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METHODOLOGICAL FEATURES OF STUDYING THE EFFECT OF SOIL POLLUTION BY EXOGENOUS CHEMICALS ON PUBLIC HEALTH.

Yusupkhujaeva A.M.
Kurbanova Sh.I.
Department of Municipal Hygiene and Occupational Hygiene.
Tashkent Medical Academy, Tashkent Uzbekistan

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Abstract:
In the literature there is only information about chronic exposure during professional contact with pesticides (Yu. I. Kundiev et al. "Without-the danger of using pesticides"). There is no data in the literature on the chronic effects of pesticides on the health of the population in agricultural areas, taking into account the level of soil contamination with biocides.

Keywords: health, soil contamination, population

Currently, there is no methodology for studying the effect of soil pollution by exogenous chemicals (in particular, pesticides) on public health.

In the literature there is only information about chronic exposure during professional contact with pesticides (Yu. I. Kundiev et al. "Without-the danger of using pesticides"). There is no data in the literature on the chronic effects of pesticides on the health of the population in agricultural areas, taking into account the level of soil contamination with biocides.

We set the task to study the result of the chronic effects of pesticides introduced into the soil on the health of the rural population. For this purpose, material has been collected on the levels of implementation, residual amounts of pesticides in the soil, as well as on the health status of the population in the region regarding their intensive soil pollution.

Agricultural areas in which organochlorine pesticides P1 and P2 were mainly used were selected as the study region. (respectively 37-58 and 17-20% of the total number of pesticides sold by pure preparation).

Table 1 presents data on the relative intensity of pesticide use in the experimental region and for comparison in the republic as a whole.

Table No. 1
Intensity of application of pesticides in the experimental region and throughout the republic

Region	**Amount of pesticides (in kg) per 1 ha of arable land**	
	Total	Especially dangerous
Investigated	12,67	3,91
Republic	1,29	0,22

The soil-climatic and hydrological conditions of the area contribute to the migration of pesticides into contact with soil environments, as our studies have shown (Table. 2), as well as literature data (A. Ya. Yakubov and T. Dzhumaev; E. I. Goncharuk), both the levels of pesticide sales and the content of their residual amounts in the soil can be used to characterize the degree of soil contamination with pesticides due to the close correlation between these indicators. However, to assess the level of soil pollution in large regions, it is more appropriate to use a statistical method that takes into account the levels of pesticide sales. In this regard, we judged the level of soil contamination with pesticides by the number of pesticides sold in this area.

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Table 2.
Correlation between the levels of realization of pesticides P1 and P2 and the content of their residual amounts in the soil

Pesticide	**District Z**		**District B**	
	r	R	r	R
P1	0,87	>0,99	0,93	>0,99
P2	0,79	>0,95	0,86	>0,99

Note. r is the correlation coefficient.
When studying the health of the population in the experimental regions, we used official accounting documentation (A.M. Markov and L. E. Polyakov). The material was processed using correlation, one- and two-factor analysis of variance (N. A. Plokhinsky). The results of the conducted studies are presented in Table 3.

Table 3
The correlation between the level of implementation of pesticides P1 and P2 and some indicators of the health of the rural population

Health indicator	**P1**		**P2**	
	η	*P*	η	*P*
Morbidity of children under 1 year	0,71	>0,99	0,82	>0,99
General childhood morbidity	0,64	>0,99	0,59	>0,95
Incidence of chronic infectious diseases	0,50	>0,95	0,40	>0,90
Mortality due to chronic non-communicable diseases	0,47	>0,90	0,38	>0,90

η- correlation relation
As can be seen from Table 3, the most sensitive indicators are the incidence of children under 1 year.
Since the impact of soil on human health is mediated through the media in contact with it - water, atmospheric air, food, the high sensitivity of morbidity in children under 1 year can be explained, firstly, by the high reactivity of the body of infants, and, secondly, according to the results of our research and literature data (E. I. Goncharuk; A. I. Shtenberg; G.

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Mayer-Bo-de) -- the entry of pesticides into the child's body with mother's milk, nutritional mixtures, juices, etc.

Due to the fact that the most sensitive indicator of health was the morbidity of children under 1 year old, for an in-depth study of the patterns of influence of soil contaminated with pesticides on the health of the population, we conducted the following studies. The relationship between the level of soil contamination with organochlorine pesticides P1 and P, and one of the indicators of the incidence of children under 1 year - the percentage ratio of the number of children who have never been ill in the current year to the number of children who turned 1 year old in this year.

Table4

Complete correlation analysis of the relationship between the level of implementation of pesticides P1 and p2 and the incidence of children under 1 year

Pesticide	r	P	η	mη	P	F_B	F_T
P1	—0,57	<0,95	0,71	0,13	>0,99	1,25	3,7
P2	—0,79	>0,99	0,82	0,09	>0,99	0,57	3,7

The examined children were born full-term, their parents lived permanently in the area, the children were in homogeneous social and hygienic conditions.

The assessment of the intensity, significance and nature of the relationship between the level of soil contamination with pesticides and the morbidity of children under 1 year was carried out by conducting a complete correlation analysis (Table. 4), which includes the calculation of the correlation coefficient (r), the correlation ratio (n), the average error of the correlation ratio (mn) and the linearity criterion of the relationship (Fß).

As can be seen from Table 4, there is a non-linear relationship between the level of soil contamination with pesticides and the incidence of children younger than 1 year, as evidenced by the fact that its curvilinearity criterion does not exceed the tabular value of the transformed Fisher criterion (FT). Exceeding it is a necessary condition for determining the linear nature of the connection. In this regard, according to N. A. Plokhinsky, in such cases, it is not the correlation coefficients that can be calculated, but the correlation coefficients, which in this case are the leading indicators and, as can be seen from Table. 4, have the following values: for P1 - 0.71, for P2; - 0.82. Such correlation coefficients indicate that there is a close relationship between the level of soil contamination with pesticides and the incidence of children under 1 year of age.

Since various factors can affect the health of children under 1 year of age, a dispersion analysis was carried out to determine the specific weight of soil contamination with pesticides in the formation of morbidity in children under 1 year of age. As can be seen from the table. 5 and 6, when processing data by single-factor analysis of variance, it was found that soil contamination with pesticides P1 and P2 has a significant impact on the morbidity of children under 1 year.

The effect of the level of use of the pesticide P1 on the morbidity of children under 1 year.

Factor A, which characterizes the level of soil contamination with pesticides (in this case, P1,), determines 78.97% of the statistical effect on the morbidity of children of this age, while other factors (Z) - only 21.03%.

The statistical influence of the level of soil contamination with pesticide R. (A) on the morbidity of children younger than 1 year is 50.72%, the share of the influence of other factors (Z) is 49.28%..

The effect of the level of use of the pesticide P2 on the morbidity of children under 1 year

As can be seen from the results of a one-factor analysis of variance, soil contamination with P1 pesticides has a greater effect on the morbidity of children under 1 year old, which may indicate a greater danger to public health of soil contamination with this pesticide.

Since pesticides P1 and P2 were used simultaneously in the studied region, to study their joint effect on the morbidity of children under 1 year of age, the data were processed by two-factor analysis of variance (Table 4).

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Table 4
Complete correlation analysis of the relationship between the level of implementation of pesticides P1 and P2 and the incidence of children under 1 year

					F_T		
Faktor	η^2, %	n	σ^2	F_B	0,95	0,99	P
A	5,39	1	97,64	2,81	245,0	6142,0	>0,95
B	58,85	1	1065,86	30,71	4,54	8,86	>0,99
AB	5,37	1	97,36	2,80	245,00	6142,0	>0,95
A+B	71,26	3	430,20	430,0	3,29	5,42	>0,99
+AB	28,74	15	34,70	—	—	—	—

As can be seen from Table 4, the influence of the level of soil contamination with pesticides P1 and P2 (factor B) is statistically significant, determining
58.85% of the statistical effect on the morbidity of children under 1 year. The influence of the sum of organized factors (A +B + AB), the type of pesticide (factor A), the level of soil pollution (factor B) and the combined action of factors (AB) determines the statistical impact on the morbidity of children under 1 year, amounting to 71.26%, the statistical influence of other factors (Z) - 28.74%.
In general, the results of the dispersion analysis showed the significance of the influence of the level of soil contamination with pesticides P1 and P2 on the morbidity of children under 1 year old when studying both the isolated and combined effects of these substances.

CONCLUSIONS

When studying the impact of the level of soil contamination with pesticides on the health of the population, the most sensitive indicator was the incidence of children under the age of 1 year.
To analyze the intensity, reliability and nature of the relationship between the level of soil contamination with pesticides and the health of the population, it is advisable to conduct a full correlation, as well as one-, two- and multifactorial analysis of variance.

When determining the impact of soil contamination with exogenous chemicals on public health, data on the intake of chemicals into the soil of the studied regions can be used to characterize the level of soil contamination with chemicals (in this case, pesticides). The development of a methodology for studying the effect of soil pollution by exogenous chemicals on public health will allow implementing one of the stages of rationing chemicals in the soil --- studying the effect of normalized chemicals in the soil on public health, as well as predicting the maximum levels of pesticide use that are safe for the health of the population of this region.

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