INCIDENCE PARTICULARITIES OF METHEMOGLOBINEMIA CASES IN BACAU COUNTY DURING 1997-2009 PERIOD

MIHAELA POPESCU[1], G. FRIPTULEAC[2]

[1] PhD Candidate UMF "Gr. T.Popa" Iaşi, [2] State Universiy of Medicine and Pharmacy "Nicolae Testemiţanu" Chişinău

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Abstract: *The methemoglobinemy annual monitoring within the National Communitarian Health Program represented the support of the descriptive epidemiologic study of the medical cases in Bacau county, in 1997-2009 period, compared to former periods of time and to other Moldavian territories (Romania). On a decreased incidence background in the Romanian Eastern part of the territory, Bacau county maintains an incidence level of 1.1-5.3‰, with a slightly increased (and sometimes constant) tendency in Moldavia. The total of 291 cases registered in Bacau county, in 1997-2009 period, represents 17.6% of the cases in Moldavia. With descriptive aspects regularly met in cases of methemoglobinemy regarding gender, age, child's alimentation, over half of them were produced because of the exposure to nitrates quantity in water over 101 mg/dm determined by inadequate hygienic conditions of the fountains. The territorial distribution of the cases outlines the risk areas of the county, indicating, at the same time, the measures of the primary prophylaxis that must be taken.*

Cuvinte cheie: *methemoglobinemie la copil, calitatea apei de băut în mediul rural, studiu epidemiologic descriptiv*

Rezumat: *Monitorizarea anuală a methemoglobinemiei în cadrul Programului Naţional de Sănătate Comunitară a reprezentat suportul studiului epidemiologic descriptiv al cazurilor în judeţul Bacău, pentru perioada 1997-2009, comparativ cu perioadele anterioare şi cu alte teritorii ale Moldovei (România). Pe fondul tendinţei de scădere a incidenţei în zona de est a României, judeţul Bacău menţine un nivel al incidenţei între 1.1-5.3‰, cu uşoară tendinţă de scădere şi cvasiconstant peste nivelul Moldovei. Cele 291 de cazuri înregistrate în perioada 1997-2009 în judeţul Bacău reprezintă 17.6% din cazurile din Moldova. Cu aspecte descriptive obişnuit întâlnite la cazurile de methemoglobinemie privind sexul, vârsta, alimentaţia copilului, peste jumătate s-au produs la expuneri la cantităţi de nitraţi în apa de peste 101 mg/dm³ determinate de condiţiile necorespunzătoare igienic ale fântânii. Distribuţia teritorială a cazurilor conturează zonele cu risc ale judeţului spre care trebuie orientate cu precădere măsurile de profilaxie primară.*

INTRODUCTION

The rural zone of Bacau county is characterized by frequent nitrous substances pollution of drinkable water, representing – by the high number and the intensity of the pollutions – an increased risk in territory.

Thus, between 1984-1995, Bacau county joins among the Romanian territory within the 50–75% out of the increased nitrates concentration fountains, with a level which surpassed three times over the CMA in about 9% of the situations. (1)

At the same time, for a long period of time, Bacau county has characterized itself by an increased tendency of number of acute methemoglobinemy cases among newborn babies, so the county places between the Romanian territories with an incidence of 1–5 %. (2)

From the first description of an acute intoxication with nitrates at a baby, made by Comly in 1945, there have been a lot of clinic and epidemiologic proofs (our country included) concerning nitrous substances contamination of water and food, and the acute and chronic effects on health.

Over the Moldavia territory, annual pursue of acute methemoglobinemy cases being part of the activity of Health Ministry – National Communitarian Health Program, and as epidemiologic investigations concerning the long period effects of consuming contaminated nitrous substances water, it has been proved that in Bacau county there already existed characteristic features, and by knowing them they can constitute the support of some prevention and control measures in the territory.

These elements constituted the foundation of making a descriptive epidemiologic study of acute methemoglobinemy in newborn babies, in Bacau county, between 1997-2009, compared to former periods of time and to some other Moldavian territories.

MATERIAL AND METHOD

This study used as statistic unity the "hospitalized case" with certain diagnosis of acute nitrates intoxication, in 1997-2009.

Investigation sheet of the case – unitary at national level – includes:

- Identification data of the hospitalized patient: age, gender, place of residence.
- Data concerning the disease: diagnosis, evolution, treatment
- Exposure data: chemical and bacteriological quality of drinkable water consumed by the child, before the intoxication took place.

[1]Corresponding Author Mihaela Popescu, Public Health Direction Bacău, 45 Vasile Alecsandri street, Bacău, România; e-mail: misumpopescu@yahoo.com; tel +40-729300200
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The results were processed by:

- the annual incidence rate per 1000 children, 0-1 year old, living in the patient's place of residence;
- tendency;
- using statistic meaning indicators of frequency differences between various territories or periods - λ^2.

RESULTS AND DISCUSSIONS

Between 1997-2009, in 8 counties from Eastern Romania, there have been registered 1656 cases of acute methemoglobinemy, 17.6‰ in Bacau county. This figure creates an annual incidence average rate on Moldavia of 2.68% with territorial variations from 0.58‰ (Suceava county) to 5‰ (Botosani county), and annual from 0.68 in 2007, to 3.72‰ in 2008.

Tale no. 1. The percentages of cases in Bacau county from the total cases in Moldavia between 1997-2009

Year	%
1997	8.96
1998	9.13
1999	24.06
2000	20.28
2001	22.29
2002	13.71
2003	15.45
2004	15.38
2005	24.22
2006	20.51
2007	20.00
2008	47.06
2009	12.50

Out of the total number of Moldavia cases, in the same interval, the "contribution" of the county territories to the whole number of Moldavia cases situated between 2-3% (Vrancea and Suceava) and 36% (Iasi) - Figure 1.

Figure no. 1. Proportion of methemoglobinemia cases on counties during 1997-2009

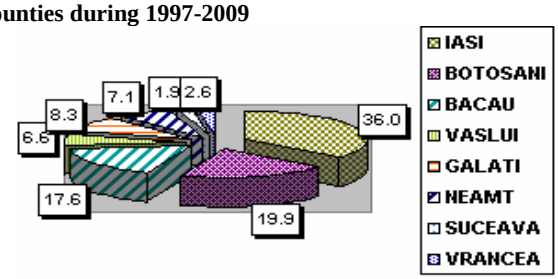
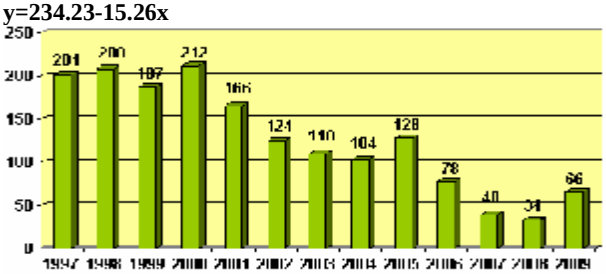


Figure no. 2. The number of cases and the tendency of methemoglobinemia cases in Moldova territory during 1997-2009

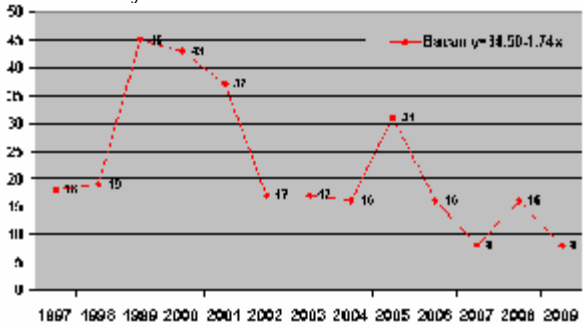
y=234.23-15.26x



Evolution of the cases meets one stage for the period 1997 – 2009 where there has been an decreased tendency (Fig.2)

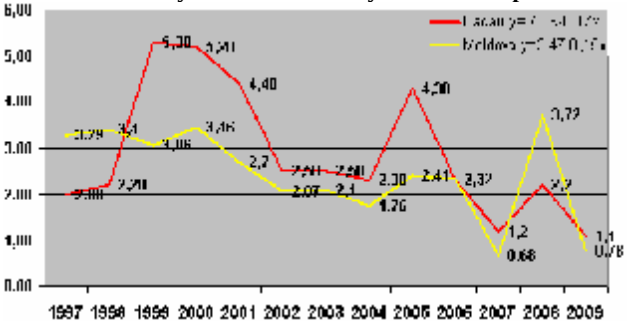
We can notice a decreasing tendency of the number of cases in Moldavia in this period of 13 years. For the entire period of this last decade on the Moldavia territory the decreased trend of the case number is mentioned and Bacau county is included in this trend.

Figure no. 3. The number of cases and the tendency of methemoglobinemia cases between 1997 - 2009 period in Bacau county



For the same period of time, the incidence level keeps the decrease trend for the Moldavia territory and also for Bacau county. (fig.4)

Figure no. 4. The trend of methemoglobinemia incidence in Moldova territory and Bacau county 1997 – 2009 period

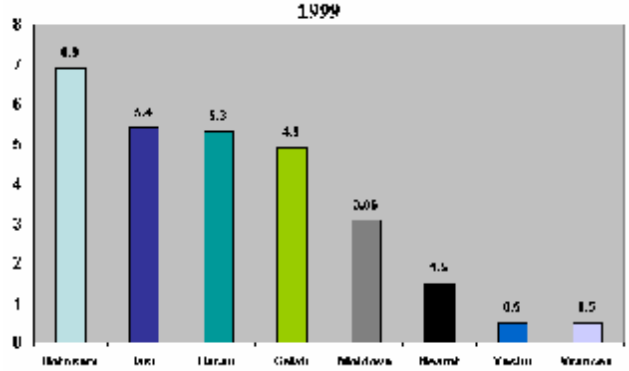


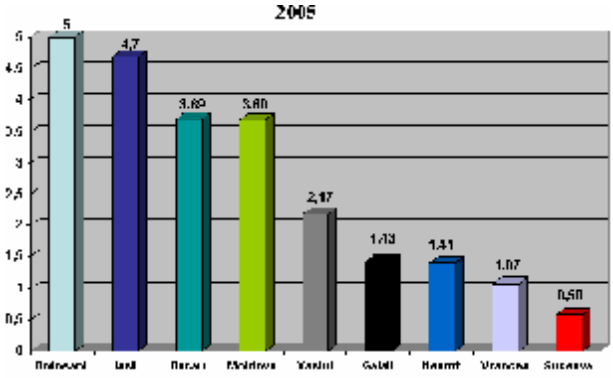
The distribution of counties is similar with Moldavia situation in this period of time, Bacau county has almost constantly the incidence higher then Moldavia's. Figure 5 reveals the situation of the years 1999 and 2005.

In detail, descriptive analyse in Bacau county between 1997 and 2009 years registered 291 cases in 56 rural areas. In 13 years of study, there are 1-2 cases mentioned in 29 rural areas and from 2 cases to 13 cases in urban areas.

These dates determined mean annual rates of incidence between 0,21‰ in Bacau city, 0.29 ‰ in Moinesti , 0.52 ‰ in Onesti, 0.94 ‰ in Cleja ‰, to 12.82 ‰ in Luizi Calugara and 32.25 ‰ in Plopana.

Figure no. 5. The county distribution after the annual incidence comparing the media in Moldavia during 1999 - 2005

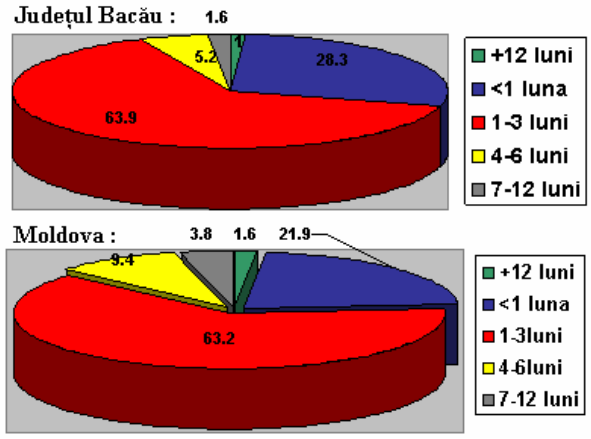




We added chronologic and geographic criteries some personal aspects of cases:

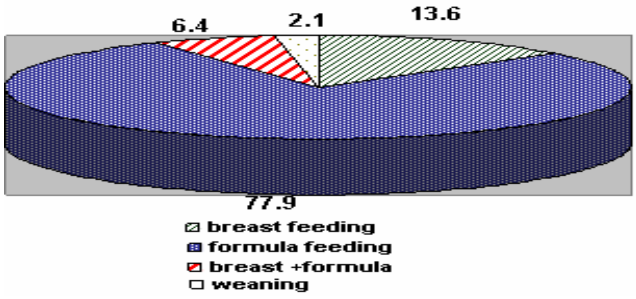
- the equal percentage of diagnosticated cases in all 4 quarters;
- around 9 at 10 cases were registered at age group less 3 mounths

Figure no. 6. Age distribution of methemoglobinemia cases during 1997 – 2009 in Bacau county and Moldavia



- More than half of cases were boys
- More than three fourths of infants were formula or breast and formula feeding (figure 7)

Figure no. 7. The type feeding frequence



- in 7/10 cases there has been a slight evolution of healing, in the same period, in Moldavia there have been several cases with severe forms and 3 deaths (0.4%).

The causality in relationship to water nitrates has been distinguished by some characteristic features of supplying with drinkable water.

- in 57,1% of the cases there were low depth public fountains, below 10 metres (66.9%); 21.8% were situated near the latrines and 50.9% have no elementary measures of sanitary protection.

The situation is even more unfavorable compared to other Moldavian territories, with just 30% out of sanitary unprotected fountains.

		Bacau county	Moldavia
Clinic form	easy	80.3	53.1
	average	6.7	20.1
	severe	12.3	26.8
	deaths		0.35
ASOCIATION with Acute Diarrheic Disease		35.2	36.9
ASOCIATION with respiratory disease		22.2	12.7

The nitrates quantity in the water at the moment the child falls ill is presented in table no.2

Table no. 2. Distribution of methemoglobinemia cases on nitrates levels in well water samples in Bacau county, compared to Moldavia

CASES % / NO3 MG/L	BACAU	MOLDAVIA
< 50	22.1	13.7
51-100	27.0	24.8
101-500	49.1	57.2
over 500	1.8	4.2

From this point of view, the situation in Bacau is more favorable compared to the rest of Moldavia territory, the difference being obvious from the statistic point of view.

Depending on the hierarchic criteria of the established territories through national level studies (2) and for the Moldavian territories (5) we mention the improvement tendency of the situation in the Moldavian counties, which nevertheless remain areas with risk, characterized by methemoglobinemy incidence of 1 – 5%. (table 3)

Table no. 3. Distribution of Moldavia counties on methemoglobinemia cases in three different periods

	1991-1993*	1996-2000**	2000-2005
Areas without information (F)	Suceava, Neamt	Suceava	-
Areas without risk (E)	-	-	-
Areas with incidence rate <1‰ (D)	Vrancea	Vaslui	Suceava
Areas with incidence rate 1-5‰ (C)	Bacau, Vaslui, Galati	Bacau, Neamt, Galati, Vrancea	Bc, Bt, Gl, Is, Vs, Vn, Nt
Areas with incidence rate 6-10‰ (B)	Iasi	Iasi, Botosani	
Areas with incidence rate +10‰ (A)	Botosani	-	

Data source: * Tanase Irina - ISP Bucuresti; ** Vasilov Marieta – ISP Iasi

CONCLUSIONS

- Acute methemoglobinemy of the newborn babies represents the direct and dramatic effect of his/her exposure to nitrates contamination of the drinkable water.
- On a background of a decreasing trend of a number of cases and of the incidence in the last 10 years in Moldavia, Bacau county maintains a slightly increasing tendency of the incidence and it situates itself in an almost constant manner over the annual rate of the Moldavia incidence.
- Although, generally speaking, it manifests in easy forms and has a favorable evolution, towards clinical healing, acute methemoglobinemy of the newborn babies represents a public health issue, in Moldavia mostly, and particularly in Bacau county, closely linked to the environment element – drinkable water – which has an inadequate quality in the rural environment.
- The performed study indicated the increased risk areas in the county, so there must be carried out primary prevention measures.

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