

**A STUDY OF ENVIRONMENTAL TOXICANTS IN WOMEN
UNDERGOING SPONTANEOUS ABORTIONS PRETERM AND FULL
TERM LABOUR: POTENTIAL HAZARDS TO PRENATES AND
NEONATES**

By

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SUMMARY

Study assessed the impact of two major organochlorine Pesticides (D.D.T. and B.H.C.) and their metabolites and isomers (D.D.E., D.D.D. and (r-B.H.C.) and five toxic metals cadmium (Cd), copper (Cu), Manganese (Mn), Nickel (Ni) and Lead (Pb) in maternal blood, cord blood, placenta, amniotic fluid and milk samples of 50 pregnant women from Impatient department of Queen Mary's Hospital, Lucknow (U.P.) Copper and Manganese were found in most of the samples of control and study group cases. These metals are normally occurring trace elements in the human body. Environmental toxicants were found to be double edged weapon's affecting the health of pregnant women and growing conceptus either directly or indirectly.

Introduction

The extent and gravity of the environmental pollution by agrochemicals and heavy metals has been a subject of increasing interest and research in the field of environmental science and technology. The potential harmful effects of pesticides and heavy metals on the animal and human beings have been reported by various scientists from time to time.

Toxicological studies in different parts of the world have thrown light on possible health hazards of major environmental organic pollutants such as chlorinated pesticides (CPS) and polychlorinated biphenyls (PCBS). The blood specimens

of women undergoing pre-term labour have been reported to be significantly contaminated with D.D.T. and its residues but no such correlation was observed in cases of spontaneous abortions (O'Leary *et al.*, 1970).

These pesticide residues have also been known to have some role in foetal growth retardation and high risk of congenital malformations in first trimester of gestation.

Chlorinated pesticides residues of D.D.T. and B.H.C. and concentration of cadmium (Cd), copper (Cu), Manganese (Mn), Nickel (Ni) and lead (Pb) are determined in maternal and cord blood, placenta, amniotic fluid and milk of women, undergoing spontaneous abortions, pre-term and full term labour including intra-uterine growth retardation and con-

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genital foetal malformations. The levels of pesticides residues and toxic metals are correlated with abnormal foetal outcome. The main objective of this study was to assess the role of these contaminants.

Material and Methods

A total of 50 women with normal and abnormal foetal outcome in the Inpatient department of Queen Mary's Hospital, King George's Medical College, Lucknow were included in the present set of study during the period from September, 1982 to August, 1983.

The cases were selected from the general population, 31 from urban areas and 19 from rural areas, all between 19 to 36 years of age. The study included 14 cases of spontaneous abortion, 14 cases of pre-term deliveries without any evident aetiology, 6 cases of intrauterine growth retardation, 4 cases of congenital foetal malformation and 12 cases with normal foetal outcome. The maternal blood, cord blood and amniotic fluid were collected in glass stoppered vials. Placenta was collected in glass bottles. Six milk samples were also collected within 48 hours of lactation by manual expression and kept in stoppered vials. All the samples were stored in cold at 4°C and analysed simultaneously after collection.

Observations

The analysis of pesticides was done by using electron captured gas liquid chromatography and those of metals by atomic absorption spectroscopy.

All the samples of maternal blood analysed for chlorinated pesticides revealed the presence of one or the other pesticides in each samples. It indicated that OCP were detectable in General Population although most of the values were towards lower side.

Higher levels of chlorinated pesticides were found in placenta and milk when compared to the maternal blood. Suggesting that OCP accumulate in fat rich tissues.

Presence of OCP in cord blood indicated that these compounds were transferred across the placenta though to a lesser extent.

The organochlorine pesticide levels in maternal blood, placenta, cord blood amniotic fluid and milk showed wide variations in range with most of the values on the lower side in control group. 95% confidence limits were therefore used for statistical analysis and comparison (Table I).

From Table II, it is evident that the pesticides levels were not significantly elevated in cases of spontaneous abortions

TABLE I

Percentage of women having detectable chlorinated pesticides in study group and control cases

	Maternal blood	Placenta	Cord blood	Amniotic fluid	Maternal milk
B.H.C.	100.0	100.0	95.83	100.0	100.0
-B.H.C.	95.74	100.00	91.55	92.30	100.0
D.D.E.	95.74	95.15	70.83	84.61	100.0
D.D.D.	82.97	80.76	58.33	30.75	83.33
D.D.T.	90.85	73.76	50.00	46.15	83.33
D.O.T.R.	95.74	95.15	70.83		100.0

when compared to the controls. This does not necessarily exclude the harmful effects of OCP on early pregnancy. These very levels of OCP could have the toxic influence on the growing embryo in susceptible individuals.

TABLE II
Summary of Elevated Pesticides Associated with Pre-term Labour, IUGR and Congenital Foetal Malformation

	Pesticides elevated
Pre-term labour	M NS P D.D.T., D.D.T. (R) C D.D.E., D.D.T. and D.D.T. (R)
IUGR	M D.D.E., B.H.C., r-B.H.C. P D.D.E., r-B.H.C.
Congenital foetal malformation	C D.D.E. M D.D.T., D.D.T. (R)

M = Maternal blood, P = Placenta,
C = Cord blood, N.S. = Not significant.

As regards the cases of pre-term labour were found to have significantly higher levels of D.D.T. and D.D.T. (R) in placenta ($P < 0.01$, $P < 0.01$) and D.D.E., D.D.T. and D.O.T.R. in cord blood when compared to the mean levels of these residues in control cases suggesting a possible contributory role of these toxicants in premature termination of pregnancy.

Besides, significantly higher levels of

D.D.E.—BHC and BHC were found in cases of intrauterine growth retardation through out maternal blood, placenta, cord blood and amniotic fluid suggestive of a possible role of pesticides in IUGR. But no definite opinion can be given because of limited number of cases.

The cases of congenital foetal malformations were found to have significantly higher levels of D.O.T. ($P < 0.05$) in maternal blood when compared to the mean D.D.T. levels in control cases. Thus the high level of D.D.T. may be a contributory factor to the foetal wastage in these cases.

Elevated pesticides levels were found more frequently in study group in cases of preterm labour (3.36-6.1 times) and intrauterine growth retardation (3.36-6.72 times).

Cadmium, lead and Nickel are the environmental contaminants not found normally at a detectable level in the blood while Cu and Mn are essentially trace elements of the body. Only elevated levels of these metals are of clinical significance.

Cd, Cu, Mn, Ni and Pb were detected in 38.9 of all the samples of maternal blood, placenta cord blood, amniotic fluid and milk. Nickel was not detectable in amniotic fluid and milk (Table III).

It may be inferred from Table IV that the detection of these metals in the blood of general population can be taken as exposure standard for the environmental

TABLE III
Percentage of Women Having Detectable Metals Level in Control and Study Group

Metals	Maternal blood	Placenta	Cord blood	Amniotic fluid	Mother's milk
Cd	92.85	85.71	78.94	75	66.66
Cu	100.00	100.00	100.00	100	100.00
Mn	92.23	95.23	68.00	75	100.00
Ni	45.25	39.09	10.52	0	0.00
Pb	80.95	90.47	89.47	100	66.66

pollution by these toxic metals. Copper and Manganese were widely present in all the samples as these are amongst the essential trace elements of the body.

TABLE IV

Summary of Elevated Metals Associated with Abortions, Pre-term Labour and Congenital Foetal Malformation

	Metals elevated
Abortions	M Cu, Mn, Pb
Pre-term labour	M Cu, Cd, Ni, Pb P Mn C Mn
Congenital foetal malformation	M Cu, Cd, Mn, Ni, Pb

Confidence limits were estimated for the median's of metal levels in control cases in order to compare these with the study group. Presence of metals in the placenta and milk in significant amount suggests the binding affinity of these metals for fat rich tissues. Presence of cord blood and amniotic fluid (at a level lower than maternal blood) indicates that these metals do cross the placental barrier though to a lesser extent.

The cases of spontaneous abortions were detected having significantly higher levels of Copper and Manganese in maternal blood ($P < 0.001$ and $P < 0.05$) when

compared to the levels in control cases. Elevated Lead levels were also seen more frequently than controls. Therefore a contributory role of these toxic metals may be suggested in the cases of abortion. In cases of congenital foetal malformation all the metals were found to be significantly higher when compared to the controls. The raised Copper levels were highly significant statistically ($P < 0.001$).

Conclusion

The study suggested the teratogenic property of these toxic metals already quoted in literature. The results in this study were parallel to the observations by previous workers.

The direct relationship of these environmental toxicants to abnormal foetal outcome cannot be emphasized too boldly as these cases have multifactorial aetiology, however, their contributory role is possible. Therefore further research in this field of obstetrics is of paramount importance.

References

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