):905-10
- Gill AC, Oei J, Lewis NL et al (2003). *Strabismus in infants of opiate-dependent mothers*. Acta Paediatr 92:379-85.
- Good Practice Guidance for Working with Children and Families affected by Substance Misuse "Getting our Priorities Right"* (2003). Scottish Executive.
- Greene CM, Goodman MH (2003). *Neonatal abstinence syndrome: strategies for care of the drug-exposed infant*. Neonatal Netw 22:15-25.
- Hansen RL, Struthers JM, Gospe SM (1993). *Visual evoked potentials and visual processing in stimulant drug-exposed infants*. Dev Med Child Neurol 35:798-805.
- Hay G, McKeganey N, Hutchinson S (2001) Scottish Executive Report. *Estimating the National and Local Prevalence of Problem Drug Misuse in Scotland*.
- Herzlinger RA, Kandall SR, Vaughan HG (1977). *Neonatal seizures associated with narcotic withdrawal*. J Pediatr 91:638-41.
- Hidden Harm (2003). *The report of the Inquiry by the Advisory Council on the Misuse of Drugs*. UK Home Office, London. ISBN 1-88473 035-2.
- Jaudes PK, Ekwo E, van Voorhis J (1995). *Association of drug abuse and child abuse*. Child Abuse Negl 19:1065-75.
- Johnson K, Greenough A, Gerada C (2003a). *Maternal drug use and length of neonatal unit stay*. Addiction 98:785-9.
- Johnson K, Gerada C, Greenough A (2003b). *Treatment of neonatal abstinence syndrome*. Arch Dis Child Foetal Neonatal Ed 88:F2-5.

- Kaltenbach KA (1996). *Exposure to opiates: behavioural outcomes in preschool and school age children*. NIDA Research Monograph 164:230-41.
- Kaltenbach KA, Finnegan LP(1989). *Prenatal narcotic exposure: perinatal and developmental effects*. Neurotoxicology 10:596-604.
- Kandall SR, Gaines J, Habel L et al (1993). *Relationship of maternal substance misuse to subsequent sudden infant death syndrome in offspring*. J Pediatr 123:120-6.
- Kelly JJ, Davis PG, Henschke PN (2000). *The drug epidemic: effects on newborn infants and health resource consumption at a tertiary perinatal centre*. J Paediatr Child Health 36:262-4.
- Kelley SJ. *Parenting stress and maltreatment in drug-exposed children* (1992). Child Abuse Negl 16:317-28.
- King TA, Perlman JM, Lupton AR et al (1995). *Neurologic manifestations of in utero cocaine exposure in near-term and term infants*. Pediatrics 96:259-64.
- Lam SK, To WK, Duthie SJ, Ma HK (1992). *Narcotic addiction in pregnancy with adverse maternal and perinatal outcome*. Aust NZ Obstet Gynaecol.23(3): 216-21.
- Murphy JM, Jellinek M, Quinn D et al (1991). *Substance abuse and serious maltreatment: prevalence, risk and outcome in a court sample*. Child Abuse Negl 15:197-211.
- Napiorkowski B, Lester BM, Freier MC et al (1996). *Effect of in utero exposure on infant neurobehaviour*. Pediatrics 98:71-5.
- Oei J, Feller JM, Lui K (2001). *Co-ordinated outpatient care of the narcotic-dependent infant*. J Paediatr Child Health 37:266-70.
- The Oregon Project for Visually Impaired and Blind Preschool Children* (1991). Skills Inventory - Vision Section. Oregon Project, 5th Edition 1991, Jackson County Education Service District, Oregon.
- Ornoy A, Segal J, Bar-Hamburger R et al (2001). *Developmental outcome of school-age children born to mothers with heroin dependency: importance of environmental factors*. Dev Med Child Neurol 43:668-75.
- Orr R (1999). *Visual Impairment*. Royal National Institute for the Blind, London.
- Osborn DA, Cole MJ, Jeffery HE (2002). *Opiate treatment for opiate withdrawal in newborn infants*. Cochrane Database Syst Rev 2005 Oct 19;4:CD004456.
- Russell-Eggitt I, Harris CM, Kriss A (1988). *Delayed Visual Maturation: an update*. Dev Med Child Neurol Jul 40:130-6.
- Scottish Executive (2003). *Getting Our Priorities Right: Good Practice Guidance for working with Children and Families affected by Substance Misuse*. ISBN 0-755916-7.
- Scottish Executive (2004). *Hidden Harm: Scottish Executive Response to the Report of the Inquiry by the Advisory Council on the Misuse of Drugs*. ISBN 0-75559-4226-4.
- Sheridan M (1997). *From Birth to Five Years: Children's Developmental Progress*. Routledge, London.
- Slattery MM, Morrison JJ (2002). *Preterm delivery*. Lancet 360:1489-97.

Sonksen PM, Petrie A, Drew KJ. (1991) *Promotion of visual development of severely visually impaired babies: evaluation of a developmentally based programme*. Dev Med Child Neurol 33:320-35.

Sonksen PM, Kingsley MPL (1995). *Severe visual impairment*. In: Community Child Health and Paediatrics, eds M Harvey, M Miles & D Smyth. Butterworth Heinemann, Oxford, pp 517-529.

Van Baar AL, Fleury P, Soepatmi S et al (1989). *Neonatal behaviour after drug dependent pregnancy*. Arch Dis Child 64:235-40.

Van Baar A, de Graaf BM (1994). *Cognitive development at preschool-age of infants of drug-dependent mothers*. Dev Med Child Neurol 36:1063-75.

Van Baar A. *Development of infants of drug dependent mothers* (1990) Journal of Child Psychology & Psychiatry & Allied Disciplines. 31(6):911-20.

Wilson GS, Desmond MM, Wait RB (1981). *Follow-up of methadone-treated and untreated narcotic-dependent women and their infants: health, development and social implications*. J Pediatr 98:716-22.

Wilson GS, McCreary R, Kean J et al (1979) *The development of preschool children of heroin-addicted mothers*. Pediatrics 63:135-41.



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