



AN INVESTIGATION OF THE CONNECTION BETWEEN EXPOSURE TO PESTICIDES AND SLOWING OF INTRAUTERINE DEVELOPMENT

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ABSTRACT:

The ubiquitous presence of organophosphorus insecticides in the environment and the widespread usage of organophosphorus insecticides in agriculture both provide a potential risk to human health. Live infants from singleton pregnancies were analysed to assess the association between exposure to pesticides and intrauterine growth retardation (IUGR). The number of live newborns with IUGR was 79, while the number of live newborns without IUGR was 292. The moms were residents of rural settlements in the state of Chihuahua, which is located in Mexico, when they were carrying their children. We looked at people's exposure to various agricultural chemicals. It was shown that there is a substantial connection between the occurrence of IUGR and a woman's history of having a positive exposure to pesticides, as demonstrated by either the mothers themselves or their neonates having acetylcholinesterase activity levels that were lower than 20 percent. The proportions of exposure in the cases were 18 percent, whereas the percentage in the control group was 8 percent; the adjusted OR (fat free mass, anti-cytomegalovirus antibodies, and placental weight) was 2.33 and the significance level was 0.04.

Keywords: *Intrauterine growth retardation; Pesticides; Acetylcholinesterase; Organophosphoric; Birthweight*

INTRODUCTION:

Intrauterine growth retardation (IUGR) has been linked to increased prenatal morbidity and mortality (Kramer et al., 1990; Rizzo and Arduini, 1991), limited growth during childhood and adolescence (Strauss and Dietz, 1997; Saigal et al., 2001), and a greater proportion of cardiovascular and metabolic diseases in adult life (Saigal et al., 2001). These findings were published in the journals Kramer (Saigal et al., 2001). Kramer et al. reported the results of these

studies (Barker et al., 1993; Benediktson et al., 1993). There are a number of risk factors that have been linked to intrauterine growth restriction, including placental pathology, maternal illnesses, and baby diseases. Furthermore, intrauterine growth limitation is linked to the mother's body composition, which is significantly related with the weight of the infant (Lederman et al., 1999). Congenital illnesses including CMV, rubella, and toxoplasmosis may be related with IUGR, which is one of the symptoms that may be associated with these infections (Yankowitz and Weiner, 1999). During the gestational period, the exposure to toxics, (Kramer, 1987) such as maternal tobacco addiction (Christianson, 1979), cocaine addiction (Ostrea et al., 1997), exposure to lead (Gonzalez-Cosso et al., 1997), or other toxics such as pesticides (Kramer, 1987), may also be associated with IUGR. Other examples of toxics include exposure to lead (Gonzalez-Co Lead is another toxin that may be harmful (Gonzalez-Cosso). There have been reports of links between exposure to pesticides during the gestational period and adverse reproductive outcomes (De Cock et al., 1994; Arbuckle et al., 2001). In addition, there have been reports of links between exposure to these substances and low birth weight in populations that have been exposed to these substances. These connections have been discovered in populations that have been exposed to pesticides as well as the chemicals in question (Sanjose et al., 1991). In animal models, the perinatal implications have been shown to be equivalent; nevertheless, in a considerable number of study studies, only low birth weight has been consistently associated to exposure. [Further citation is required] [Further citation is required] (Gupta, 1995). It is possible to be exposed to organophosphate compounds either via one's line of work or through their natural surroundings. Populations living in close proximity to areas where methyl-parathion was used have an increased risk of exposure to the chemical through skin contact as well as through consumption of contaminated water, food, and plants, according to research that was conducted and published in 1997 by the United States Agency for Toxic Substances and Disease Registry (ATSDR). The research was conducted by the United States Agency for Toxic Substances and Disease Registry (ATSDR).

MATERIAL AND METHODS:

Intrauterine growth retardation, also known as IUGR, has been linked to increased prenatal morbidity and mortality (Kramer et al., 1990; Rizzo and

Arduini, 1991), limited growth during childhood and adolescence (Strauss and Dietz, 1997; Saigal et al., 2001), and a greater proportion of cardiovascular and metabolic diseases in adult life (Saigal et al., 2001). These results were reported in Kramer et al (Barker et al., 1993; Benediktson et al., 1993). IUGR might be caused by a number of different reasons, some of which include placental pathology, maternal illnesses, and baby diseases. In addition, intrauterine growth limitation is tied to the body composition of the mother, which is significantly associated with the birth weight of the child (Lederman et al., 1999). IUGR is one of the symptoms that may be related with congenital infections such CMV, rubella, and toxoplasmosis. Other possible congenital illnesses include: (Yankowitz and Weiner, 1999). During the gestational period, the exposure to toxics, (Kramer, 1987) such as maternal tobacco addiction (Christianson, 1979), cocaine addiction (Ostrea et al., 1997), exposure to lead (Gonzalez-Cosso et al., 1997), or other toxics such as pesticides (Kramer, 1987), may also be associated with intrauterine growth restriction (IUGR). Lead is another poisonous substance (Gonzalez-Cosso). There have been reports of links between exposure to pesticides during the gestational period and adverse reproductive outcomes (De Cock et al., 1994; Arbuckle et al., 2001), in populations exposed to these substances as well as low birth weight. These studies were conducted in populations that were also found to have low birth weight. These connections have been established in populations that have been exposed to both pesticides and the substances in question (Sanjose et al., 1991). However, only a low birth weight has been consistently associated to exposure in a considerable number of study studies; the perinatal implications have been equivalent in animal models. [Further citation...] [Further citation...] (Gupta, 1995). Both occupational and environmental exposure to organophosphate compounds have the potential to result in contamination. According to research that was conducted and published in 1997 by the United States Agency for Toxic Substances and Disease Registry (ATSDR), populations living in close proximity to areas where methyl-parathion was used have an increased risk of exposure to the chemical through skin contact as well as through consumption of contaminated water, food, and plants. This increased risk was found to be present in populations living in close proximity to areas where methyl-parathion was used.

PROCEDURES:

The Instituto Mexicano del Seguro Social's Hospital General de Zona 11 in Delicias, Chihuahua served as the source for the recruitment of mother/newborn pairs for the purpose of this research. In order to determine the prevalence of IUGR, a screening was performed. The newborns were defined as having intrauterine growth restriction (IUGR) if, according to the weeks of gestation, their weight was less than the 10th percentile reported in the tables of Overpeck et al. The number of weeks of gestation was calculated by using the most recent menstrual cycle (1999). The hospital's institutional review board awarded the surgery its seal of approval, which means it may now go forward. When the mothers were requested to take part in the research, they were provided with detailed information on the objectives and methods of the study. Each participant filled out an informed consent form, which was then reviewed by all of them and signed by each of them. An interview was performed, a structured questionnaire was filled out, and a blood sample was obtained after delivery in order to analyse maternal exposure to agrochemical chemicals during pregnancy. This was done so that the level of exposure could be determined. This blood sample was analysed for acetylcholinesterase (AChE) activity (Ellman et al., 1961), haemoglobin (spectrophotometry, automatic CellDyn 3700 SL haematology analysing system), and a qualitative estimate of serum IgM antibodies against rubella. All of these tests were performed using the CellDyn 3700 SL haematology analysing system. Serum samples were stored in a freezer at a temperature of 20 degrees Celsius before being analysed using an IMX System. Umbilical cord vein blood samples were drawn in order to analyse neonates' concentrations of acetylcholinesterase and haemoglobin. These measurements were carried out on babies who had just been born. Following delivery, the maternal coagulum was removed from the placentas, and the placentas were then placed in plastic bags prior to being weighed on a paediatric scale that had been calibrated in preparation. Electric bioimpedanciometry was performed on the mother 4–12 hours after delivery using a Body Dynamics 310 corporal composition analyzer in the following manner: first, the mother's weight and height were measured. After that, the sensor pads were placed in the right hand, forearm, foot, and leg of the mother while she was in the semi-flower position with a 30 degree inclination. Finally, the results of the electric bioimpedanciometry were analysed. The anthropometric parameters were

evaluated by people who had previous training and were already familiar with the usual methodologies that were used in the evaluation process.

STATISTICAL ANALYSIS:

Kramer (1987); Gonzalez-Cosso et al. (1997) and Sanin et al. (2001) investigated the link between exposure to cholinesterase-inhibiting pesticides and intrauterine growth restriction (IUGR). They adjusted their findings using the most reliable birth weight predictors that were available at the time. Kramer's study was published in 1987. Gonzalez-Cosso et al. (1997) and Sanin's study was published in 2001. To get started, a descriptive data analysis was done so that the characteristics of the study group could be grasped better. This was done so that the next step could be taken. In order to identify the key predictors of IUGR as well as the probable confounding variables that may be at play in the link between the two, a multivariate analysis that was based on logistic regression models was carried out. This was done in order to determine the following: In order to choose the best model, we began with a saturated model that included all of the variables that the bivariate analysis revealed to have a p-value of 0.010 or below. From there, we moved on to the multivariate analysis. We got began by getting rid of the covariates one by one. Calculating the percentage of change in the odd ratios (OR) compared to the value obtained from the main association was the method that was used in order to establish the degree to which one variable would be able to account for another (Rothman, 1987). The smoking habit of the mother, her employment, the number of children she had, the placental weight in grammes (g), IgM antibodies against rubella virus, T. gondii, and CMV, and the gender of the infant were some of the characteristics that were assessed. All relevant confounders and predictors with a statistically significant connection were taken into account in the final iteration of the multivariate model. The odds ratio (OR), which was computed by using the maximum likelihood method and was accompanied by a confidence interval of 95%, was used in the reporting of the results (95 percent CI). The standard procedures proposed by Hosmer and Leneshow were used in order to do an analysis on the modification of the completed model (2000). Each and every one of the analyses, in addition to the calculations regarding the sample sizes, were carried out using Stata (Stata Statistical Software, Release 5.0, Stata Corporation, College Station, TX). According to the findings of a pilot study, it

was determined that the appropriate size of the sample would be one that had a statistical power of ninety percent, a level of confidence of ninety-five percent, and an expectation of discovering ten percent of exposure to cholinesterase inhibiting pesticides in the healthy group and twenty-five percent in the IUGR group. These figures were based on the expectation that the healthy group would have ten percent of the exposure, while the IUGR group would

RESULTS:

During the course of the research project, which spanned a total of 6109 days, the participants in the study accounted for 7.36 percent of the total number of hospital births that took occurred during that time. In all, 450 women and their newborns took part in the research study; of the newborns, 104 were diagnosed with intrauterine growth restriction (IUGR), while the other 346 were considered to be clinically healthy. Due to the absence of some factors, the final analysis was conducted on a total of 371 mother/newborn pair combinations. Of these, 79 had IUGR whereas the remaining 292 did not. There was a lack of information on the placental weight ($n = 27$), anti-cytomegalovirus IgM antibodies ($n = 48$), fat-free mass in the mother ($n = 8$), and newborn acetylcholinesterase ($n = 4$). There were no statistically significant differences between the mother-newborn pairs that were included in the study and those that were excluded from the study when it came to the characteristics that were taken into account in the final analysis. This applies to both the mother-newborn pairs that were included and those that were left out. The clinical characteristics of the moms did not vary significantly from one another in any meaningful way (Table 1). This difference did not approach the level of statistical significance ($p = 0:79$), even though there was a foetal death antecedent in 10 percent of the IUGR group and 8 percent of the healthy group. In the group of women who had IUGR, 4% of them smoked tobacco throughout their pregnancies, while only 2% of the women in the healthy group did so [$p = 0:23$]. [S]moking throughout pregnancy was associated with an increased risk of IUGR. The enzymatic activity of AChE decreased during the months of greater use of pesticides in patients who were evaluated during this time (5.24 1.16 IU—April to August), compared to the non-use period 5.78 1.21 UI (October–February), or those in which the use was minimal (March and September) 6.21 1.25 UI. Patients who were evaluated during this time were compared to those who were evaluated during this time (p

0:01). During this period, patients were being examined and assessed. In the mothers, the inter-individual variability of acetylcholinesterase activity was found to be 22 percent, whereas in the newborns it was found to be 26 percent. It was determined that there was a correlation between the acetylcholinesterase activities of the mothers and the babies, and the coefficient of correlation was found to be 0.43, and the probability level was 0.01.

DISCUSSION:

The results of this study indicate that there is a correlation between the history of the mother's positive exposure to pesticides and intrauterine growth restriction (IUGR) in newborns. IUGR is an abbreviation for intrauterine growth restriction. It was discovered that the levels of acetylcholinesterase activity in these mothers and their infants were 20 percent lower than those seen in women and newborns from similar groups at a period when pesticides were not being given. The current design makes it difficult to isolate the toxic agents to which the subjects were exposed, but members of the organophosphate group were the most commonly used pesticides in the communities where the participants in this study lived while they were pregnant. This is despite the fact that it is difficult to isolate the toxic agents due to the current design. The pregnant women were exposed to these chemicals throughout their pregnancies. In the majority of instances, they were treated to a number of distinct chemical chemicals that were combined into one another. The use of combination pesticides in agricultural settings as a technique of managing pests is becoming increasingly popular, however the use of organochlorine pesticides is still common in these contexts. These are compounds that go through the placenta as well, and they have been discovered in the umbilical cord (Waliszewski et al., 2000), in addition to being identified in the breast milk of women who live in certain cities in Mexico (Terrones et al., 2000). Authors who have identified the pesticides exposure relationship and measured it in residential areas have shown that there is a greater risk of low birth weight in women whose residence is up to 300 metres from the zone where these kinds of substances have been used. This was discovered by measuring the relationship in residential areas. This was shown to be the case when compared to female participants whose homes were located a greater distance from the zone (Xiang et al., 2000). In other studies, the possibility of a relationship between IUGR and exposure to

pesticides was investigated; however, these investigations came up empty. However, these investigations have shown a significant increase in the chances of having a low birth weight and dying during pregnancy (Hanke and Hausman, 2000). We have not been able to find any evidence to support the hypothesis that there is an interaction between the maternal fat-free mass of 6.45 kg and the presence of pesticides in the environment (data not shown). This could be because the sample size was not estimated to support such an interaction. In any case, we have not been able to find any evidence to support the hypothesis. We are unable to rule out the chance of confusion being caused by the presence of suspected teratogens or other variables that were not taken into consideration in this specific inquiry. However, we are able to rule out the possibility of confusion being caused by the presence of other factors.

CONCLUSION:

It is likely that novel biomarkers, such as levels of pesticide metabolites in meconium, may be able to provide more precise data when used to determine exposure during the prenatal period (Whyatt and Barr, 2001). In addition, genotoxic markers that are sensitive to early effects have the potential to give information that is useful. A multivariate analysis was performed using the variables that exhibited statistically significant findings in order to account for the possibility that IUGR might be caused by a variety of different factors. The results of this analysis were employed in the study. The connection between IUGR and pesticide exposure remained unchanged when considered within the framework of this model. It may be advantageous to do study on the elements that affect birth weight due to the fact that birth weight is a very important predictor of both survival during the perinatal period and healthy development later on in life (Barker et al., 1993; Benediktson et al., 1993). In addition, it is absolutely necessary, on many different levels of society, to search for a wide variety of solutions to lessen the negative effects that pesticides have on people's health and to work toward a method of agricultural production that is less harmful to the environment. Both of these things need to be done simultaneously.

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