R E S U L T S

T A B L E (9)

DATA OF THE CASES STUDIED

Case no.	Serial no.	Age of child (months)	Sex	Child's weight (kg)	Age of mother (years)	Maternal diet	Artificial milk diet	Pesticides	Residence	No. of children nursed	Length (cm)
1	2	1 5/30	♀	3.80	30	Regular	–	-ve	Urban	1	55.5
2	5	12	♂	7.20	32	"	–	"	"	4	69.5
3	3	3	♀	3.50	28	"	–	"	"	2	60.0
4	4	1 5/30	♀	3.70	29	"	+	"	"	3	56.0
5	2	6	♂	6.00	26	"	–	Kelthane	"	1	72.0
6	3	20	♀	9.50	27	"	+	-ve	Rural	2	77.0
7	6	13	♀	8.60	33	"	–	Kelthane	"	5	74.0
8	3	24/30	♂	3.75	31	"	–	-ve	"	2	57.0
9	3	2	♂	4.75	28	"	–	Kelthane	"	2	59.5
10	6	8	♂	8.57	34	"	–	-ve	Urban	5	71.0
11	5	12/30	♀	2.50	36	"	–	Kelthane	"	4	45.0
12	2	12/30	♀	3.50	26	"	–	-ve	"	1	52.0
13	4	17/30	♂	2.50	29	"	–	-ve	"	3	50.0
14	4	26/30	♂	2.25	33	"	+	O.P. + Kel.	"	3	54.0
15	2	12	♂	7.00	30	"	–	-ve	Rural	1	70.0
16	5	9	♂	5.50	36	"	–	Kelthane	Urban	4	67.0
17	4	7	♂	4.00	35	"	–	-ve	Rural	3	60.0
18	5	9	♂	4.00	35	"	–	-ve	Urban	4	64.0
19	6	24/30	♀	3.00	34	"	–	-ve	"	5	60.0
20	4	6/30	♂	3.50	31	Irregular	–	Kelthane	"	3	58.0
21	7	12/30	♂	3.00	37	Regular	–	"	"	6	54.0
22	1	12/30	♀	2.00	28	"	–	-ve	"	0	44.0
23	1	24	♀	8.00	26	"	–	Kelthane	Rural	0	75.0
24	1	8/30	♂	3.00	20	"	–	-ve	Urban	0	52.0
25	1	14/30	♀	3.40	28	"	–	-ve	"	0	47.0

T A B L E (9) [continued]

Case no.	Serial no.	Age of child (month)	Sex	Child's weight (kg)	AAge of mother (years)	Maternal diet	Artificial diet	Pesticides	Residence	No. of children nursed	Length (cm)
26	1	18		4.50	25	Regular	-	-ve	Urban	0	61.0
27	3	15/30		3.00	27	"	-	"	"	2	48.0
28	3	20/30		3.50	28	Irregular	-	Dimeth.	"	2	49.0
29	6	18		8.00	30	"	+	Kelthane	Rural	5	78.0
30	2	13		9.25	25	Regular	-	-ve	"	1	80.0
31	1	8		7.90	24	"	+	Dimeth.	"	0	72.0
32	3	6		8.00	22	Irregular	-	-ve	"	2	72.0
33	3	10		7.50	30	"	-	"	"	2	68.0
34	1	20		11.20	33	Regular	-	"	"	0	90.0
35	4	12		7.50	25	Irregular	-	"	"	3	69.0
36	4	13		9.80	29	"	-	Dimeth.	Urban	3	78.0
37	5	9		5.50	36	Regular	-	-ve	Rural	4	71.5
38	4	7		4.00	35	"	-	"	"	3	68.0
39	5	9		4.50	35	"	-	"	"	4	72.0
40	6	24		8.50	34	"	-	"	"	5	76.0

Note: All cases administered breast milk to their children.
All cases did not receive medical hormones except cases 6, 14, 28, 29 and 31
All cases delivered by normal labour except case no. 11 and 17 (Caeserean section)
All cases were normal except Case 11 (diabetic), 17 and 26 (hypertensive) and 31 (diabetic)

T A B L E (10)

DISTRIBUTION OF PESTICIDES IN HUMAN MILK
IN RELATION TO MATERNAL AGE

Pesticide	Maternal age		T o t a l
	>30 years old	<30 years old	
Positive	6	7	13
Negative	15	12	27
T o t a l	21	19	40

$\chi^2 = 0.29$
$P < 0.05$

T A B L E (11)

RESIDENCE IN RELATION TO THE PRESENCE OF PESTICIDES IN HUMAN MILK

Pesticide	Residence		T o t a l
	Rural	Urban	
Positive	9	4	13
Negative	10	17	27
T o t a l	19	21	40

$\chi^2 = 12.95$
$P > 0.05$

T A B L E (12)

ASSOCIATION OF PESTICIDES IN HUMAN MILK WITH THE FREQUENCY OF LACTATION

Pesticide	First lactation	All lactated	T o t a l
Positive	2	11	13
Negative	15	12	27
T o t a l	17	23	40

$\chi^2 = 5.3$
$P < 0.05$

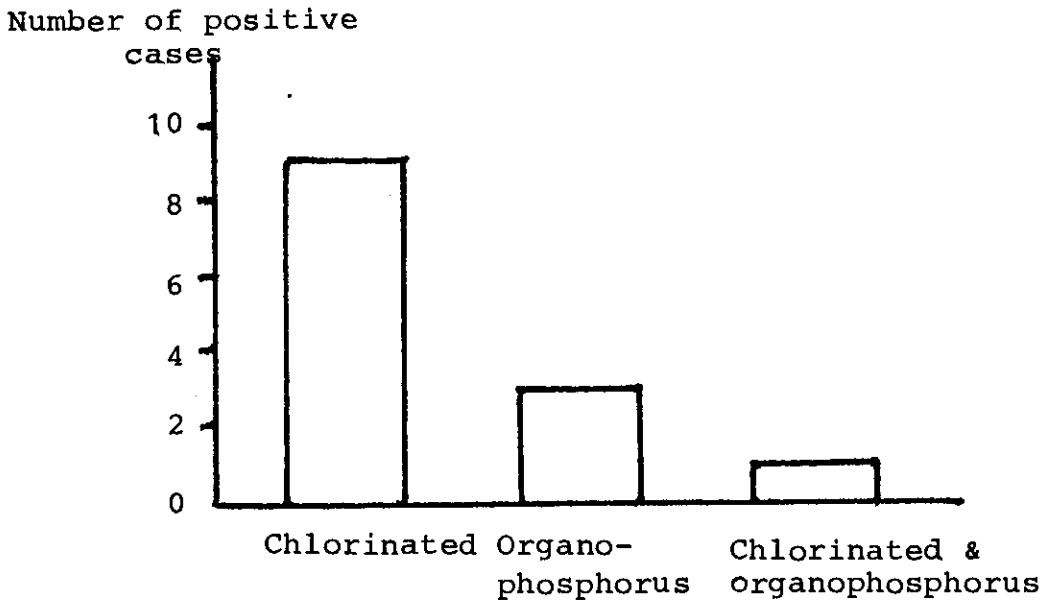

FIGURE (4)
Distribution of chlorinated and organophosphorus pesticides among the positive samples of human milk in the cases studied.

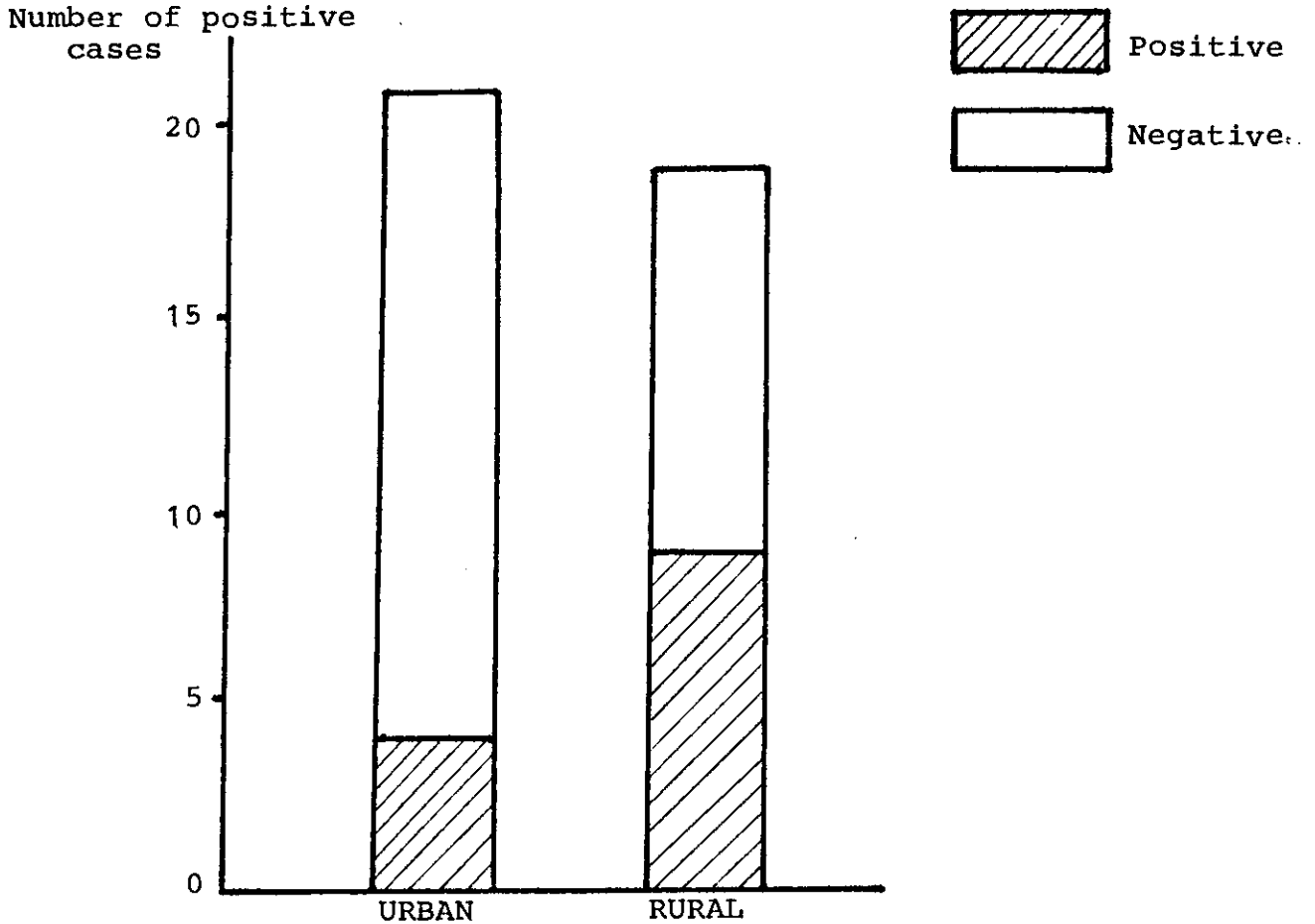

FIGURE (5)

Distribution of positive and negative findings of pesticides (chlorinated and organophosphorus) in human milk among the rural and urban women studied

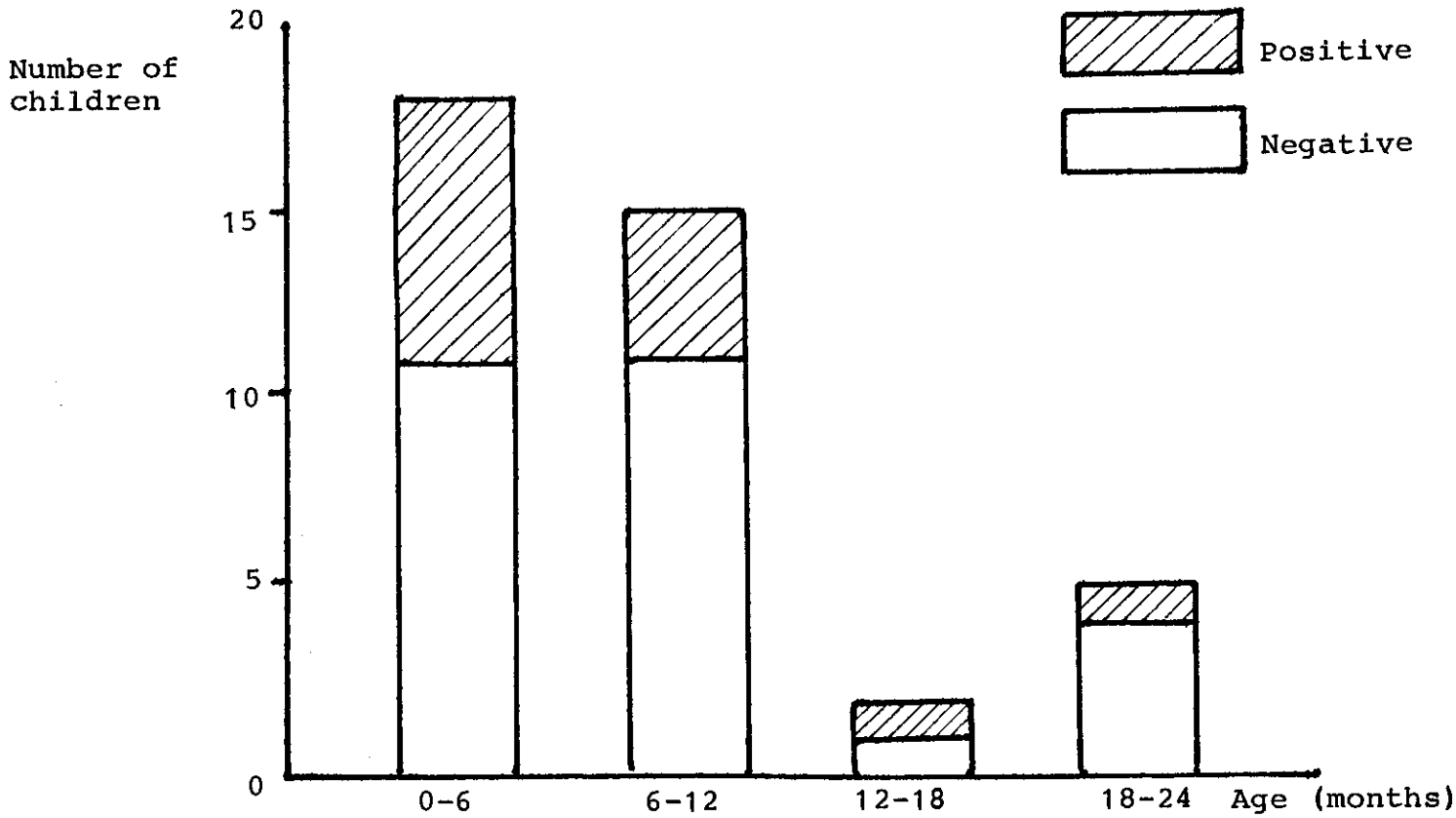

FIGURE (6)

Presence of pesticides in human milk in various age groups of nursed babies included in the present study

D I S C U S S I O N

D I S C U S S I O N

The problem of environmental contamination by toxic substances and human exposure to these substances has attracted increased attention in recent years. Particular concern has centered on insecticides, which have become widespread environemntal pollutants, as well as contaminants of the human population (Jensen, 1983).

The use of insecticides now causes a lot of harmful effects on mothers and infants. The insecticides involved are the polychlorinated biphenyls (PCBs) and dichloro-diphenyl dichloroethane (DDE), which are widely used in pesticide applications (Rogan, 1986). From 1930 to 1972, in the U.S.A., and until today in our country, D.D.T. is sprayed or applied directly into the environment in large quantities. This chemical is not readily degraded in the environment, not is it metabolized nor excreted by any organism. Instead, they come into a steady state; they bioconcentrate in the food chain, and produce low level, but ubiquitous contamination of human beings (Brinkman 1980).

Exposure and consequent storage of these chemicals by human beings has been repeatedly documented. They are

stored in fat, and are not excreted under physiological circumstances by human beings (Rogan, 1986).

Since breast milk is about 5% fat, and this fat appears to be in approximate equilibrium with the body's fat stores, breast milk is highly susceptible to transmit insecticide contamination.

Since breast milk analyses have been undertaken for purposes of monitoring exposure to and storage of persistent environmental chemicals, this study did not include the monitoring of morbidity in the children. Insecticides are toxic, but data on their toxicity for human beings is very sparse, and is limited only to high-dose and mixed exposure (Lucas et al., 1982).

The largest U.S. survey was done in 1975 on women volunteers from a representative sample of U.S. hospitals. Out of 1436 women tested for DDT, all had p,p'-DDT and p-p'-DDE (dichlorodiphenyl-dichloroethane) - the most stable metabolite in tissues (Savage, 1977).

PCBS were present in at least "trace" amounts in 9.9% of 1038 samples, and about one-fourth the Food and Drug Administration "action level" (2.5 parts per million) at which a commercial food would have been removed from the market (Lucas et al., 1982).

There have been two outbreaks of mass poisonings due to PCBs, and the thermal degradation products that contaminate them as they are used are called Yusho (oil

disease) in Japan in 1968 (Kuratsune, 1980), and the other, called Yucheng, in Taiwan (Hsu et al., 1984).

The chemicals leaked into cooking oil during its processing, and went undetected until the oil was analyzed chemically after the disease outbreaks. The principal sign of toxicity was chloracne, which is a highly toxic, cystic, relatively non-inflammatory acne-like rash. The children born to exposed mothers tended to be of low birthweight, had hyperbilirubinaemia, and had pigmentation of the gingiva, nails, nose, and axillary and groin folds (Rogan, 1982).

Unfortunately, in Egypt, there have been no detailed studies on this subject until now. In this work, we are attempting to throw some light on chlorinated or organophosphorus insecticides excreted in human milk.

Our results are tabulated in Table (9), showing age of babies, sex, weight, age of mother, maternal diet medications, health status, obstetric history, residence, serial number of the infant and the presence or absence of insecticides in breast milk. From that table, we can observe that, out of the 40 samples, only 13 were positive for breast milk insecticides:

Positive chlorinated pesticides (Kelthan): 9 samples

Positive organophosphorus pesticides (Dimethoate): 3 samples

Positive both insecticides: One sample.

This percentage is to some extent of value in comparison to the work of Rogan (1986) in U.S.A., who found the PCBs and DDe in maternal serum, cord blood, placenta and serial samples of breast milk from 868 women. Almost all samples of breast milk showed detectable levels of both chemicals. The level was higher in black women, older women, cigarette smokers, and in those who consumed fish during pregnancy. Only age and race showed large effect.

On the other hand, previous studies by Prodyet (1989) had been made on two generations of an Israeli family who had been chronically exposed to organophosphates, and had 100-fold amplification of the "silent" allele of the CHE gene on chromosome 3; the absence of the amplification of other genes on chromosome 3 suggests that the amplification of the CHE gene was a specific response to exposure to the organophosphate.

Malathion effects were studied by Lonnerdal and Asquith (1982), who found that it is absorbed during typical spraying doses, without appearing to contaminate the human breast milk in amounts that would be hazardous to a nursing infant.

Also, Karalliedde (1988) reported on two patients who ingested organophosphate insecticides with suicidal intentions during the second and third trimesters of pregnancy. The mothers delivered normal healthy infants

after successful and energetic management of the cholinergic and intermediate phases of the poisoning.

In our work, as seen in Table (10), there is significant association between maternal age, and the presence of pesticides in human milk, but our results show that, as age of the mother rises, the level of pesticide also rises. This indicates that environmental pollution is severe. This is in contrast to other studies done in the U.S.A., where the level of pesticide decreases as the age of the mother rises, because, among other causes, the use of chlorinated pesticides has been banned since 1972, as mentioned before.

Also, Table (11) shows that there is no significant association between maternal residence and the presence of insecticides in human milk. We found positive samples in both rural and urban areas. Samples no. 1-20 were from Cairo, while samples no. 21-30 were from Benha. The samples no. 5, 7, 9, 11, 14, 16 and 20 were all positive for kelthane. Kelthane is the only chlorinated insecticide still widely distributed in Cairo. Samples no. 21, 23, 29 were positive for chlorinated insecticides, while samples no. 14, 28, 31 and 36 were positive for organophosphorus insecticides. Organophosphorus compounds are distributed much more in rural areas than in urban ones.

As regards the frequency of lactation, i.e. number of breast-fed babies that were fed by their mothers, it is well known that women have higher levels in their first lactation, and in the earlier samples of a given lactation, and the level declines both in the time spent in breast-feeding, and in the number of children nursed. Their decline is a measure of exposure to the child (Lucas et al., 1982).

In our work, there is a significant difference between the milk samples from mothers lactating for the first time and those who have been lactating more than once. As the number of lactations increases in frequency, the samples showed positive results for pesticides. This indicates an excess pollution in our country, and a dangerous level of exposure to those harmful chemicals. It is supposed to be that all fat lost from mothers by lactation contains pesticides stored in their adipose tissues. So, the first child will receive the chemicals stored, and the second one will receive less amounts of chemicals. In our country, the second and third nursed babies received contaminated milk, which indicates the high index of pollution (Table 12).

Figure (4) shows the distribution of the chlorinated and organophosphorus pesticides among the positive samples of human milk. It was found that the percentage of the chlorinated samples was more than the organophosphorus

samples, and one case had both chemicals present. This case (case no. 14) nursed her baby, and had breast-fed 3 children before this one. She was 33 years old, and her breast milk contained both chlorinated and organophosphorus pesticides, denoting high contamination. The baby showed multiple congenital anomalies, and was of low-birth weight. Despite his age of 26 days old, he was only 2.25 kgs. She gave a positive history of the use of organophosphorus compounds regularly every week in her household.

Figure (5) showed the presence of pesticides (both chlorinated and organophosphorus) in the rural and urban areas. There is no statistically significant difference between both groups.

Figure (6) showed the various age groups of the nursed babies included in this study. There were grouped as:

First group: 0-6 months
Second group: 6-12 months
Third group: 12-18 months
Fourth group: 18-24 months

All the age groups showed positive samples of contamination (as shown in Figure 6).

In this study, all the mothers nursed their babies immediately after delivery, and maintained breast feeding

until weaning at the average age of 2 years old. Only one mother fed her child artifically, because she had not enough breast milk to feed her child.

CONCLUSION

C O N C L U S I O N

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In this study, we stressed upon the pesticides that contaminate breast milk. We detected that human milk can be contaminated and may thus affect future growth of the infant, and even threaten with other hazards.

We also detected a certain degree of environmental pollution in our country.

We therefore recommend to exercise increased care against the abuse of pesticides in both domestic and agricultural fields.

We also recommend authorities to undertake a much larger study on a greater scale with follow up of children born to mothers whose milk samples were contaminated to assess the future effects of pesticides on the infant's health, growth and development.

S U M M A R Y

S U M M A R Y

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Breast feeding continues to have practical and psycho logical advantages that should be considered when the mother selects the method for feeding her newborn. Human milk is the most appropriate of all available milks for the human infant, since it is uniquely adapted to his (or her) needs.

The growing awareness of the problems of contamination of human milk by environmental pollutants has been particularly concentrating on the contamination of milk by polychlorinated biphenyls (PCBs) and organophosphorus compounds (OP).

In the present thesis, fourty lactating mothers were submitted to the random cross-section study of this work. They were selected to be without manifestations or signs of toxicity with organophosphorus or chlorinated compounds (i.e. random samples). Twenty cases were selected from urban areas, and the other twenty cases were selected from rural areas (Benha). For each case, the infant was examined for his general condition, weight, length, and head circumference.

Each milk sample was examined for detecting traces or any residual metabolite of either polychlorinated biphenyls (PCBs) or organophosphorus compounds (OP).

Out of the total of 40 samples,

13 samples were positive for insecticides

9 cases were positive for PCBs (Kelthane)

3 cases were positive for OP (dimethoal)

1 case was positive for both types.

This percentage is, to some extent, of value compared to the similar studies in the U.S.A. (Rogan, 1986), and in Taiwan (Hsu, 1984). However, this is the first of such studies to be conducted in Egypt.

In our work, we noticed that there is no apparent physical or mental abnormality in the examined infants, except for one case (Case no. 14), who had multiple congenital anomalies, and was of low birth weight.

Also, there was no significant association between the residence and the presence of insecticides, with the distribution of Kelthane being more in urban areas, and that of dimethane more in rural areas.

We also noticed that, as the age of the mother increased, the level of pesticides increased in the milk.

This indicates that environmental pollution is severe in contrast to other studies done in the U.S.A., where the level of pesticide decreased as the age of the mother increased, because among other causes, the use of chlorinated pesticides was stopped, and they have been banned since 1972.

In our work, there is a significant difference between the milk samples from the lactating mothers for their first time, and those who have been lactating more than once. As the number of lactation increases in frequency, the samples showed positive results for pesticides. This also indicates an excess of pollution in our country.