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ORIGINAL PAPER

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Hospital stay and short-term follow-up of children of drug-abusing mothers born in an urban community hospital – a retrospective review

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Abstract In order to assess the current use of medical and social services of children of drug-abusing mothers in regard to their short term outcome in a Swiss urban community hospital, we compared hospital, private paediatricians and home nursing records of 37 of these children with 37 matched control children from birth to 18 months of age. Children of drug-abusing mothers (CDAM) experienced a longer neonatal hospital stay than control children with a median (25%–75%) of 26 days (10.5–52.5 days) versus 5 (5–6) days ($P < 0.001$), a substantial part of which, 8 days (3.5–26 days) versus 0 days (0–1 day) ($P < 0.001$) was not motivated by any specific medical treatment or nursing care. Before discharge, CDAM were referred to out of hospital nursing and social services for further management, but only 13% were effectively followed. More than 50% were lost to follow-up by their initial paediatrician after 1 year of life.

Conclusion New ways to ensure better co-ordination between paediatricians and the social services (inside and outside the hospital) should be developed to shorten the neonatal hospitalisation period and improve the quality of follow-up.

Key words Child of drug-abusing mother · Medical follow-up · Social follow-up · Neonatal hospitalisation

Abbreviations *CDAM* children of drug-abusing mothers · *IUGR* intra-uterine growth retardation

Introduction

Drug abuse has become a common problem in western societies and a growing number of drug-abusing women give birth nowadays. Becoming parent with such a condition can be difficult and potentially deleterious to the child's care and development.

Most of the medical literature regarding children of drug-abusing mothers (CDAM) refers to their acute medical problems, particularly relating the risk of occurrence and management of a withdrawal syndrome [5, 10]. In addition to this acute problem and due to the often brittle personality and social status of their parents, many of these children remain in the hospital during the time needed to prepare their return home and organise social and medical follow-up [4, 10, 12]. The complexity of this issue and the number of people implied often lead to a long hospital stay without any medical needs, but adding risks of nosocomial complications [3, 8]. These aspects have so far been poorly analysed. Particularly in Switzerland, the efforts put on such patients and the impact on their short-term outcome has not been quantified.

The purpose of this study was to evaluate the utilisation of medical structures by such children (public

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hospital and private practitioners), with regard to their medical and developmental short-term outcome.

Patients and methods

We reviewed the charts of 37 neonates born in the maternity unit of the Geneva University Hospital between January 1 1989 and December 31 1994 identified by using the local computerised diagnoses "CDAM" or "neonatal withdrawal syndrome". A control group of newborns was established using the following matching criteria: infant of the same gestational age and gender, born during the same week and whose mother was the same age (±4 years), number of previous deliveries (±1) and pregnancies (±1), and was not clinically suspected to take any kind of toxic substance during or before pregnancy.

Hospitalisation for CDAM in the neonatal unit was aimed at recognising early signs of withdrawal syndrome, at taking care of any neonatal complications these children are known to be at higher risk for, and to evaluate the conditions of home return and organise a systematic nursing follow-up at home when required.

Groups were compared for maternal risks of vertical transmission of infectious diseases by comparing serologies (toxoplasmosis, rubella, syphilis, HIV, hepatitis B virus), evidence of intra-uterine growth retardation (IUGR) by comparing birth weight, length and head circumference as well as perinatal adaptation by the Apgar score. Paediatric records for neonatal hospitalisation were reviewed to quantify medical problems associated with maternal substance abuse, type of feeding, possible nosocomial infections, length of stay (in the neonatology unit for children requiring medical attention or in the well-babies nursery for normal newborns), number of specialised consultations (neurology, cardiology, infectious diseases, social services) and laboratory examinations performed (blood, urine and cerebrospinal fluid, bacteriological, radiological and electrophysiological). On a social point of view, mothers were compared regarding their nationality, marital and professional status.

The length of hospital stay was segregated into two periods: a "medical hospitalisation" period justified by any medical monitoring or intervention and a "social hospitalisation" period during which no medical care or investigation was required. Hospital length of stay for the control group was taken as the duration of post-partum hospital stay.

The follow-up of these children during the first 18 months of life was assessed by a questionnaire sent to their paediatricians regarding vaccination performed, number of consultations, reason for consulting, growth, weight and psychomotor development with four items on the Denver scale (child sits alone, speaks five words, walks alone, thumb-index opposition). We also sent questionnaires to the main home nursing service connected to our hospital (Geneva Home Nursing Institution) to assess how many of these children had effectively been taken care of after being addressed to them. The ethical committee of the paediatric department approved the protocol of this study.

Statistical analysis

Lengths of stay were compared using the non-parametric Wilcoxon rank sum test. Other normally distributed variables were compared by *t*-test or chi-squared test. A value of $P < 0.05$ was considered significant.

Results

A total of 37 mothers were sorted from the hospital records according to our criteria after exclusive alcohol or tobacco users. As validation of the matching process, mean age (±standard deviation) of the investigated mothers compared to the control group was 26.9 (±3.8) years versus 27.7 (±4.8) (n.s.), mean number of pregnancies was 2.2 (±1.8) versus 1.5 (±0.7) (n.s.) and number of deliveries was 1.6 (±0.9) versus 1.9 (±1.1) (n.s.). Gestational ages of delivery were similar between groups: 37.6 (±2.9) weeks versus 38.6 (±2.4) weeks (n.s.).

Obstetric records

The majority of mothers in the CDAM group were addicted to opiate derivatives: 41% taking methadone alone, 8% heroin alone and 51% a combination of substances (methadone, heroin, benzodiazepines, cocaine). Almost all mothers taking methadone (82%) were followed in a regular drug substitution programme during their pregnancy. A higher prevalence of positive serological markers was found in toxic abusing mothers compared to control mothers for HIV (19.4% versus 0%; $P < 0.025$) and for hepatitis Bs antigen (46% versus 0%; $P < 0.005$). On a social standpoint, 73% of the CDAM mothers were of Swiss nationality versus 35% in the control group ($P < 0.05$), while 35% were married versus 89% ($P < 0.005$) and 30% had a professional occupation versus 65% ($P < 0.05$) at the time of delivery.

Regarding their newborns, birth weight (2657 ± 656 g versus 3218 ± 581 g, $P < 0.003$), birth length (47.1 ± 3.4 cm versus 49.7 ± 2.7 cm, $P < 0.004$) and head circumference (32.3 ± 2.2 cm versus 34.6 ± 2.1 cm, $P < 0.008$), were all significantly lower in the CDAM group leading to a higher rate of IUGR (29.7% versus 0%, $P < 0.001$). Apgar scores were similar in both groups.

Length of hospital stay

The median (25–75 percentiles) length of hospital stay was significantly longer for the 37 CDAM (26 days (10.5–52.5 days) versus 5 (5–6 days) days, $P < 0.001$) and 65% of them developed signs of withdrawal syndrome. Of the CDAM, 92% required a long hospital stay during which they did not require any treatment or investigation. The median length (25–75 percentiles) of this "social" hospitalisation was 8 days (3.5–26 days) for CDAM versus 0 days (0–1 day) ($P < 0.001$) in the control group (Fig. 1).

CDAM were not subjected to significantly more radiological or electrophysiological examinations except for cerebral ultrasound (33.3% versus 10%, $P < 0.05$). Bacteriological examinations were all significantly more performed in the CDAM population than in controls: blood cultures 35.1% versus 10.8% ($P < 0.025$); urine cultures 21.6% versus 5.4% ($P < 0.05$); white blood count 81.1% versus 21.6% ($P < 0.001$); serum chemistry 67.6% versus 24.3% ($P < 0.001$). Over the whole hospital stay, 30% of CDAM were treated with antibiotics for suspected or proven infection versus 8% in the

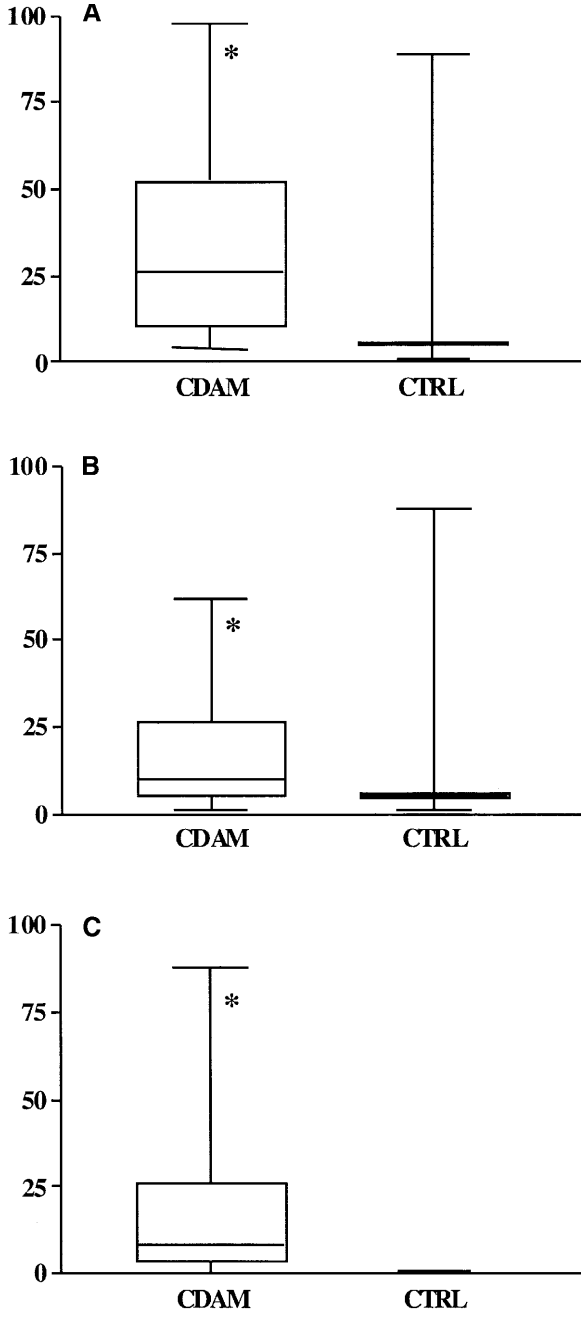

Fig. 1 Length of neonatal hospital stay in days of 37 children born to drug-addicted mothers and of 37 matched control children. **a** Total length of stay; **b** length of medically-indicated stay; **c** length of socially-indicated stay. The box plot represents the 25–75 percentile values. The *horizontal bar* expresses the median ($P < 0.005$ versus CTRL). (*CDAM* children of drug-addicted mothers, *CTRL* control children)

control group ($P < 0.05$). Also CDAM mainly required more specialised consultations, especially in neurology (16.2% of the CDAM versus 2.7% of controls, $P < 0.05$), psychiatry (35.1% versus 0%, $P < 0.001$), infectious disease (13.5% versus 0%, $P < 0.05$) and social services (51.4% versus 0%, $P < 0.001$). Of the CDAM, 70% were fed with formula (including all children of HIV or hepatitis B positive mothers) versus 8.3% of the control group ($P < 0.05$).

After hospital discharge, both groups consulted similarly the outpatient clinics and emergency rooms of our children hospital during their first 2 years of life (33.4% of the CDAM versus 36.4% of controls).

Private paediatrician records

Of 37 paediatricians, 31 (87%) answered our questionnaire for the CDAM and 21 (57%) of 37 for the control group. Written and oral reminders were undertaken to increase the reply rate. A total of 52% of the CDAM had been lost to follow-up by their initial paediatrician during the 1st year of life versus 33% of the control group (n.s.). Characteristics of children did not differ between those followed and those lost to follow-up. The vaccination plan at 15 months of life had been followed correctly by 45.2% among the CDAM group versus 76.2% in the control group ($P < 0.05$).

Regarding somatic development, there was no significant difference between both groups at 1 year of age: medium weight and head circumference were between the 10th and 50th percentiles and height between the 3rd and 50th percentiles. There was also no significant difference in psychomotor development of both groups regarding the four Denver Scale items compared.

The number of visits to the practitioner was not significantly different between both groups with a mean of 5.31 ± 3.96 consultations per year for the CDAM versus 5.5 ± 3.65 (n.s.) for the control group during the 1st year of life and 7.86 ± 5.18 for the CDAM and 6.89 ± 3.23 (n.s.) for the control group during the 2nd year of life. There was a slightly higher but non-significant rate of "non-medical" reasons for consulting among CDAM (9.3% of the CDAM versus 0%, n.s.). Vaccination rate was similar in both groups during the 1st year of life (82% of CDAM versus 88% of controls, n.s.) but decreased among CDAM at 18 months of age (45% of CDAM versus 75% of control vaccinated children, $P < 0.05$). All children of hepatitis B positive mothers received three vaccine doses.

Home nursing records

All 37 CDAM but none of the control group had arrangements made for home follow-up by a nurse of a public health organization (Geneva Home Nursing Institution) before their hospital discharge. Only five (13.5%) of them were effectively followed by a nurse at home. Statistical analysis was not applicable for such a small group.

Discussion

This retrospective study objectifies that a group of CDAM makes use of important hospital resources in an urban community hospital in Switzerland. The mater-

nity department of Geneva University is part of a community hospital delivering 3000 babies a year which account for more than 50% of the total deliveries in the area. Due to the highly expensive insurance fees for admission to private clinics in Switzerland, women delivering in such facilities, while at an even risk to be potentially drug addicted, cannot be expected to represent similar social problems as those delivering in the public hospital. Consequently, our study population can be taken as representative of the whole population.

On a social point of view, the majority of drug-dependent mothers was of Swiss nationality, not married and did not have any stable professional activity. The high rate of non-Swiss mothers in the control group is comparable to the high rate of foreigners living in Geneva. Most of the drug-abusing mothers in this study were opiate dependent and 82% of them were followed in a regular methadone substitution programme before delivery. The absence of other drugs in this study can probably be ascribed to the lack of a systematic toxic screening among pregnant mothers in our hospital. The important use of hospital resources for these children is only partly explained by medical problems and is mostly due to the time needed for arranging what is considered a return home under the best conditions. Although this might be due to local inappropriate management, we believe this is likely to be the case in other countries of similar social structure.

CDAM required a hospital stay longer than 7 days five times more often than children from the control group. During this hospital stay, CDAM were subjected to significantly more investigations (blood and bacteriological as well as radiological examinations) and specialised consultations. These higher needs could possibly be due to three medical factors. First, the initial hospital stay was mostly motivated by the exhibition of a withdrawal syndrome: 65% of CDAM presented signs of withdrawal syndrome during the first days of life, a proportion in agreement with the current literature reporting that 60% to 75% of newborns of opiate-addicted-mothers develop neonatal withdrawal syndrome [5, 10, 13–15]. Symptoms are known to present during the 1st day of life in most children of heroin-addicted mothers (76%) and within 48 h in 92% of methadone-addicted mothers [14]. The severity of withdrawal symptoms is similar for either heroin or methadone but the duration is longer in the latter. In addition, severity does not correlate with the amount of drug taken during pregnancy. We did not observe these differences in our study, probably because most women took both drugs during pregnancy. Further, the amount of drug ingested could not be precisely evaluated. CDAM suffering from withdrawal syndrome were treated with phenobarbital or chloral hydrate. The mean duration of the treatment was around 2 months. Tapering and discontinuation of the treatment was decided by the child's paediatrician. Second, while narcotics are not reported to have teratogenic effects, they are associated with lower mean birth weight and length [1, 9, 15]. In our study, 29.7% of CDAM had IUGR, known to be an important factor of neonatal complications. Oloffson et al. [11] correlated the small weight and height with a direct effect of opiates on the fetus (especially methadone) as well as poor maternal nutrition during pregnancy. Despite these risk factors of neonatal complications, neonatal adaptation as assessed by the Apgar score was no different in both of our groups and did not explain specific problems requiring a longer hospital stay. Neonatal complications were mostly associated with nosocomial infections due to the longer hospital stay. Third, drug-abusing mothers had a high prevalence of HIV or hepatitis B infection, known to be potentially vertically transmitted, thus putting their offspring at high risk of infection. At the time of the study, the risk of HIV vertical transmission of 15% and additional risk with breast feeding of 12% to 14% [2, 6, 7] was correctly recognised by hospital staff and children of HIV positive mothers were all fed with formula. Children born to hepatitis B-infected mothers were vaccinated at birth and vaccination follow-up was adequate at 6 months.

Overall, the management of these three main medical issues explained only about 50% of the total length of hospital stay. Indeed, 92% of the CDAM did not require any medical or nursing care after this acute phase but stayed in the hospital for social reasons for an average time of 15.5 days. Such long hospitalisations are known to be harmful for the child from a psychological point of view, forcing a long separation from its mother, and medically risking nosocomial infections [9]. The longer hospitalisation period is also difficult for the hospital staff with a possible disinterest in the child and his condition. We were unable to quantify the total amount of nursing work these children required during their "social hospitalisation". Although they were handled based on a one to four nurse/patient ratio, the nurses spent much more time for parents support, participation in multidisciplinary colloquia and outpatient arrangements, than for true medical care. On a hospital resource basis, the total of 573 hospital days attributed to social care, would cost overall more than half a million Swiss francs a year.

Despite the time spent to organise it, the social follow-up of these children after hospital discharge was very poor and few children were followed at home. Reviewing the home nurses notes, we found that medical doctors and home nurses did not co-ordinate correctly. Indeed, when transmission was made properly, home nurses could obtain access to the child's caregivers. This poor follow-up is then best explained by physician's and nurse's lassitude due to the long hospital stay. Among both groups, many children were not followed by the paediatrician mentioned on the hospital chart after 12 months of life, making further comparative analysis irrelevant. When analysed for the 1st year of life, vaccination schedules were similarly followed by both groups. At that time, length and weight differences objectified at birth were reduced and children born with IUGR had reached normal growth percentiles. As

mentioned by Chasnoff et al. [4], head circumference growth during the 1st year of life is the best prediction of the child's development prognosis.

CDAM certainly require medical monitoring during their first few days of life and some will need medical interventions. Nevertheless, in an urban community hospital, we have shown that their stay on a neonatology unit was much longer than required by medical management or monitoring. Furthermore, this long and costly extra hospital stay of 2 weeks did not secure a good follow-up. After their hospital discharge, medical follow-up was correct during the 1st year of life but social institutions were not involved appropriately due to an improper co-ordination. The early collaboration of multiple caregivers to organise a most adequate follow-up is warranted.

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