0145-6008/98/2202-0321$03.00/0
ALCOHOLISM: CLINICAL AND EXPERIMENTAL RESEARCH

Vol. 22, No. 2
April 1998

Neuropsychological Disorders in Children Exposed to Alcohol during Pregnancy: A Follow-Up Study of 24 Children to Alcoholic Mothers in Göteborg, Sweden

Marita Aronson and Bibbi Hagberg

This paper reports on a follow-up study of 24 children to alcoholic mothers at 12 to 14 years of age. The mothers were offered support to help them stop drinking during pregnancy and was grouped to time point of instituted sobriety. Six of the 24 children attended a school for the mentally retarded, and 11 children had some kind of special education. The children have difficulties in mathematics, logical conclusions, visual perception, spatial relations, and short-range memory/attention. Sixteen children were in fostercare. A clear correlation between the occurrence and severity of neuropsychological problems and the degree of alcohol exposure in utero was found.

Key Words: Fetal Alcohol Syndrome, Follow-Up Study, Intellectual and Behavioral Problems, Special Education.

THE EFFECTS of alcohol on the developing fetus have been well recognized for about 25 years. The fetal toxicity of alcohol has now been confirmed by several groups around the world.[1–4] Our research group reported in the 1970s and 1980s on the consequences of alcohol on the growing fetus and child.[4–9] Follow-up studies have been few, partly because this field of research is new, and partly because there have been problems tracing the examination groups for follow-up. Studies on the intermediate and long-term outcome of children born to alcoholic parents have recently been reported from United States, France, and Germany.[9–12] Streissguth's study demonstrated the continuing impact of prenatal alcohol exposure on attention, reaction time, intelligence, memory, learning (particular in the field of arithmetic), and other neuropsychological functions.[9–10] Steinhausen's[12] study indicated the persistence of hyperkinesis, sleep disorder, and stereotypies in adolescence. The follow-up study of Lemoine of 105 adult patients with fetal alcohol syndrome (FAS) suggested that mental retardation, other learning disabilities, behavior problems, and "instability" may be very common outcomes.[11]

From the Department of Pediatrics, East Hospital, Göteborg, Sweden.

Presented at the 1996 Borchard Foundation Symposium on the Behavioral Effects in Children following Prenatal Alcohol Exposure, Missillac, France, July 28–30, 1996.

Reprint requests: Marita Aronson, Ph.D., Department of Pediatrics, East Hospital, S-41685, Göteborg, Sweden.

EARLIER STUDIES OF FAS IN GÖTEBORG

Our research group has previously published three studies of children exposed to alcohol in utero. In a retrospective study,[4–6] 99 children of 30 alcoholic mothers were observed. Thirty percent of the children had a birthweight below 2500 g, and 13% were younger than 37 gestational weeks at birth. Fifty percent had delayed development, and a majority required special education or placement in schools for handicapped children. Fifty percent had specific neuropsychological deficits, making it more difficult for them to make good use of their intellectual resources. Four percent of the children suffered from mild cerebral palsy.

In a matched controlled study,[7,8] 21 of the 99 children were followed up at an average age of 5.5 years and compared with a comparison group, matched for sex, age, height, birthweight, and social circumstances. The comparison group showed normal growth. Children of alcoholic mothers, on the other hand, demonstrated no significant gain in growth rate, and motor and psychological development levels were considerably below those of the comparison group. We found a high rate of indices of brain dysfunction (including mental retardation), even among those children who had been placed in foster homes at an early age.

In a prospective study,[5,6] 26 children and their alcoholic mothers were followed through the preschool years, including medical and psychological examinations. The mothers' alcohol consumption, being at the level of alcohol abuse (the equivalent of a daily intake of 200 ml of hard liquor or more), was monitored during pregnancy. A comprehensive support program was implemented. Children of mothers ending their alcohol abuse prior to the 12th week of gestation ($n = 5$) had normal growth and mental development during the preschool years. Conversely, children of mothers maintaining a high level of alcohol consumption throughout pregnancy ($n = 13$) had low birthweight and were delayed in their mental development. Of the 26 children, 11 had FAS, 9 had FAE, and 6 had no physical abnormalities or mental retardation.

FOLLOW-UP STUDY AT AGE 12 TO 14 YEARS

The 26 children (16 boys, 10 girls) from the prospective study were assigned for participation. The children ranged

in age from 11.5 to 14.0 years. Two of the children had moved abroad and could not be examined. For two of the remaining 24 children, information could only be obtained from the school. The remaining 22 individuals were clinically and neuropsychologically examined. [A Wechsler Intelligence Scale for Children (WISC) IQ score was available for one further girl.] Twenty of these were examined by a psychologist blind to group status and diagnosis.

Consumption Groups

The children were divided into four groups according to the amount of alcohol consumption of the mothers during pregnancy. Group 1 (2 boys/3 girls), consisting of children whose mothers ended their alcohol abuse at 5 to 12 weeks of gestation; group 2 (6 boys/1 girl), consisting of children whose mothers ended consumption at 20 to 25 weeks of gestation; and group 3 (5 boys/4 girls), consisting of children whose mothers consumed alcohol throughout pregnancy. The children in group 4 (3 boys/2 girls) were discovered after birth and showed signs of FAS. Their mothers had consumed alcohol at abuse level (200 ml hard liquor/day or more) throughout the pregnancy. The average age of the mothers at the time of delivery was 21.8 years (range: 19.6–24.3) for group 1, 29.9 years (range: 24.9–33.1) for group 2, 28.5 years (range: 24.3–39.2) for group 3, and 29.2 years (range: 21.6–33.1) for group 4. The mothers in group 1 were youngest and had not been alcoholics for as long a time as the mothers in the other three groups. Mothers in group 1 could also have ended their alcohol abuse earlier in gestation.

Neuropsychological Testing and Clinical Interview

The test methods used were the WISC-R[13] and the Bender.[15] The foster or biological parents were interviewed in detail about the child's development and behavior for about 60 min. The classroom teacher was interviewed about the child's behavior and achievement in the school for about 30 min. The child was tested on the test battery and was observed with regard to attention level, distractibility, activity level, social interaction, communication and overall behavior (including compulsive behaviors, rituals, tics, and stereotypies).

RESULTS

Neuropsychological Findings

The total scores of the WISC test are shown in Fig. 1. Four children were mildly mentally retarded and had tested IQ scores in the 51 to 70 range. Two of these had neonatally diagnosed FAS, one came from group 4 (severe abuse group), and one from the moderate abuse group (group 2). The remaining 19 children for whom WISC results were available had IQ scores of 73 or more, and their mean IQ was 91.0 (SD: 10.3).

The lowest scores pertained to children from groups 3 and 4, the severe abuse groups. Those five children in this group who had been diagnosed as having FAS already at birth showed pronounced difficulties on the following subscales: comprehension, arithmetic, picture arrangement, and information. The remaining nine children in this group had pronounced difficulties in arithmetic (Fig. 2). The children in the moderate abuse group (group 2) scored low on the digit span subscale. There is a significant difference between group 1 and groups 3 and 4 on the different subtests. Figure 3 shows the results from Griffiths test[14] at 10 and 18 months in comparison to follow-up tests with WISC at 12 to 14 years of age.

The Bender Test results indicated that 10 children had a severe delay (>3 years) in the development of visual perception. Three of the five children with neonatally diagnosed FAS belonged in this group, as did 5 of the remaining 9 children from groups 3 and 4. Two children with this type of severe delay, according to Bender testing, were recruited from the moderate abuse group (group 2).

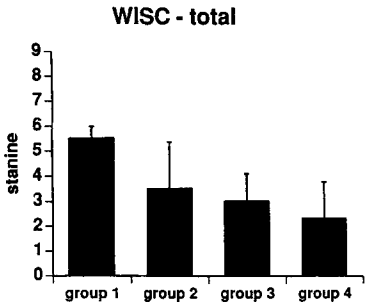

Fig. 1. Results of WISC for all children, divided into consumption groups.

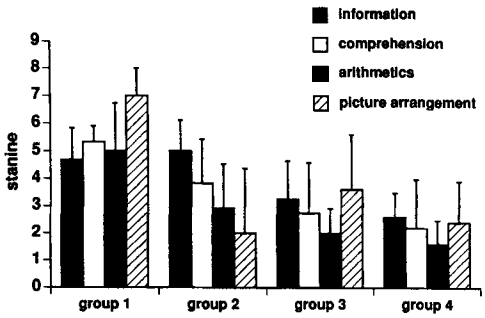

Fig. 2. Results of four WISC subtests: Information, Comprehension, Arithmetic, and Picture Arrangement. Data are presented by consumption group.

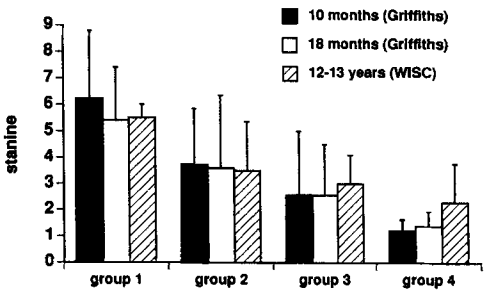

Fig. 3. Comparison of WISC test results at 12 to 14 years of age and Griffiths test results at 10 and 18 months, respectively.

Table 1. Type of Schooling According to Subgroup Status

	Group 1 (n = 4)	Group 2 (n = 7)	Group 3 (n = 8)	Group 4 (n = 5)	All (n = 24)
Regular school	4	3	0	0	7
Special education	0	4	5	2	11
Education for the intellectually subnormal	0	0	3	3	6

Table 2. Fostering According to Subgroup Status (See Text)

	Group 1 (n = 4)	Group 2 (n = 7)	Group 3 (n = 8)	Group 4 (n = 5)	All (n = 24)
Biological parent	3	4	0	1	8
Foster home	1	3	8	4	16

Children's School Difficulties

Of the 24 children for whom information about the school situation was available, six attended schools/classrooms for mentally handicapped children. Eleven received some kind of special education support from the school, and seven attended normal classrooms. In the first two groups, 11 children received special education in mathematics and the Swedish language, and 9 had a personal assistant (Table 1).

Psychosocial Situation for Children and Biological Mothers

Three of the 25 biological mothers (one pair of twins) had died before the follow-up census date. Sixteen of the 24 children, for whom information was available, lived in foster homes at the time of follow-up. Eleven children had been taken into care before 18 months of age, whereas the remaining five were taken into custody later. Eight children were still living with their biological parents (Table 2).

Most of the fostered children had been living in environments unsuitable for small children before the time of fostering, with a biological mother who abused alcohol, changed partners very often, and was unable to provide a sense of security for the child because of their own personal problems.

In addition to measures taken with the aim of supporting the mothers, a whole host of other interventions had been tried. The biological mothers of the 16 children received therapeutic assistance in their own home. Other forms of support included housing, summer accommodation homes, and long-term sick leave benefits.

Teacher Interviews

Interviews with the teachers made it clear that a majority of the children had problems learning mathematics and Swedish. They had poor attention and showed little perseverance. These children understood instructions more easily in a smaller group. Some of them readily made new friends, but had a hard time keeping friends.

Parent Interviews

These interviews with the principal caregiver suggested that the children's most significant problem may be a lack of impulse control and bursts of aggression. The children seemed not to realize the consequences of their own behavior and demanded much more attention than normal children.

Several foster parents felt a need for support in their role as parents to these children. Support had been granted from different authorities, such as social services, pediatric clinics, child and adolescent psychiatric clinics, preschools, and day nurseries, etc.

DISCUSSION AND CLINICAL CONCLUSIONS

This follow-up shows that a majority of the children exposed to abuse levels of alcohol in utero had attention deficits, motor control problems, or both in preadolescence. Specific learning disorders were very common also, and mild mental retardation occurred in about 1 in 6 cases. Streissguth et al.,[9,10] Lemoine and Lemoine,[11] and Steinhausen[12] have reported similar results from follow-up studies in the United States, France, and Germany.

In accordance with results obtained in our previously published studies, the children displayed more frequent and severe disturbance if the mother had abused alcohol throughout pregnancy. The children, whose mothers discontinued their alcohol consumption no later than the 12th week of gestation, all developed normally and did not show conspicuous difficulties in school. Their mothers were also the youngest ones and had not been abusing alcohol for as long a period of time.

Early fostering did not appear to eliminate the harmful effects of exposure to alcohol in utero. However, our clinical impression, although not yet supported by systematic study, suggest that placement in a foster home leads to improved performance and a better quality of life for affected children, but normalization does not occur. We had the impression that the fostered children were better able to cope with their difficulties than those who remained in the biological home. Thus, if the mother, despite vigorous attempts at psychological support, continues to abuse alcohol and has severe personal psychological problems, fostering may be the best alternative for the child. Nevertheless, staying in contact with the biological parents will usually be important for the identity and development of the child.

REFERENCES

1. Lemoine P, Harousseau H, Borteyru JP, Menuet JC: Les enfants de parents alcooliques: Anomalies observées. A proposos de 127 cas. Quest Med 21:476–482, 1968

2. Jones KL, Smith DW: The fetal alcohol syndrome. Teratology 12:1–10, 1975

3. Bierich JR, Majewski F, Michaelis R: Fetal alcohol syndrome. Pediatr Res 9:864, 1975

4. Olegård R, Sabel KG, Aronson M, Sandin B, Johansson PR, Carlsson C, Kyllerman M, Iversen K, Hrbek A: Effects on the child of alcohol abuse during pregnancy. Acta Pediatr Scand 275(Suppl.):112–121, 1979

5. Aronson M: Children of Alcoholic Mothers. Göteborg, University of Göteborg, Thesis, 1984

6. Aronson M, Olegård R: Children of alcoholic mothers. Pediatrician 14:57–61, 1987

7. Aronson M, Kyllerman M, Sabel KG, Sandin B, Olegård R: Children of alcoholic mothers: Developmental, perceptual and behavioral characteristics as compared to matched controls. Acta Pediatr Scand 74:27–35, 1985

8. Kyllerman M, Aronson M, Sabel KG, Karlberg E, Sandin B, Olegård R: Children of alcoholic mothers: Growth and motor performance compared to matched controls. Acta Pediatr Scand 74:20–26, 1985

9. Streissguth AP, Clarren SK, Jones KL: Natural history of the fetal alcohol syndrome: A 10 year follow-up of eleven patients. Lancet 2:85–91, 1985

10. Steissguth AP, Aase JM, Clarren SK, Randels SP, LaDue RA, Smith DF: Fetal alcohol syndrome in adolescents and adults. JAMA 256:1961–1967, 1991

11. Lemoine P, Lemoine PH: Outcome in the offspring of alcoholic mothers (study of 105 adults) and considerations with a view to prophylactics. Ann Pediatr (Paris) 39:226–235, 1992

12. Steinhausen HC: Children of alcoholic mothers. A review. Eur Child Adolesc Psychol 4:143–152, 1995

13. Psykologiförlaget: Wechsler Intelligence Scale for Children, ed 4. Stockholm, Psykologiförlaget, 1980

14. Alin-Åkerman B, Nordberg L: Griffiths utvecklingsskalor I och II. Manual for administering och utvärdering. Stockholm, Psykologiförlaget, 1980

15. Koppitz E: The Bender Gestalt Test for Young Children. New York, Grune & Stratton, 1971