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Pregnancy outcome for women working in laboratories in some of the pharmaceutical industries in Sweden

by Evert Hansson, MD, †¹ Sten Jansa, MD,² Heide Wande,² Bengt Källén, MD,³ Eric Östlund, MD⁴

HANSSON E, JANSÄ S, WANDE H, KÄLLÉN B, ÖSTLUND E. Pregnancy outcome for women working in laboratories in some of the pharmaceutical industries in Sweden. *Scand j work environ health* 6 (1980) 131–134. The pregnancy outcome of laboratory employees in three pharmaceutical industries in Sweden were studied with interviews, postal questionnaires, and register studies. The total material shows only a slightly increased miscarriage rate and normal perinatal mortality and malformation rates. Subdivision into two types of laboratory work, "chemical" and "other," revealed a significant difference, with an increased perinatal death rate and an increased rate of major malformations in the chemical group. This observation supports earlier findings indicating that work during pregnancy in a chemical laboratory can represent a hazard to the fetus.

Key terms: laboratory work, malformation, miscarriage, perinatal death.

A laboratory of the Astra pharmaceutical industry in Södertälje, Sweden, expressed concern in the summer of 1977 because two infants born by laboratory employees had died perinatally, and some miscarriages had also been noted. The result was a study of all identifiable pregnancies that had occurred among employees of this laboratory. Two more instances of perinatal death and two other infants with major malformations were then identified in a total of 35 infants. Six miscarriages were identified. These findings were published in a local medical journal (2). Two more studies were then initiated. One concerned laboratory workers employed

in the Uppsala University (4), where a high incidence of infants with major malformations was noted, but no perinatal deaths. The second is reported in this communication, which describes the pregnancy outcome among laboratory workers in three pharmaceutical industries in Sweden.

Material and methods

The material was collected by the health officers of each company. The strategy in data collection varied somewhat.

The Astra group studied six different units: Astra's control laboratory (that included in the previous study), Astra's toxicological laboratory, Astra Läkemedel, Astra-Ewos, Hässle, and Draco. Interview studies using a standardized questionnaire were made with all women employed in the laboratories. Furthermore, all women who had been employed were listed, and each woman was sought in the central

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register (Swedish National Board of Health and Welfare) on all deliveries, the Medical Birth Record Register, and the Register of Congenital Malformations. Thus infants born by former employees could be identified.

The Apoteksbolaget material was collected partly with questionnaires sent to all presently employed women and partly with a search of the registers for all women who had been on maternity leave from the laboratories in question. No supplementary interviews were made.

A postal questionnaire study, comprising all presently employed women, was made at the Leo company. No supplementary interviews were made.

The Medical Birth Record Register is a computerized register containing summaries of all delivery records of women having given birth since 1 January 1973 in Sweden. The record contains data on the pregnancy and delivery and also diagnoses given to the infants. The Register of Congenital Malformations contains detailed information on infants born with

major malformations in Sweden since 1965. The identity of a specific woman included in the registers can be obtained with the aid of a social security number.

Results

The total number of pregnancies per woman was slightly higher in the "chemical laboratory" group than in the "non-chemical" group (0.7 against 0.5), but the difference was smaller if the number of infants per woman was calculated (0.6 against 0.5). The miscarriage rate of the total group studied was not conspicuously high (12 %), but there was an apparent difference between the chemical laboratory group (18 %) and the nonchemical group (10 %) (table 1).

Table 2 presents data on all infants born by the employees studied. Most of these infants were born after 1972, but a few births had occurred as early as 1960. It should be noted that the number of births is higher in table 2 than in table 1

Table 1. Results of an interview/questionnaire study of miscarriages of women working in chemical laboratories and in other employments in the pharmaceutical industries studied.

Company	Chemical laboratories			Other employment			Total		
	Number of women	Number of pregnancies	Number of miscarriages	Number of women	Number of pregnancies	Number of miscarriages	Number of women	Number of pregnancies	Number of miscarriages
Astra	51	41	6	379	257	25	430	298	31
Leo	48	27	5	218	59	8	266	86	13
Apoteksbolaget	11	10	3	28	11	1	39	21	4
Total	110	78	14 (18 %)	625	327	34 (10 %)	735	405	48 (12 %)

Table 2. Number of infants born and abnormalities noted. Data from an interview/questionnaire study and a register study.

Company	Chemical laboratories				Other employment				Total			
	Number of infants	Number of deaths	Number of major malformations	Number of minor malformations	Number of infants	Number of deaths	Number of major malformations	Number of minor malformations	Number of infants	Number of deaths	Number of major malformations	Number of minor malformations
Astra	56	5	3	2	210	1	2	5	266	6	5	7
Leo	22	1	2	1	51	0	0	1	73	1	2	2
Apoteksbolaget	25	0	1	0	36	0	0	0	61	0	1	0
Total	103	6	6	3	297	1	2	6	400	7	8	9

— the former also includes infants identified in the central registers and born by women who had not been interviewed.

The number of abnormal births was small: 7 neonatal deaths and 8 major malformations. The distribution between the two occupational groups was skewed, however; 12 of the abnormal births occurred among the 103 infants in the chemical laboratory group against 3 among the 297 births in the nonchemical group. This difference was statistically significant [$\chi^2 = 6.6$ at 1 df, $p = 0.01$ — normal approximation (1)].

Table 3 presents the maternal age distribution of the two groups studied. No major difference was seen, but there was a tendency towards a higher maternal age in the nonchemical group than in the chemical laboratory group.

Table 4 lists the malformations observed and the causes of death. It is notable that most malformations registered in the chemical laboratory group were more severe than those in the nonchemical group. It is also interesting that, in two of the six perinatally dead in the chemical laboratory group, an abruptio placentae was registered.

Discussion

The overall outcome of the pregnancies in the study does not markedly or significantly deviate from that expected if the group is compared to a reference group made up of all women giving birth in Sweden. Since 1973, the average perinatal death rate and rate of major malformations has been approximately 1.5 and 2 ‰, respectively. When the material is broken down into two groups according to type of occupation, chemical laboratory work or not, the former group shows a significantly higher perinatal death rate and rate of major malformations. There is also a higher miscarriage rate in that group.

It is difficult to estimate the expected rate of miscarriages in a population studied by interviews or postal questionnaires. Experience shows that information on miscarriages obtained in this manner is often biased; thus, for instance, induced abortions are sometimes stated to be spon-

taneous. It is, perhaps, not very likely that this source of error affects the two groups studied in a different way. The miscarriage rate in the nonchemical group was reasonable.

The response rate in the interview and postal questionnaire studies was less than 100 %. This rate could bias the findings based on the total material but could hardly affect the outcome of the register studies. There were no discrepancies between the results of the two study techniques.

Another problem in interpreting the results of this study is that the cluster of abnormal births which initiated the study

Table 3. Maternal age distribution (‰) of women in the chemical laboratory group and the nonchemical group. Only women with pregnancies ending after 1 January 1973.

Age class (a)	Chemical laboratories	Other employment
≤ 19	0	2
20—24	15	17
25—29	63	41
30—34	18	31
≥ 35	3	9

Table 4. List of malformation diagnoses and probable causes of death.

Chemical laboratories	Other employment
<i>Malformations</i>	
Multiple gut atresia	Syndactyly
Cleft palate	Hypospadias
Hydrocephalus with brain malformations	
Hypospadias	
Cleft lip and palate	
Congenital heart defect and face malformation	
<i>Causes of death</i>	
Knot on the umbilical cord	Abruptio placentae
Dead at age 6 d; cause unknown	
Abruptio placentae	
Retentio and abruptio placentae	
Twin collision	
Dead at age 2 h; prematurity	

is included in the "chemical laboratory" group. If these 41 pregnancies are removed, 62 remain with 5 dead or seriously malformed infants, rates that are still different from those of the non-chemical group.

The various objections that can be raised make the results of this study questionable if they are isolated. However, an earlier report (5) described an increased miscarriage rate among women working in hospital laboratories, and another found an increased incidence of major malformations in infants born to laboratory workers at the Uppsala University (2). In the latter study, four infants with atresia of the gut and one with cleft lip and palate was found (among 245 infants born). It is interesting to note that also in the present material one case of atresia of the gut and two cases of cleft lip and/or palate were found among the 110 infants born.

Various confounding factors may exist to distinguish the group of women working in chemical laboratories from the other women studied. The age distribution can hardly explain the difference in pregnancy outcome. Abruptio placentae is known to be associated with maternal smoking (3). Two of the women in the present study whose infants died from abruptio placentae were nonsmokers, the third, not working in a chemical laboratory, smoked ap-

proximately 10 cigarettes a day during her pregnancy.

At the present time, it seems justifiable to suppose that work in chemical laboratories may involve a risk to the fetus. It is not possible to state which factor(s) may be of importance. Volatile chemicals (eg, organic solvents) are possible candidates, but the possibility of resorption through the skin should not be forgotten. We think that an intensification of efforts to reduce exposure to possibly harmful chemicals during work in chemical laboratories is justifiable, the hazard during pregnancy being one of many.

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