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INFLUENCE OF WATER FACTOR ON THE INCIDENCE (XI, XIV, XIV) CLASSES OF DISEASES AMONG ADULT POPULATION IN THE RURAL TAXONS

Hryhorenko L.V.
PhD, assistant professor, „Dnipropetrovsk Medical Academy MHU", Hygiene and Ecology Department, Dnipro

Samoshkin V.V.,
PhD, assistant professor, chief of Department of Anatomy, Biomechanics and Sport Metrology, Prydniprovsk Academy of Physical Training and Sport, Dnipro

Denisenko N.M.
PhD, assistant professor of Department of Anatomy, Biomechanics and Sport Metrology Prydniprovsk Academy of Physical Training and Sport, Dnipro
hryhorenkoluibov@ukr.net

Abstract. Purpose of research: correlation analysis influence of some indicators of drinking water quality (total hardness, dry residue, Cl-, SO4-, salts of Ca, Mg, F, Al, Fe, Zn, Cu, Mn, nitrogen ammonia, nitrites, pH, nitrates, oxidation) to the incidence (XI, XIV, XIV) classes of diseases among adult population in the rural taxons of Dnipropetrovsk region for 2008 – 2013 years. Materials and Methods. Statistical processing and analysis results of research carried out by the medical statistical methods. Evaluation of the relationship between variables was carried out by coefficients of Spearman's rank correlation (r). Research methods: sanitary-toxicological, physical-chemical (for definition indicators of potable water quality from decentralized water supply sources); medico – statistical (mathematical processing obtained quantitative indicators, methods of variation statistics). Results of research and Discussion. In the local water sources from some rural taxons was shown, that salt arthropathy among adults was weakly correlated with all inorganic substances, except: pH + F + oxidability (r=0.01–0.28, p < 0.05). A similar trend was observed between salt arthropathy, which was correlated with all inorganic substances, except nitrate + oxidability (r= 0.03, p < 0.05). Weak correlation had been shown between a combined effect in water pH + F + nitrates and incidence of the stones of kidney and ureter diseases at the adult population (r=0.03, p <0.05).
Key words: rural taxons; morbidity (XI, XIV, XIV) classes of diseases; drinking water; adult population.

Introduction. Mineral composition of drinking water carried out to the development of non-infectional diseases and non-specific somatic pathology [1]. In particular, an increased total hardness of water leads to the disruption of mineral metabolism (numerous disorders of blood concentration for calcium, magnesium, potassium, strontium, iodine, chlorine, and iron) [2]. Increased water salinity, mainly due to the chlorides and sulphates could affect to the secretory activity of a digestive system, disturbs water-salt balance and contributes to the development of circulatory system diseases [3]. Consumption of drinking water, containing hardness and salts higher than hygienic standard can contribute to the development of urolithiasis, diseases of the circulatory system, digestive system, as a result of influence on water-salt and lipid metabolism [4]. In the research works [5, 6] were studied effect on a population health of drinking water with abnormal iron content. Another researcher [7] was focused on the influence of high concentrations of microelements in drinking water to the non-infectional morbidity. It was shown, that action of unbalanced mineral composition of drinking water on the human body: Fe (23 MAC), Mn (6 MAC), small amount of chlorides, sulfates, iodine, fluoride, total hardness correlated with increased incidence of main classes of diseases among the adult population: diseases of endocrine system; blood and blood-forming organs; circulatory system; digestive organs [8, 9]. In work [10] was found that consumption of drinking water with excessive concentrations of total hardness, salinity and iron content in 1.1 – 3.2 times caused increasing of morbidity at the population of such diseases as musculoskeletal system, genitourinary system and diseases of a digestive system.

Purpose of research: correlation analysis influence of some indicators of drinking water (total hardness, dry residue, Cl-, SO4-, salts of Ca, Mg, F, Al, Fe, Zn, Cu, Mn, nitrogen ammonia, nitrites, pH, nitrates, oxidation) on the incidence (XI, XIV, XIV) classes of diseases among adult population in the rural taxons of Dnipropetrovsk region for 2008 – 2013 years.

Materials and Methods. All kinds of statistical processing were performed with using standard package "STATISTICA" version 6.1. (serial number AGAR 909 R455721FA). Evaluation of relationship between variables was conducted on the coefficient of rank correlation Spearman's (r). Research methods: sanitary-toxicological, physical-chemical (for definition indicators of drinking water quality from water supply sources); medico–statistical (mathematical processing of the obtained quantitative indicators, methods of variation statistics).

Results of Research and Discussion. In a structure of all diseases proportion of gallstone disease was varied from 0.12 % in the 1 taxon to 0.16% in the 6-taxon. At the same time, a highest growth rate of XI class of disease was observed in the 3 taxon: in all rural districts +24,7 %, in Dnipropetrovsk region +0.8. The lowest incidence of gallstone disease was significantly detected among adult residents of the 1 taxon: (6.08±0.55) %00 (p < 0.001), with negative growth rate in a range (from -21.2 to -36.3) % respectively, by the districts and region. It was revealed increasing morbidity of salt arthropathies among adult population in the 2, 3 4 taxons: in (1.50–1.61); (2.95–3.17); (1.10–1.18) times by the levels of average district and average regional indicators. The highest positive growth rate XIV class of disease (N25-N29), in a comparison with all types of taxons, was observed among rural residents from the 3 taxon: +194.9 % (by the districts), +216.8 % (by the region).

The high incidence this class of diseases was shown among rural population in the 2nd taxon: (18.03±3.52) %00, with overnormal levels of average district and average regional indicators on 1.61–1.11 times. At the same time, a positive growth rate for the stones of kidney and ureter diseases was varied from +61.4 % in the districts and +10.9 in the region. Proportion XIV class of diseases (N17-N19) in the separate taxons of a region was the following: 0.23 % (in the 1 and 5 taxons); 0.31 % (in the 2 taxon); 0.16 % (in the 3 and 4 taxons); 0.26 % (in the 6 taxon). Another tendency was revealed by the

stones of kidney and ureter diseases level. The lowest level of intensity for XIV class of diseases (N17-N19) was carried out in the 3rd and 4th taxons: from (9.58±0.73) to (7.03±0.51) %00 (p<0.001) (Fig. 1-2).

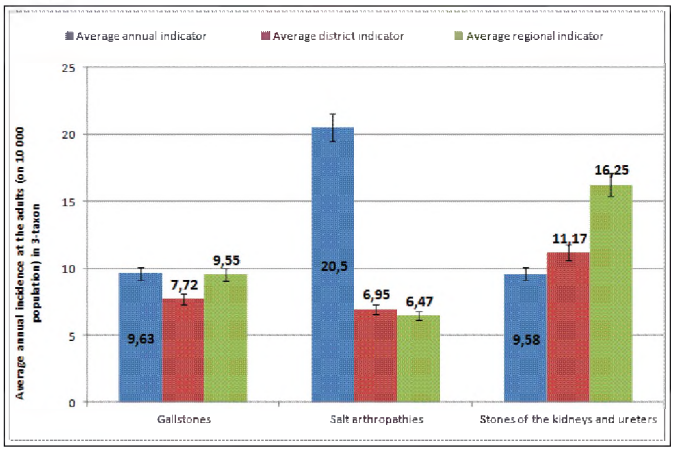

Figure 1. Morbidity (XI, XIV, XIV) classes of disease at the adult population in the 3rd taxon of Dnipropetrovsk region during 2008-2013 years (M±m).

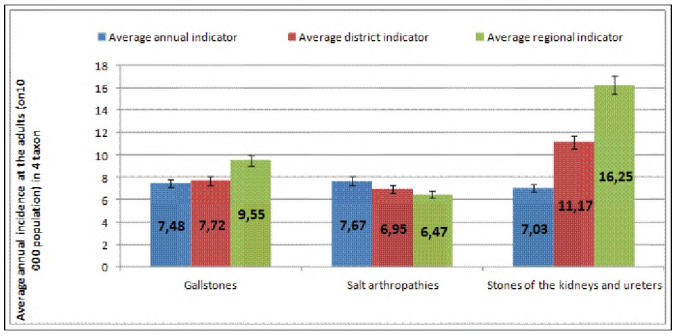

Figure 2. Morbidity (XI, XIV, XIV) classes of disease at the adult population in the 4th taxon of Dnipropetrovsk region during 2008-2013 years (M±m).

Negative growth rates was typical for stones of kidney and ureter diseases in the 3 and 4 taxons, in both cases – by the districts and by the region. It was varied in the values from (-14.2 to -41.0) % in 3 taxon; from (-37.1 to -56.7) % in 4 taxon.

Noteworthy increasing for prevalence of the stones of kidney and ureter diseases at the adult population, primary among rural population in the 1-2 taxons. The lowest level of this class of diseases among rural residents was observed in 5 taxon: (48.74±1.89) %00 (p < 0.05).

Whereas a highest prevalence XIV class of diseases (N17-N19) was identified in 1 taxon of the region: (66.95±5.76) %00, with a positive growth rate both for the districts and the region – from (+21.1 to +1.6) %. Overnormal level of an average district and average regional indicator was registered in (1.21–1.02) times. Proportion of prevalence kidney of stones and ureter, in a structure of all diseases, was a highest during 2008–2013 years in the 1–2 taxons and was on the level (0.48 %).

A negative growth rate for prevalence this class of diseases was carried out at the residents in 3 taxon. It was varied from (-0.6 to -16.6) % by average district and average regional indicator, respectively. In the 4 taxon was carried out from (-19.1 to -32.1) % respectively. In the 5 taxon a growth rate was ranges from (-11.8 to -26.0) %; in the 6 taxon: from (-0.4% to -16.4) %.

The highest prevalence of salt arthropathies was observed among peasants in the 3 taxon: (137.68±8.09) %00 (p<0.001), with a positive growth rates, respectively: in the districts (+133.4 %), in a region (+206.1 %). Overnormal levels were typical for both indicators: in 2.33 – 3.06 times. Probably lowest prevalence XIV class of disease (N25-N29) was shown at the adult population in the 1 taxon: (29.85±7.91) %00 (p<0.001), with a negative growth rate both for all districts (-49.4 %) and for the region (-33.6 %) (Fig. 3).

The negative growth rates for prevalence this class of diseases was observed in the following taxons: 2 – by the districts (a growth rate -17.1 %); 5 – by the districts (-26.2 %), and by the region (-3.3 %); 6 – by the districts (-23.4 %).

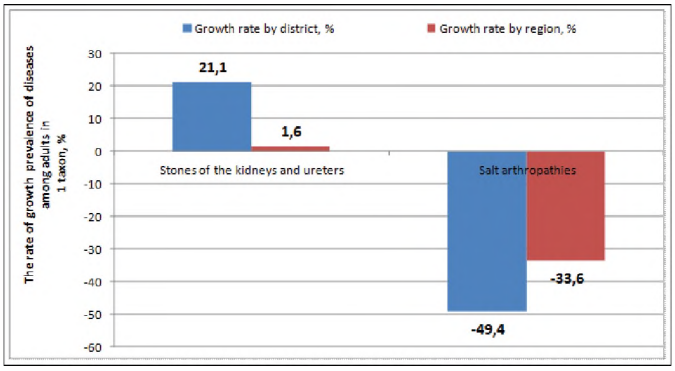

Figure 3. Growth rate for prevalence XIV class of diseases among adult population in the 1 taxon of Dnipropetrovsk region.

It was shown, that incidence of salt arthropathy at the adult population having a moderate correlation with contents in the drinking water from centralized sources of the next substances: in the 1 taxon – Ca, Mg, Fe (r=0.47, p<0.05). In the 2nd taxon salt arthropathy was correlated with total hardness (r=0.56, p<0.05), dry residue, content of Cl-, SO4-, Ca, Mg (r=0.47, p<0.05). In the 3 taxon – with a dry residue, Cl-, SO4-, Ca Mg, except rigidity and Fe (r=0.47, p<0.05). In the 4-taxon – with a dry residue (r=0.30, p<0.05). In the 5-taxon – correlation was absent. In the 6 taxon –was shown a weak correlation with Fe (r=0.03, p<0.05).

Incidence of the kidney of stones and ureter was correlated with a salt composition of drinking water in the centralized water supply sources, carried out in the 1, 2, 5, 6 taxons. In the 1 taxon disease of this class had an average correlation with rigidity (r=0.35, p<0.05), dry residue (r=0.64, p<0.05), Cl- (r=0.58, p<0.05), SO4- (r=0.51, p<0.05). In the 2 taxon – was shown correlation with hardness (r=0.43, p<0.05), dry residue, Cl-, SO4-, Ca, Mg (r=0.58, p<0.05). In the 5 taxon – with dry residue, SO4- (r=0.32, p<0.05). In the 6-taxon was found a weak correlation with dry residue (r=0.01, p<0.05).

Gallstone disease in the majority of rural taxons did not correlate with indicators of salt composition of centralised water sources, or having an average correlation in the 2nd taxon – with Fe (r=0.54, p<0.05). In water sources from 5 taxon – was demonstrated correlation with dry residue, SO4- (r=0.08, p<0.05).

In the centralized water sources from some taxons, salt arthropathy in adults was weakly correlated with all inorganic substances, except: pH + F + oxidability in the 5 taxon (r=0.01–0.28, p<0.05). A similar trend was observed between salt arthropathy, which was correlated with all inorganic substances, except nitrate + oxidability in the 6 taxon (r = 0.03, p<0.05). A weak correlation was shown in the 5-taxon between combined effect in water (pH + F + nitrates) and incidence on the stones of kidney and ureter (r=0.03, p < 0.05).

Among adult population in the 1 taxon was observed a moderate correlation between incidence of salt arthropathy and combined effect in the decentralized sources salts of Ca+Mg+Fe (r=0.47, p<0.001). Stones of kidney and ureter diseases was correlated with total hardness (r=0.35, p<0.001), dry residue (r=0.58, p<0.001), Cl- (r=0.51, p<0.001), SO4- (r=0.51, p <0.001).

In the 2 taxon was revealed a weak correlation between gallstone disease among adults with dry residue (r=0.09, p<0.001) and SO4- (r=0.04, p<0.001) in the water from decentralized sources. Stones of kidney and ureter diseases were correlated with dry residue (r=0.05, p<0.001). It should be noted that in the 3-taxon stones of kidney and ureter diseases was correlated with Fe in water from decentralized sources (r=0.35, p<0.001). Whereas a salt arthropathy was correlated with Fe in water from the 5– 6 taxons (r=0.33–0.47, p <0.001).

In the 4 taxon were absent any correlation links (XI, XIV, XIV) classes of diseases with indicators of the drinking water quality. Taking into account incidence at the adults of the stones of kidney and ureter diseases, in the territory of 5-taxon was identified a medium-strength correlation with content in water of the hardness, dry residue, Cl-, SO4-, Ca, Mg (r=0.35–0.51, p<0.001). In the 6 taxon was carried out correlation the given classes of diseases with a dry residue, Cl-, SO4-, Ca, Mg (r=0.33 – 0.39, p<0.001).

Conclusions. In the majority of drinking water sources, taking from some rural taxons of Dnipropetrovsk region, was revealed a typical tendency – increased content of the total hardness, dry residue, chlorides, sulfates, calcium, magnesium, iron. The excess iron content was found in all taxons of the region, except 3 taxon: (12.1 MAC) in the 1 taxon; (from 2.25 to 35.5) MAC in the 2 taxon; (from 1.15 to 3.7) MAC in the 4 taxon; (from 1.35 to 60) MAC in the 5 taxon; (from 1.15 to 1.1) MAC in the 6 taxon. Therefore, a long-term consumption of drinking water with a high salt content leads to the increasing of the stones of kidney and ureter diseases, salt arthropathy, cholelithiasis at the adult population.

Results of our previous studies [11-13] had been shown, that the greatest weight in a structure of all diseases among adult population of 6 types of taxons could caused by the stones of kidney and ureter diseases, salt arthropathy, cholelithiasis.

In particular, infectious and parasitic, digestive system, urinogenital, bone and muscular system and other classes of disease, i.e. nervous system, blood and organs of hematopoiesis, anemia, neoplasms, such as some nosological forms – congenital anomalies (malformations), including anomalies of the circulatory system, occupy the last rank place in a structure of all diseases in the separate taxons of Dnipropetrovsk region for 2008 – 2013 years.

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