INFLUENCE OF ECOLOGICAL FACTORS TO ARTICULAR SYNDROME IN RHEUMATOID ARTHRITIS

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This article presents results of a comparative analysis of the peculiarities of articular syndrome in rheumatoid arthritis (RA) according to the four areas of Uzbekistan. The study included 460 patients with a documented diagnosis of RA: I Zone is the northern region – Tashkent – 144 patients; II Zone is the western region – Khorezm region – 112 patients; III Zone is the eastern region – Namangan region – 104 patients and IV Zone is southern region – Surkhandarya region – 100 patients. The comparative analysis has shown that articular syndrome in RA in four different zones have certain differences. So, in II and IV areas known fact of predominance of fast progressive start, as well as more aggressive joint syndrome. The results of disperse analysis indicated degree of contamination of air and soil by xenobiotics. It depended on the clinical, radiographic and sonographic signs of articular syndrome in RA. It means that changes in the micro elementary composition of soil and air which depends on zone of residence of patients with RA in Uzbekistan contributes rate of progression of joint syndrome.

Keywords: *rheumatoid arthritis, articular syndrome, ecologic factors, climate geographic zone.*

ВЛИЯНИЕ ЭКОЛОГИЧЕСКИХ ФАКТОРОВ НА СУСТАВНОЙ СИНДРОМ ПРИ РЕВМАТОИДНОМ АРТРИТЕ

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В данной статье представлены результаты сравнительного анализа особенности течения суставного синдрома при ревматоидном артрите (РА) в зависимости от четырех зон Узбекистана. В исследование включено 460 больных с достоверным диагнозом РА: I зона, северный регион – город Ташкент – 144 больных; II зона, западный регион — Хорезмская область – 112 больных; III зона, восточный регион — Наманганская область – 104 больных и IV зона, южный регион — Сурхандарьинская область – 100 больных. Сравнительный анализ показал, что суставной синдром при РА в четырех различных зонах имели определенные различия. Так во II и IV зонах отмечается достоверный факт преобладания быстро прогрессирующего начала, а также более агрессивный суставной синдром. Результаты дисперсного анализа указывают, от степени загрязнения ксенобиотиками атмосферного воздуха и почвы зависят клинические, рентгенологические и сонографические признаки суставного синдрома при РА. Это означает, что изменения микроэлементарного состава почвы и атмосферного воздуха в зависимости от зон проживания больных РА в Узбекистане способствует темпу прогрессирования суставного синдрома.

Ключевые слова: *ревматоидный артрит, суставной синдром, экологические факторы, климатогеографические зоны.*

Climatic peculiarity of human habitat have always been the most important factor which affect to health. When marked effects of different environmental indicators to human health, it became clear that the priority of environmental factor composes – up to 30%. Of these, pollution accounts about 20% and climate geographic conditions – 10% [1 p, 157-158]. Therefore, it is obvious that the problems associated with the disease can not be considered without debate and features of the environment.

Geographical factors, according to a study conducted under the auspices of the WHO are estimated as external risk factors that could adversely affect to functioning of all systems of the human body, as well as the to course and outcome of various diseases, including rheumatic diseases [2, p. 28-30]. In recent years, it began to discuss the possible connection of the current and future features of rheumatoid arthritis with unfavorable environmental factors [3, p. 68]. RA is a multi factorial disease in which the interaction of genetic component and environmental factors determines not only the disease but also its pronounced clinical polymorphism [4, p. 2206]. Weighting of disease occurs under the simultaneous influence of environmental factors [5, p. 1747; 6, p. 7-8; 7, p. 86].

To date, Uzbekistan is the object of many investigations of medical and geographic directions, as Republic is distinctive by its geographical location, climate and nature of the development of industry and agriculture. Moreover, special attention should be paid to the environmental problem in certain areas of the Republic. As is known, deterioration of the nature does not occur immediately or instantly, this process is observed for a long time, in other words, the environmental situation gradually accumulates. The big environmental problem in Uzbekistan is the high degree of soil salinity. The real threat was extensive contamination of soil by various types of industrial and household wastes. One of the major problems is the quality of water resources, the problem of the disappearance of the Aral Sea and the threat of ecological safety in the country and contamination of air space. Our Republic of Uzbekistan is located in the arid zone and characterized by the presence of major natural sources of atmospheric dust as the Karakum and Kyzylkum deserts with frequent dust storms [8, p. 78]. Therefore, we believe that actual study in this field, particularly in matters of environmental rheumatology, in particular on the issues of RA in various climatic and geographical regions of Uzbekistan. We are interested in properties of development and duration of RA associated with environmental factors.

The aim of this study was evaluate the influence of environmental factors to articular syndrome in patients from various regions of Uzbekistan.

Material and Methods

The study is included 460 patients with a documented diagnosis of RA at the age of 50,6 ± 9,1 years, disease duration

9,9 ± 4,7 years:

1) I area, the northern region – Tashkent – 144 patients;

2) II region, the western region – Khorezm region – 112 patients;

3) III region, the eastern region – Namangan region – 104 patients;

4) IV area, the southern region – Surkhandarya region – 100 patients

These hygienic assessment of environmental pollution, in particular xenobiotics in its three objects – air, soil and water (surface water and underground water sources) were obtained as a result of laboratory tests of sanitary stations, government offices of regional committees in the field of hydrometeorology, control of natural condition and environmental safety, as well as governmental Committee of Uzbekistan by protection of nature. Total emissions of air pollutants from stationary and mobile sources characterize the general anthropogenic load to the air. According to these data, the level for 5 years in the atmospheric emissions to the area of the experimental zones includes following:

- in the I area for the year was 302,76 ± 96,12 t / km2, to 1 patient with RA -17,2 ± 29,16 kg;

- in the II area of 81,2 ± 16,2 t / km2, to 1 patient with RA -31,2 ± 1,8 kg;

- in the III area 68,51 ± 11,4 t / km2, to 1 patient with RA -9,1 ± 1,1 kg;

- in the IV area of 90,5 ± 8,9 m / km2, to 1 patient with RA -35,1 ± 3,4 kg.

Using of integral indicators of environmental burden to the atmosphere (ψ), water (σ) and soil (ω), compared them with clinical signs of RA (F) on the number of patients and with integral criterion in the study areas of Uzbekistan (G).

Statistical analysis of the results of research carried out by computer variations, correlation, one (ANOVA) and multivariate (ANOVA / MANOVA) dispersion analysis (programs «Microsoft Excel» and «Statistica-Stat-Soft», USA). We evaluated average values (M), their errors (m), the standard deviations (s), the correlation coefficients (r), the criteria of dispersion (D), the Student (t), Wilcoxon – Rao (WR), χ2 McNemar – Fisher and reliability of statistical parameters (p).

Results and discussion

Among the studied patients predominance women – 336 (93.3%). 85 (18.5%) patients suffered from this disease less than 5 years, from 5 up to 10 years – 255 (55.4%), and more than 10 years – 120 patients (26.1%). Drug remission was determined in 80 patients (17.4%), the activity is preserved – in 366 patients (79.6%). Poly arthritis were in 440 patients (95.7%). Systemic manifestations were detected in 269 patients (58.5%). In addition to the articular syndrome, the most frequent complaints were general weakness (65.2%), irritability, sleep and attention disorders (56.5%), restlessness and anxiety (65.2%), low-grade fever (39.1%). Almost all RA patients had signs of anemia of chronic inflammation.

The comparative analysis has shown that articular syndrome in RA in four different zones have certain differences. So in II and IV areas known accurately fact of predominance of fast progressive start, in 71.4% (p = 0.0021 *; p = 0,083®; p = 0.0019 $) and 75% (p = 0.0024 &; p = 0,083®; p = 0,00074J) cases respectively, (in area I – 24,3%, in zone III – 18.3%) and a more aggressive articular syndrome. This feature is confirmed, as is evident from Table. 1, and the average values of the number of swollen and painful joints in patients from II and IV zones which superior such as patients from III zone (p <0,05).

Table 1

Comparison of clinical and laboratory data in patients with RA in different regions of Uzbekistan

Indicator	I zone n=144)	II zone (n=112)	III zone (n=104)	IV zone (n=100)
RF, U / L	105,6±24,3	551±23,5*$	93,6±4,5	595±41,2&J
Stiffness, hours	2,02±1,7	3,9±1,35$	1,01±1, 8	4,2±1,4J
Pain, VAS	6,52±1,72#	7,75±1,52$	3,12±1,22	8,2±1,6J
NPJ	13,1±3,7#	19,3±8,5$	7,72±2,28	23,3±9,1J
NSJ	7,6±1,86#	14,8 ±5,58*$	4,6 ±0,67	17,2 ±7,2&
Ritchie index	7,65±3,03#	12,55±3,2$	4,54±1,1	14,9±5,2J
OAB, VAS	55,32±16,6	67, 8±12,1$	33,31±13,2	72,5±11,3J
Activity, SDAI Activity, SDAI	43,07±9,3	66,26±13,6$	35,06±7,46	77,4±15,1J
HAQ	10,5±5,4	15,0±2,6$	7,5±1,94	16,2±2,1J
CRP, mg / l	14,8±5, 8#	27,9±8,43*$	7,07±0,1	33,9±8,8&J
ESR, mm / h	30,3±14,67	31,4±13,69	29,3±12,67	39,6±15,3

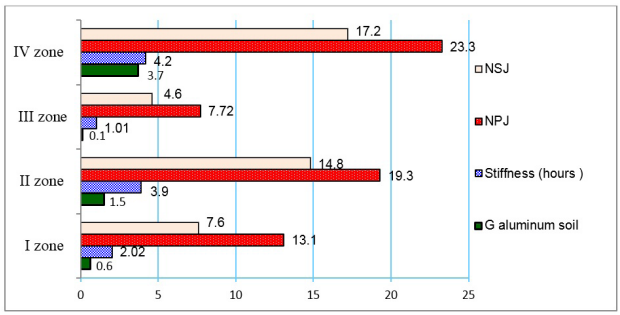
Notes: *p < 0,05, statistically significant differences of study indicators: * – in comparison between I and II zones; # – in comparison between I and III zones; $ – in comparison between II and III zones; & – in comparison between I and IV zones; ® – in comparison between II and IV zones; J – in comparison between III and IV zones. NPJ – the number of painful joints; NSJ – the number of swollen joints. EAD – evaluation of activity by doctor.*

The results of our analysis establishes the impact of the degree of environmental pollution by xenobiotics air ψ to the ω soil, as well as direct correlation ω with integral parameter of contamination of groundwater and drinking water σ. There are significant positive correlations with the degree of ω plant emissions of harmful substances into the atmosphere, with a level of accumulation in the regions of industrial waste and fluoride chloride (FH) load by xenobiotics, sulfates and phosphates in drinking water. At the same time the degree of dust ψ depends on ω salinity (r = 0,76; p = 0.032).

It is known that the content of substances in the soil enters into the human body through the vegetable and animal food. In turn, plants and animals are supplied by micronutrients from the soil [9. 72]. Thus, the composition of minerals in the soil has a positive or negative effect to the human body, thereby specifically affects to duration of diseases, in particular to RA [3, p. 66]. Especially, human activity and anthropogenic impact influence to the composition of the soil. Thus parameters G influence to the levels in the soil zone of residence of patients with RA as toxic microelements as nickel, aluminum and fluorine, and sulfates, which shown results from one factor dispersion analyses. Indicators G directly correlated with the content in the soil of nickel and aluminum fluoride (r = 0.69; r = 0.77; r = 0.71) and backwards – with concentrations of zinc (r = -0,66).

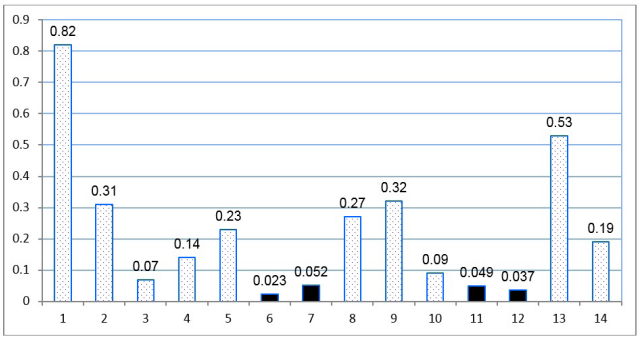
According to ANOVA integral indicator of soil contamination with nickel ω significantly affect to the radiological stage of the disease and indexes Ritchie and Larsen. It should be noted that there is a significant direct correlation between the values

of ω and articular syndrome, however, high aluminum content of the soil was significantly affected to the localization of the articular syndrome. So, in figures G <2 Aluminum G has a negative correlation (r = -0,44; r = -0,42; r = -0,32) with NPJ, NSJ and duration of morning stiffness, which become positive (r = 0.89; r = 0, 73; r = 0,79) in rates G> 2. It means that increasing of accumulation in the soil influences to pronounced degree of articular syndrome. As can be seen from pic. 1, area with high aluminum in the soil (IV area) is valid pronounced characters of above symptoms (p = 0.0042 &; p = 0,033J).



Picture 1. Articular syndrome depends on index G aluminum in soil. NPJ – the number of painful joints; NSJ – the number of swollen joints.

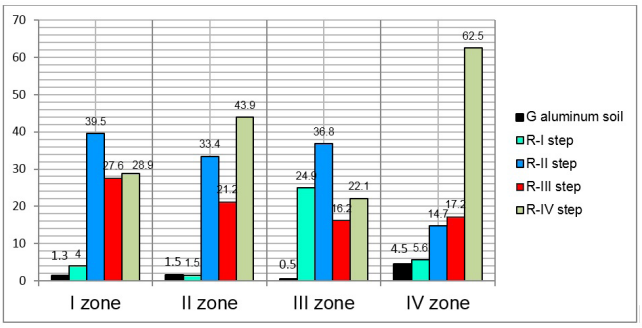
It should be noted that on the background G> 2, as seen from pic. 2, the severity of air pollution by xenobiotics significantly influences (in the figure indicated in black) to the incidence of lesions of the elbow (p = 0.023), the shoulder (p = 0.052), knee (p = 0.049) and hip (p = 0.037).



Picture 2. A significant effect (p D) to the frequency of destruction of individual joints: 1–maxillary, 2-sternoclavicular, 3–proximal meta carpophalangeal 4–meta carpophalangeal, 5–wrist, 6–elbow, 7–shoulder 8–proximal interphalangeal joint of feet, 9 –meta tarsophalangeal 10–ankle, 11–knee, 12–hip 13–sacroiliac, 14–vertebral arcuate appendicle shaped.

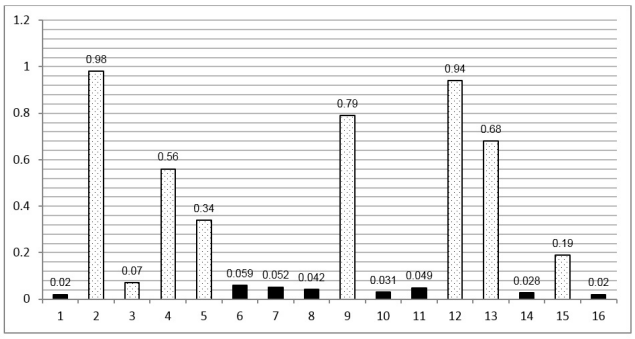
It is noteworthy, as shown by one-factor disperse analysis to the functional index of HAQ affects ω soil zinc (Zn). This performance is directly correlated with the G Ritchie index (r = 0,59) and back to the index HAQ (r = -0,67). Thus, by decreasing of ω, i.e. decreasing of concentration of Zn in the soil degraded functionality of the joint, which reflect on the index of HAQ, in particular in zones II and IV and contrast with the increasing of concentration in the soil improved HAQ, in particular in the zone III (p = 0.0034 $ p = 0.043 J). It should be noted, according to the literature [10, p. 702], against changes in the level of Zn in the blood of patients with RA in synovial environment increases the number of proteolytic activity of matrix metalloproteinases, which are involved in the implementation of preinflammatory and destructive action to the joint.

The important point, indicating the degree of progression of disease and complication of anatomical defects of joint in RA is radiological evidence of articular syndrome. As mentioned above, the rate of soil contamination ω significantly affect to the radiological stage of the disease and the index of Larsen. As can



Picture 3. X-ray changes in the RA depend on index G aluminum in soil.

be seen from pic. 3, in contrast from other zones in zone IV with increasing of accumulation of nickel (r = 0.089) will increase cases with ankylosis (IV radiographic stage of RA) and significantly increase Larsen index (p = 0.0023$, p = 0,033J). At the same time multivariate dispersion analysis also shows a high degree of impact on the overall ψ sonographic signs of RA. As can be seen from pic. 4, degree of atmospheric pollution by xenobiotics significantly influences (in the figure indicated in black) to the frequency of sonographic and radiographic signs of RA. It is noted the dependence of tendovaginitis, enthesopathies, ligamentosus, intra-articular calcifications, changes of horns of the menisci, Baker's cysts and bodies of Hoff on the parameters ψ. As the one-factor dispersion analysis to the frequency of sonographic and radiographic signs of RA affects to the degree of ω salinity. Thus, in ω salinity G > 2 (II zone) observed its direct strong correlation with indicators such as the tendovaginitis (r = 0,84), ligamentosus (r = 0,97), Baker's cyst (r = 0,77) and body of Hoff (r = 0,91). It means that with increasing of salinity of the soil whereas increases above cases.



Picture 4. Significant effect (p D) to the frequency of lesions by sonographic and certain clinical and radiological signs of RA 1–tendovaginitis, 2–enthesopathies, 3–subchondral sclerosis, 4–osteophytosis, 5–osteocystos, 6– epiphyseal osteoporosis, 7–systemic osteoporosis, 8–osteo erosion 9– subluxations, 10–ligamentos 11–aseptic necrosis, 12–joint calcifications, 13– changing of horns of menisci, 14 – Baker cyst, 15 – chondromatosis body, 16 – Hoff body.

We should note that F articular syndrome in RA are not associated with the parameters of sulfates and phosphates in the drinking water(p > 0.05).

Thus, the results of disperse analysis indicate the degree of ω and ψ depend on clinical, radiographic and sonographic signs of articular syndrome in RA. It means that changes in the micro elementary composition of soil and air which depends on the zone of residence of patients with RA in Uzbekistan contributes rate of progression of joint syndrome.

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