123 YEARS OF PASTEUR INSTITUTE NIŠ

55th DAYS OF PREVENTIVE MEDICINE

INTERNATIONAL CONGRESS

BOOK OF ABSTRACTS

26-29. 09. 2023.
NIŠ, SERBIA

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MAIN TOPICS

The One Health approach supports global health

Microbiology today
Current parasitosis
Theoretical and practical problems of communicable diseases
Theoretical and practical problems of non-communicable diseases
Nutrition and health
Environment and health
Experiences of implementing health education in the community
Health education in youth population
Application of information and communication tools in the health care system
Round table: Current state of antibiotic resistance

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KEYNOTE LECTURE

CHALLENGES OF MANAGEMENT OF MEDICAL INSTITUTIONS IN THE 21ST CENTURY

Samo Fakin

Consultant in health management / International expert Government, Ministry of Health, Republic of Slovenia

An individual's health is his greatest value. The health of the nation is based on the health of the individual. Security and progress are based on the health of the nation. That is why we need a long-term stable and robust system. The healthcare system is extremely complex and vulnerable. Therefore, it needs effective management.

In healthcare, there is no tradition of managing healthcare institutions in the sense of efficient companies anywhere in the world. In the last 30 years, there has been a transfer of good practices of effective management from commercial companies. For example, ISO standards, HASAP, RAL, laboratory standards.

Health care institutions in the medical and other professions operate according to a number of doctrinal principles where performance is generally not measured. In the field of institution management, however, we are left to traditional models of management.

For a stable healthcare system we, above all, need good leadership. A clear vision of the system with efficiency values. Careful planning at all levels. Personnel management. Ensuring the stability of all stakeholders and suppliers. Continuous process improvement at all levels.

For stable, development-oriented, planned and systematic development, we need tools for continuous improvement. We need a unified approach at the national level, both in the selection of planning and management tools.

The education and training of all managers at all levels is extremely important. It is a doctrinal approach known in medicine. Otherwise, the development of health protection is left to many individuals and interests. At the very least, this is a recipe for poor and uneven development.

The manager of the future must be trained in the use of modern tools of continuous quality improvement. He must know the tools for improving his own efficiency.

The basic principle of the company's development is the orientation towards continuous improvement. These can be spontaneous or planned and managed.

Successful companies soon realized that only a constant focus on quality improvement leads to long-term stability and success. We also expect the same from the healthcare system.

There is no doubt that leaders need a unified view of the mission, vision and values of the organization they lead. For this, they need constant training, just like in medicine.

Unfortunately, there is little or almost no planned education. Bad leadership produces bad results.

A good leader must master both hard and soft skills.

In 30 years of practice, I would emphasize some basic skills:

PLANNING

It is necessary to separate the long-term and annual operational plan. The basis for the long-term plan of each institution is the health care development plan at the national level. Usually this is a document of the parliament. In a regulated system, each institution has its own long-term plan. This is followed by annual operational plans.

Basic questions

We all know how to plan. We use six basic questions every day in almost every task. What, why, how, who, until when, with what. So why is it not used in daily operational management? The answer seems to be found in our established reflexive way of thinking. We use this tool intuitively, without thinking.

SWOT analysis

A relatively simple but subjective method of determining the actual situation. Both positive and negative factors must be taken into account when using it. Opportunities and threats can be summarized in a common chapter. An important element of use is visual presentation. Participants must see all the elements. With this, we avoid the subjective assessment of individuals.

System of balanced indicators

One of the basic methods where we highlight key factors for customers, key financial results, process improvements and the aspect of learning and growth. The method is useful for long-term and short-term planning.

Analyzing and monitoring quality and progress

In the organization, it is necessary to set key indicators of the success of both, the mission and the vision.

Every progress needs to be measured, otherwise we don't know if we have achieved it.

Various standards, EFQM model

A number of models are used to monitor quality, their use tells the user that the work is monitored, measured and improved, planned and systematic. In healthcare, it is used in many subsystems.

Integrity is captured by the EFQM model. An organization is good if it systematically monitors and improves its performance in the area of factors and results. The factors that most influence success are: leadership, planning, employee development, partners and suppliers, process improvements. We monitor the results in four areas: customer, employee, company and financial satisfaction.

Basic principles of the model of excellence
adding value for customers
creating a sustainable future
developing organizational capabilities
leading with vision, inspiration and integrity
agile management
achieving success with the talent of employees
permanently achieving excellent results

OPERATIONAL MANAGEMENT SKILLS

Effective management of meetings, creation of new ideas, lateral thinking, ease of thinking - comprehensibility. That's where De Bo comes in--new tools for thinking. It is a departure from the classical method of the ancient Greek philosophers, hypothesis and argumentation. These are fairly new methods that are unknown to classic managerial models.

Soft management methods

SHORT AND LONG TERM THINKING

When using knowledge on a daily basis, it is good to know how it is created in our brain and what affects everything afterwards. Thinking fast means that the brain offers us an answer to the existing situation. There is nothing wrong with this as long as the answer is consistent with the solution. When this is not the case, it is necessary to jump over a mental barrier, which cannot be done.

Nobel laureate KAHNEMAN divides thinking into two main groups, short-term or intuitive and long-term - with reflection. A fundamental property of our brain is the speed of thought. The brain first offers already learned knowledge for use. Completely intuitive and without thinking. This is of course suitable for routine and everyday use.

This hinders us in creating new knowledge. Especially when the existing knowledge is exhausted. That's when it's time to create, not throwing in the towel (not giving up).

Once we understand how our thinking works, we can overcome obstacles that tell us THIS IS NOT POSSIBLE. And we don't know how to replace it with this one yet.

EMOTIONS AND LEADERSHIP

One of the key success factors is satisfied employees. Management is responsible for a positive organizational climate. In principle, an employee is satisfied if his basic needs are satisfied.

Knowing basic human needs and related emotions is a necessary component of leadership. For a manager, basic knowledge of Maslow and Glasser is recommended and sufficient. Maslow classified needs into a pyramid. In doing so, he determined the order of priorities. In principle, we satisfy needs in order. If basic needs are not met, it is difficult to realize higher needs.

In addition to basic needs, Glasser classified five more basic emotional needs. The need for security, love, power, freedom and fun.

Emotions are therefore inherited and learned. They are also part of our memory. Emotions are also offered by the brain automatically, as a response to the existing situation.

The leader must be aware of his own way of thinking and the thinking of his colleagues. Only with a good knowledge of how thinking works can he create a positive climate for the effective functioning of the institution.

SESSION: MICROBIOLOGY TODAY

INVITED LECTURES

ANTIFUNGAL RESISTANCE TO DERMATOPHYTE FUNGI - A GROWING PROBLEM

Roderick Hay

King's College London, London Bridge Hospital, United Kingdom

Objectives. Over many years patients with dermatophyte infections, usually tinea corporis and cruris, which respond poorly to treatment have been recognised.
Situation/results: Recently there have been numerous reports of similar treatment unresponsive tinea cases mainly from India, Bangladesh and Iran. Many of these new infections are caused by a newly described dermatophyte related to the *T.mentagrophytes* complex, *T indotineae* and many show resistance to terbinafine in vitro; most of these have mutations in the squalene epoxidase gene. They may also show increased MICs to other antifungals such as itraconazole. The situation is complicated by two other factors - the widespread use of generic antifungals or strong topical corticosteroids which are widely available without prescription. So-called drug-resistant tinea has also emerged as a common problem at community level. Cases of this new infection are now seen in Europe, the USA and other countries of the Middle East and Asia. At present there is little evidence of community transmission in all these newly affected countries, but it has been reported.
Conclusion. Drug resistant dermatophytosis is emerging as a significant problem in local communities and displaced refugee populations. The current situation underlies the urgent need for new treatments and public health strategies.

PERSISTENT CHLAMYDIAL INFECTION AND IN VITRO FERTILIZATION OUTCOME.

Dejan Baskić
Faculty of Medical Sciences, University of Kragujevac, Serbia

Objective: To study the relationship between the presence of serological markers of chlamydial infection in the serum and follicular fluid and the outcome of in vitro fertilization. Of the many causes, Chlamydia trachomatis is one of the most common bacterial causes of infertility. The aim of this study was to examine the relationship between the presence of serological markers of chlamydial infection in the serum and follicular fluid and the outcome of in vitro fertilization.
Design: The study included a population of female patients aged 20 to 42 years, who were in the procedure of in vitro fertilization at the University Clinical Centre Kragujevac and Clinic Narodni Front Belgrade. The titer of IgG, IgA and IgM antibodies specific for MOMP antigen
Chlamydia trachomatis in serum and follicular fluid was determined in all patients using EUROIMUN commercial ELISA test (Lubec, Germany). 132 female patients ages 20 to 42 years who were in procedure of in vitro fertilisation. The titer of IgG, IgA and IgM antibodies specific for the MOMP antigen of C. trachomatis in serum and follicular fluid was determined in all patients using the EUROIMUN commercial ELISA test (Lubec, Germany).
Results: The percentage of the success of in vitro fertilization is lower in seropositive compared to seronegative subjects. Moreover, it decreases with increasing number of antibodies to which the subjects are positive, so that it is the lowest in the group of subjects that are positive for three or more different antibodies, and the highest in the group in which no antichlamydial antibody was detected.
Conclusion: We found out, there is strong correlation between patients with multiply positivity for antichlamydial antibodies and negative IVF outcome.

Key words: Chlamydia trachomatis; antichlamydial antibodies; IgG; IgA; IgM; IVF; outcome;

RESISTANCE AND REPRESENTATION OF CERTAIN RIBOTYPES OF CLOSTRIDIOIDES DIFFICILE IN SERBIAN PATIENTES

Predrag Stojanović
University of Nis, Faculty of Medicine; Institute for Public Health Nis, Serbia

Abstract

Purpose: Research over the past decade has shown that *Clostridioides* (C.) *difficile* infection (CDI) is no longer an exclusively nosocomial infection and reported the onset of symptoms in the community. The aim of this study is to estimate community-onset(CO) CDI in the entire (all age) population groups in south Serbia, and describe the clinical characteristics and risk factors for CO-CDI.
Methods: The study group included 93 patients with CDI. The control group consisted of 186 patients with community-onset diarrhea, whole stool specimens were negative for *C. diffiicile* and toxins A/B.
Results: Of all CDI cases diagnosed with a community onset, 74.19% had a previous contact with a healthcare facility. By using the multivariate statistical regression model, the following risk factors for CO-CDI development were determined: previous antacide usage (OR=0.267, 95%C.I.:0.10–0.291, $p< 0.01$), history of chronic kidney disease (OR=0.234, 95%C.I.:0.10–0.51,$p< 0.01$) and an antibiotic use during the prior 2 months (OR=0.061, 95%C.I.:0.02–0.17, $p< 0.01$) especially taking tetracyclines (OR=0.146, 95%C.I.:0.07–0.22, $p< 0.01$) and cephalosporins (OR=0.110, 95%C.I.:0.14–0.42, $p< 0.01$). The most common ribotypes(RTs) are RT001(32.25%) and RT027(24.73%). All tested toxigenic isolates of *C. difficile* were sensitive to metronidazole, vancomycin and tigecycline. The presence of pCD-METRO plasmids was not detected in any of the *C. difficile* isolates.
Conclusion: All data indicate (especially a high frequency of RT027) that the majority of CDI cases in this study, are not classic community-associated CDI but healthcare-related. Avoidance of high-risk antibiotics in favor of lower-risk antibiotics may help reduce the incidence of CDI.
Keywords: *Clostridioides difficile*, community-onset, ribotyping, resistance, diarrhea

Introduction

Research conducted over the last twenty years shows that the jump in the incidence of CDI (*C. difficile* infection) is due to the education of doctors, the use of more sensitive methods of microbiological diagnostics, but also due to the spread of the hypervirulent and hyperepidemic strain of the genotype NAP1 /BI/ RT027/ toxinotype III (1, 2) PCR ribotype (RT) 027 strains are characterized by the production of large amounts of toxins A and B in vitro, during the log phase of growth, and the presence of genes encoding a binary toxin (*cdtA* and *cdtB*). The reason for the hyperproduction of toxins should most probably be sought in the deletion of a part of the genome that has the role of regulator of negative control of the production of toxins A and B (1).

One of the more detailed European studies on ribotyping of *C. difficile* isolates was done by Freeman et al. (2) and included 2694 isolates from 39 cities in 22 countries. The presence of 144 different RTs was determined. The most frequently isolated RT in Europe was the hypervirulent RT027 with 12.22% and it dominates in Denmark, Hungary, Italy and Poland, while RT 018 and 078 dominate in Italy, and RT 176 and 017 in the Czech Republic. A high prevalence of RT001 was found in Latvia and Slovakia. The spread of RT 198 and 356 was recorded in Hungary and Italy. The greatest diversity of RT was recorded in Belgium. Similar data are published by researchers at the regional and national level (eg. RT 178 in Eastern Europe, RT 244 in Australia and New Zealand, RT 018 in Italy and RT 017 in Asian countries (South Korea, China, Japan)). Epidemics in Belgium are most often caused by RT 12 (3, 4, 5, 6, 7).

The presence of certain ribotypes is also indicated by data from the Reference Laboratory for Anaerobes from Cardiff, on patient isolates from 58 British hospitals. A total of 54 different PCR RTs were identified when it comes to isolates from hospitalized patients, but only 16 PCR RTs make up 90% of all samples, and RT 001 is represented by 58%. The next most common strain, RT 106, accounts for 7% of isolates, and has spread over the past few years to London and south-east England from its source -

central Great Britain. *C. difficile* strain typing data from England and Wales show that toxin A negative / toxin B positive strains, PCR RT 17 (represented by less than 3% of all typed isolates during the study) were detected in 10 British hospitals (8). In people living in the community, out-of-hospital isolates, non-toxic RT 10 (15.9%) was most often cultured. RT 20 and 14 were represented by 11.8% and 8.7%, and RT 1 was represented by only 7.4%. The published results indicate that certain strains most likely reproduce much faster in the hospitals themselves and that the conditions of the hospital departments themselves act as a selector for the presence of certain strains.

C. difficile is often present in animals and is cultured from the meat of pigs, calves and horses (9). Studies show that farmers and their animals can be colonized by RT 078, indicating their exchange and possible sources of infection (10).

Research on the representation of certain RT *C. difficile* in the territory of Serbia is underway. The research covered about 20 medical institutions (three clinical centers in Niš, Vojvodina-Novi Sad and Serbia-Belgrade; general hospitals in Kraljevo, Kruševac, Čačak, Leskovac, Pirot, Vranje, Subotica and Sombor; Military Hospital Niš and Military Medical Academy Belgrade ; KBC Bežanijska kosa, Zvezdara, Dragiša Mišović-Dedinje; Institute for Health Protection of Children and Youth of Vojvodina, Institute for Pulmonary Diseases of Vojvodina, KVB Institute,,Dedinje,, GAK,,Narodni front,, Belgrade, Orthopedic hospital ,,Banjica,,; Dom zdravlja Niš). Preliminary results show the predominance of RT 027 (47.28 %) and RT 001 (23.85 %) among isolates from hospitalized patients. The findings in outpatients are similar (RT 027 (37.20 %) and RT001 (20.93 %), but RT 006, 014, 020, 037, 085, 126 etc. were also cultured) (7).

During the year 2023, an analysis of data for out-of-hospital cases of CDI from the territory of southern Serbia (community-onset CDI (CO-CDI)) was performed (11).

Material and methods

The research was carried out at the Institute of Public Health in Nis using the already described microbiological methodology (11, 12). The final examined group included 93 patients with CO-CDI (55.91% women and 44.09% men).

The antimicrobial sensitivity of the suspension of *C. difficile* isolates (McFarland 1) was tested by the E-test against six antibiotics: metronidazole (0.016-256 μg/mL), vancomycin (0.016-256 μg/mL), tigecycline (0.016-256 μg/mL), fusidic acid (0.016-256 μg/mL), rifampicin (0.002-32 μg/mL) and moxifloxacin (0.002-32 μg/mL) (LIOFILCHEM® srl, Via Scozia zona ind. Le, Roseto degli Abruzzi, Italy). *Brucella* Agar enriched with haemin and vitamin K (Biomedics, Parg qe tehnicologico, Madrid, Spain) was used. Agar plates were incubated in an anaerobic atmosphere (AnaeroGen bags and Anaerobic indicator, OXOID, United Kingdom) at 37 °C for 48 h. *Bacteroides fragilis* ATCC 25285 and *Bacteroides thetaiotaomicron* ATCC 2974 were used as control strains (12).

Molecular characterization of *C. difficile* isolates performed at Leiden University Medical Center, Medical Microbiology (National Reference Laboratory for *C. difficile*). Multiplex PCR for the determination of *C. difficile* toxin genes (tcdA, tcdB, cdtA and cdtB), 16S rDNA gene and GluD gene (GDH) was performed according to the previously described methodology. *C. difficile* ribotyping was performed using capillary gel-based electrophoresis (CE-ribotyping) according to the previously described methodology (Table 1) (13, 14). The presence of plasmid-mediated resistance to metronidazole (pCD-METRO 7-kb plasmid) was determined according to the previously described methodology (15).

Table 1. Primers for multiplex-PCR

Gen	Primer	Primer sequence (5’ – 3’)	Concentracion of primer(µL)	A fragment of greatness (bp)
TcdA	TcdA-F3345	GCATGATAAGGCAACTTCAGTGGTA	1	629
	TcdA-R3969	AGTTCCTCCTGCTCCATCAAATG	1	
TcdB	TcdB- F5670	CCAAARTGGAGTGTTACAAACAGGTG	0.4	410
	TcdB- R6079A	GCATTTCTCCATTCTCAGCAAAGTA	0.2	
	TcdB- R6079B	GCATTTCTCCGTTTTCAGCAAAGTA	0.2	
CdtA	CdtA-F739A	GGGAAGCACTATATTAAAGCAGAAGC	0.05	221
	CdtA-F739B	GGGAAACATTATATTAAAGCGAAGC	0.05	
	CdtA-T958	CTGGGTTAGGATTATTTACTGGACCA	0.1	
CdtB	CdtB-F617	TTGACCCAAAGTTGATGTCTGATTG	0.1	262
	CdtB-R878	CGGATCTCTTGCTTCAGTCTTTATAG	0.1	
16S rDNA	PS13	GGAGGCAGCAGTGGGGAATA	0.05	1062
	PS14	TGACGGGCGGTGTGTACAAG	0.05	
GluD	908CLD_gluDs	GTCTTGGATGGTTGATGAGTAC	0.1	158
	909CLD_gluDas	TTCCTAATTTAGCAGCAGCTTC	0.1	

Through the statistical analysis of the collected data, the results are presented by frequency distribution expressed as percentages or median/mean values. Comparisons of medians/means were performed by either Student's t-test or Mann-Whitney U test, depending on the distribution of the variables, using GraphPad Prism version 5.03 (GraphPad Software Inc., San Diego, CA, USA) and SPSS (version 21.0, IBM Corp, 2012). Frequency distributions were compared using Fisher's exact and chi-square tests. Logistic regression models were used to identify patient-related risks. Variables found to be statistically significant by univariate analysis were then entered into multivariate logistic regression analysis to identify independent risk factors for the development of CDI. Probability values (p) less than or equal to 0.05 were considered statistically significant.

Results

The majority of patients with CO-CDI (74.19%) had previous contact with healthcare institutions that lasted from 1 to 4 hours. The duration of antibiotic therapy and the use of antibiotics are statistically significantly associated with the occurrence of CO-CDI ($p<0.05$), especially the class of cephalosporins, tetracyclines and quinolones ($p<0.05$). Some types of antibiotics are also associated with the onset of infection (ceftriaxone, ceftazidime, cefepime, cephalexin, cefaclor, doxycycline, tetracycline, ciprofloxacin, ofloxacin and norfloxacin) ($p<0.05$).

Previous use of antacids (OR = 0.267, 95% C.I.: 0.10–0.291, $p < 0.01$), presence of chronic kidney disease (OR = 0.234, 95% C.I.: 0.10–0.51, $p < 0.01$) and taking antibiotics 2 months before CDI onset (OR = 0.061, 95% C.I.: 0.02–0.17, $p < 0.01$) especially tetracycline (OR = 0.146, 95% C.I.: 0.07–0.22, $p < 0.01$) and cephalosporin (OR = 0.110, 95% C.I.: 0.14–0.42 , $p < 0.01$) are independently associated with CO-CDI.

A total of 20 different ribotypes (RTs) of *C. difficile*, the causative agent of CO-CDI, have been identified. The following prevalence of RT isolates of *C. difficile* (n = 93) was determined: 30 (32.25%) patients with RT001, 23 (24.73%) patients with RT027, 9 (9.67%) patients with RT014, 4 (4.30%) patients with RT955, 3 (3.22%) patients with RT808, 3 (3.22%) patients with RT020, 3 (3.22%) patients with RT006, 2 (2.15%) patients with RT005, 2 (2.15%) patients with RT015, 2 (2.15%)) patients with RT054, 2 (2.15%) patients with RT126, and one patient each with RT002 (1.07%), RT018 (1.07%), RT037 (1.07%), RT070 (1.07%), RT078 (1.07%), RT103 (1.07%), RT106 (1.07%), RT414 (1.07%), RT709 (1.07%). One (1.07%) *C. difficile* isolate was not identified by the standard RT library. The presence of binary toxin was determined in all isolates belonging to RTs 027, 070, 078, 126 and 955. Out of 93 patients, 12 (12.90%) had a relapsed form of CDI (rCDI). All 12 patients with rCDI had the same RT as during the first episode of infection - relapse (7/12 patients (58.33%) RT027 ($p < 0.05$), 2 patients RT001 and one each RT014, RT020 and RT955).

Using EUCAST ECOFF, all tested toxigenic *C. difficile* isolates were susceptible to metronidazole, vancomycin and tigecycline. A high rate of resistance was found to moxifloxacin (68/93, 73.11%) and rifampicin (22/93, 23.65%), while resistance to fusidic acid was 11.82%. Resistance to two or more antibiotics was found in RTs 001, 014, 027 and 078. Isolates of *C. difficile* RT 027 were less sensitive to metronidazole, which was shown by elevated MIC50 and MIC90 values. In all patients with rCDI, *C. difficile* isolates obtained during the first and subsequent episodes of rCDI had the same sensitivity to the tested antibiotics. The presence of the pCD-METRO 7-kb plasmid was not detected in any *C. difficile* isolate.

Discussion

The outcome and severity of CO-CDI is still poorly understood, especially when compared to HO-CDI. CO-CDI is associated with significant clinical complications (40% of patients require hospitalization, 20% develop severe infection, 4.4% have severe complications, 20% do not have an adequate therapeutic response and 28% develop rCDI (16). Previous studies report that patients with CO-CDI, compared to patients with HO-CDI, are younger and have a milder course of the disease (17). In our study, the patients had several statistically significantly high clinical and biochemical parameters, which is most likely a consequence of the high prevalence of the hypervirulent *C. difficile* strain (RT027). This ribotype is known to be associated with the occurrence of severe forms of CDI and a higher mortality rate (18, 19). Hypervirulent RT027 is also associated with the occurrence of rCDI (19), which is consistent with our results (in 7/12 (58.33%) of patients, rCDI was caused by ribotype 027).

The epidemiology of *C. difficile* is region-specific (20, 21, 22), but previous studies show in 80% of cases the similarity in the representation of RTs in hospital and non-hospital cases. Similar to the research of Dutch scientists (23), a study from Canada indicates that it is not possible to clearly distinguish RTs that cause infections in and outside the hospital (16). This may also be a consequence of the trend of shortening hospital stays after interventions and therapeutic treatment, which leads to CDI

after hospital discharge (CO-HA-CDI). Similar findings are found among family members with CDI who are exposed to an exposed case of HA-CDI, which also leads to an increased incidence of CO-CDI (24).

Conclusion

Of all cases, the CO-CDI, 74.19% had previous contact with health care institutions. Chronic kidney diseases, taking antacids and antibiotics (especially cephalosporine and tetracyclines) are predisposing the factors for the formation of infection. We have identified 20 different RTs of *C. difficile* challengers of infection and determined the high frequency (24.73%) RT 027, which is most likely reflecting the connection of CDI with pre-existing contacts with health care institutions. All tested isolates *C. difficile* were sensitive to metronidazole, vacomycin and tigecyclin. Resistance to two and more antibiotics was determined by the RTs 001, 014, 027 and 078. The use of antibiotics and outside hospitals must be more severe controlled because most patients with CO-CDI took antibiotics in a period of 2 months before CDI.

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ENTEROPATHOGENIC YERSINIAE AS IMPORTANT CAUSATIVE AGENTS OF FOODBORNE ZOONOSES

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Enteropathogenic Yersinia are zoonotic pathogens reported by EFSA/ECDC as the third most important infectious agent with 6876 confirmed human cases in Europe and a notification rate per 100,000 population of 1.9. Infections caused by the human pathogenic bio/serotypes of *Yersinia enterocolitica* or *Yersinia pseudotuberculosis* are running usually as a self-limited diarrheal illness but in many cases severe complication (reactive arthritis, erythema nodosum, Reiter's syndrome etc.) are observed. Contaminated with both pathogens meat, milk and their products cause a significant health risk for consumers, especially in young children, infants and immunocompromised patients. Herewith, the latest achievements of our Department are presented. In recent years, a number of modern molecular techniques (PFGE, ddPCR, LAMP, etc.) have been developed and optimized, which allow fast and reliable proof and quantification of enteropathogenic yersinia in various clinical samples, as well as those from the environment - feces, lagoons, soils, wastewater, etc. Valuable protocol was developed for direct identification of pathogenic *Y. enterocolitica* and *Y. pseudotuberculosis* in slaughterhouse pig feces with dd PCR. The role of migrating birds and their feeding ticks on the dissemination of some medically important zoonotic pathogens along the East-European flyway was evidenced. By using core genome multilocus sequence typing scheme a new species *Yersinia thracica* was described.
Key words: Yersinia, PCR based methods, pigs, migrating birds, *Yersinia thracica*
Acknowledgments: The research team acknowledges the project: “Prevalence and characterization of antibiotic-resistant food pathogens isolated from pigs, lagoons, wastewater and fertilized soils in Bulgaria” funded by Bulgarian National Science Fund, Ministry of Education and Science, Republic of Bulgaria, grant number KP-06-N36/7.

ANTIMICROBIAL ACTIVITY OF ESSENTIAL OILS BACTERIA *LEGIONELLA PNEUMOPHILA*

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Introduction: Physical and chemical approaches are used to prevent the reproduction of Legionella bacteria or to eliminate it, but these are often ineffective or may cause damage to plumbing and equipment due to the frequent use of aggressive disinfectants. The aim of these study was to determine the effect of natural antimicrobial agents of tea tree and lemon eucalyptus essential oils on Legionella pneumophila bacteria.
Methods: To determine the reproduction intensity of Legionella pneumophila bacteria at different concentrations, the antibacterial potential of selected natural extracts was analysed using the microdilution method.
Results: The results showed that tea tree essential oil was effective in preventing biofilm formation in all three bacterial strains of Legionella pneumophila. It was most effective against Legionella pneumophila strain 130b. We achieved a 50 % efficacy in preventing biofilm formation at MIC 1, a 53 % efficacy at MIC 2, and a 5 6% efficacy at MIC 3. The lowest efficacy of essential oils in preventing biofilm formation was demonstrated in Legionella pneumophila subsp. ATCC 33152, which suggests that this particular bacterium is more resistant to the effects of essential oils than the other two.
Conclusion: During the research, we found that tea tree essential oil has the highest efficacy against biofilm formation and has antibacterial properties. Its active substances have been shown to have apositive effect on the prevention of biofilm formation. Further research in this field would be necessary to determine the efficacy of the active components on different bacterial strains, together with the potential for synergistic activity of different essential oils.
Keywords: Legionella pneumophila, biofilm, legionellosis, antibacterial activity;

RECENT FEMS INITIATIVES 5 YEARS AFTER IDEAS – REALIZATION AND BENEFIT FOR MOST TALENTED EARLY CAREER MICROBIOLOGISTS

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FEMS (Federation of European Microbiological Societies) established in 1974, to celebrate 50 years anniversary in 2024, is a federation of more than 50-member societies, network of around 30,000 professionals, early and senior career scientists committed to advance microbiology. FEMS is investing in science supporting microbiology and microbiologists in Europe and worldwide, connecting people and sharing knowledge through: Grants, Publications, Events (Congress, Conference on Microbiology, Summer School for Postdocs, Webinars), EAM (European Academy of Microbiology). FEMS is providing 5 types of grants for meeting organizers and early career researchers (over 400.000 EUR per year) and 7 types of awards. FEMS publish seven highly regarded journals. Six journals will go Open access from January 2024 (FEMS Microbiology Ecology, FEMS Pathogens and Disease, FEMS Microbiology Reviews and FEMS Yeast Research, microLife and FEMS Microbes). During International Congress–53rd days of Preventive Medicine in Nis, Serbia, I have announced three very promising projects. Results and outcome of their realization will be presented. One of the projects started in 2019, as noble idea to organize serial of FEMS postdocs summer schools, for excellent European and non-European postdocs, in organization with worldwide scientifically recognized and distinguish professors, lecturers, researchers and scientists. Place to connect young and senior scientists, exchange of knowledge, and production of ideas for new scientific projects, brainstorming and team building. FEMS Summer school for postdocs is unique because of the:

- Venue (MedILS, Mediterranean Institute of Life Sciences, in Split, Croatia, International centre of excellence in the field of natural sciences),
- Programs (very attractive, prepared by distinguish scientists who are mentors and speakers),
- School duration (we started with 10 days, last one 8 days)
- Low Registration fee (400 EUR).

Covid-19 pandemic had influence on the organization. Four, great summer school for postdocs were organized (2019, 2022 in April and in September 2023). Total of 74 postdocs and 44 speakers-mentors participated to four past summer schools. Evaluation of all participants emphasised summer school as: Great, Unique, Amazing, Wonderful experience, Inspiring, Enriching, will Recommend, Presious, New Ideas…). Fifth summer school is scheduled for September 2024. The second project, very important for FEMS visibility and promotion is organizing a FEMS network of Ambassadors & Deputy ambassadors in countries out of Europe, with most developed microbiology science. We have very active ambassadors and deputies in eight countries (Japan, China, South Korea, USA, Australia & New Zealand, Canada, India and Brazil. The third project is organization of serial of FEMS biennial conferences on microbiology, between FEMS Congresses. Conference have limited number of topics.

First FEMS conference on microbiology organized in association of FEMS with Serbian Society for Microbiology (SSM), was scheduled for 2-4 July 2020, in hotel Hilton, Belgrade, Serbia. Because of Covid-19 pandemic, we organized this conference as ONLINE conference. It was the largest online microbiology conference in Europe, very successful, with over 650 registered participants from 39 European and 20 non-European countries. In 2022, from 30 June to 3 July, in Hotel Hilton Belgrade, Serbia, FEMS Conference on Microbiology was organized in association of FEMS with Serbian Society for Microbiology (SSM). Over 600 participants in person and over 130 online participated to this extremely successful conference.

FEMS Conference on Microbiology 2024 was postponed for 2026.

ORAL PRESENTATION

ANTIMICROBIAL POTENTIAL OF HYSSOPUS OFFICINALIS ESSENTIAL OILS

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Objectives: Essential oils (EOs) are mainly secondary metabolites of plants and have been reported to have various biological activities such as antibacterial, antifungal, anticancer, anti-inflammatory, etc. Biological activity studies have shown that *Hyssopus officinalis* EO has significant antibacterial and antifungal activity. The aim of the present study was chemical and antimicrobial study of essential oil from natural populations *H. officinalis* from Eastern Serbia: Klenje village (sample 1), Vidlič mountain (sample 2) and Kravlje village (sample 3).
Methods: Gas Chromatographic-Mass Spectrometric Analysis (GC-MS) analyses were performed to the analysis of essential oils. The antimicrobial activity was investigated by the broth microdilution method.
Results: Dominant components of EOs are: β-pinene, 45,4% (sample 1); eucalyptol, 33,4% (sample 2) and cis-pinocamphone 41,7 (sample 3). The lowest values of bacteriostatic and bactericidal activity (for the most number of bacteria) were recorded for the essential oil from Kravlje village. At the same time, this EO exhibit the best antifungal activity.
Conclusion: The results presented in this study indicate the great potential of this essential oil as an alternative antimicrobial agent that can be used to control infectious diseases, especially against the *Candida* species that was found to be the most sensitive.
Keywords: *Hyssopus officinalis*, Essential oil, Antimicrobial activity.

HIGH-RISK HUMAN PAPILLOMAVIRUS DETECTION AND PARTIAL GENOTYPING USING REAL-TIME PCR METHOD

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Objectives: Human papillomavirus is a common sexually transmitted infection which usually shows no symptoms and goes away by itself, but can sometimes cause serious illness.
Materials and methods: In this study, cervical smears from women between the ages of 25 and 65 were examined using the *real-time* PCR method for simultaneous detection and partial identification of high-risk HPV (hrHPV) genotypes. Qualitative detection and identification of DNA from 14 high-risk HPV genotypes (HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, and 68), has been performed using the diagnostic test Viasure High-Risk Human Papilloma Virus (*CerTest Biotec, S.L.).*
Results: A total of 625 cervical smears were collected during the period from January to July 2023. Among 195 positive results (31%), single HPV genotype infection was detected in 120 samples (62%), while multiple genotype infection was detected in 75 samples (38%). The most prevalent hrHPV genotype was among group (31, 39, 56) 28%, and HPV16 (18%).
Conclusion: This analysis showed that the prevalence of hrHPV infection among analyzed women was high. HPV testing improves the identification of women who are at high risk of recurrence, lowering the proportion of women who need frequent and long-term monitoring.
Keywords: Human papillomavirus, real-time PCR, hrHPV

DETECTION OF GENES CAUSING RESPIRATORY INFECTIONS BY VIRUSES SARS-COV-2, INFLUENZA A, B AND RSV

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Objectives: During the Sentinel project (January to July, 2023.), samples from hospital patients were analyzed for the presence of *SARS-CoV-2*, *Flu A*, *Flu B* and *RSV* viruses, to determine the diagnosis and further treatment.
Methods: The 336 samples were collected using nasopharyngeal swabs, stored and transported in vNAT medium and analyzed by the RT-PCR method. For detection of *SARS-CoV-2* we used Xpert Xpress SARS-CoV-2 test. The Ct value for positive results for the N2/N2 and E genes is in the range of Ct≤45. For detection of *Influenza A, B* and *RSV* we used Viasure *Flu A, Flu B & RSV* kit. The results are positive when the Ct value for the target gene is Ct≤40.
Results: Analysing 336 samples, total number of positive samples was 80 (24%), out of which *SARS-CoV-2* was detected in 22 samples (27%), Flu A was detected in 23 samples (29%), Flu B was detected in 35 samples (44%), and *RSV* was not detected. The presence of coinfections was detected in four samples *SARS-CoV-2* and *Flu A / SARS-CoV-2* and *Flu B* (two of each).
Conclusion: Rapid and accurate diagnostics remain important for identifying infected individuals, reducing transmission, and collecting data for surveillance purposes.
Keywords: SARS-CoV-2, RT-PCR, Influenza A/B, RSV

COMPARATION OF DIFFERENT ANTIBIOTIC REGIMES IN TREATMENT OF PERFORATIVE APPENDICITIS IN CHILDREN

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Objectives: Although, the choice of antibiotics for treatment of perforative appendicitis (PA) in children is based on good clinical practice recommendations, there are no optimal regimes.
Materials and methods: Retrospective study encompassed children with PA, empirically treated either with ceftriaxone/metronidazole combination (Group 1) or antipseudomonal antibiotic (Group 2) immediately after appendectomy. Clinical, laboratory and microbiological findings during hospitalization were analyzed.
Results: Thirty tree (76.7%) out of 46 children were assigned into group 1, while 13 (23.3%) were assigned to group 2. Group 1 had higher level of C-reactive protein (CRP) on admission (179.9 + 116.6 vs 138.8 + 91.2 mg/l), and more common Gram-negative bacteria isolates comparing to Group 2. More common postoperative complications (6.1 vs 15.4%), higher CRP at discharge (27.3 + 19.3 vs 21.1 + 12.3 mg/l), prolonged antibiotic therapy (11.2 + 4.1 vs 8.3 + 1.5 days, $p< 0.001$) and duration of hospitalization (11.9 + 3.9 vs 8.5 + 1.9 days, $p< 0.001$) were also characteristics of Group 2.
Conclusion: Both ceftriaxone/metronidazole combination and antipseudomonal antibiotics equally provide favorable outcome in children with PA. In spite of optimal initiation of antipseudomonal antibiotics in more severe cases of PA, prolonged antibiotic treatment and hospitalization is expected.
Keywords: antibiotics, perforative appendicitis, appendectomy, children.

SACCHAROMYCES CEREVISIAE AS A CAUSATIVE AGENT OF GENITAL FUNGAL INFECTIONS

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Objectives: The aim of this research was to determine the prevalence of *Saccharomyces (S.) cerevisiae* genital infection in women, *in vitro* sensitivity of this species to antifungal drugs, as well as to examine the percentage of biofilm-producing strains.
Methods: During 2022, 304 women were diagnosed with fungal genital infection (FGI) by inoculation of patient material on Sabouraud dextrose agar (SDA) and chromogenic medium and incubating at 37°C for 3-5 days. Yeast isolates were differentiated using Integral System YEASTS Plus (ISYP) test and matrix-assisted laser desorption in ionization-time of flight mass spectrometry (MALDI-TOF MS). ISYP test was used to determine susceptibility to antifungal drugs. Biofilm production was examined by the Stepanovic method.
Results: MALDI TOF MS confirmed that *S. cerevisiae* was isolated from the samples of 23 (7.57%) patients. A high percentage of isolates resistant to nystatin (21.74%), clotrimazole (61.11%), and itraconazole (60.87%) was determined using a commercial antimycogram test. Using the Stepanović procedure, it was determined that 30.43% of *S. cerevisiae* strains produce biofilm.
Conclusion: Since *S. cerevisiae* is resistant to the most commonly used antimycotics and 30.43% of genital isolates can produce biofilm, it is necessary to consider the diagnostic procedure and treatment of FGI caused by this yeast, especially in case of chronic/recurrent forms of infections.
Keywords: *Saccharomyces cerevisiae*, MALDI-TOF MS, fungal genital infection, biofilm, antimycogram.

POSTER PRESENTATION

INFLUENZA VIRUS SUBTYPES CIRCULATING IN VOJVODINA, SERBIA DURING THE 2022/2023 SEASON

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Objectives: Influenza virus can cause severe respiratory illness related to morbidity and mortality worldwide. This study aimed to determine the prevalence of influenza A and B viruses in ambulatory and hospital patients with flu symptoms during the 2022/2023 season.
Methods: A total of 1394 combined nasal and throat swab samples from patients with acute respiratory symptoms in Vojvodina during the 2022/2023 season were analyzed. Extraction of RNA was performed using QIAamp Viral RNA Mini Kit. Influenza virus was detected using rRT-PCR CDC Influenza SARS-CoV-2 Multiplex Assay and then subtyped with CDC primers.
Results: The overall prevalence was 19.7%, with 53.7% of the samples positive for influenza A and 46.3% for influenza B. The dominant subtype was A (H1N1)pdm09 (80.1%), followed by A(H3N2) (19.9%). All influenza B-positive samples belonged to Victoria lineages. The highest prevalence of influenza A and B was in the 30–64 age-group. Influenza A had a higher prevalence than influenza B in both ambulatory and hospital samples, 52.2% and 55.6%, respectively. February was the peak month for influenza activity, with 37.9% of the total positive samples.
Conclusion: Considering the results, continuous surveillance of influenza virus subtypes is necessary to predict seasonal trends and prepare for potential influenza outbreaks.
Keywords: Influenza, RT-PCR, Prevalence, Vojvodina

EVALUATION OF ANTIFUNGAL ACTIVITY AND TOXICITY OF TERRESTRIAL CYANOBACTERIAL NOSTOC STRAINS

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Objectives: Cyanobacteria (blue-green algae) have been identified as particularly rich source of new and bioactive compounds, but as well as the toxic ones, which limit their biotechnological use. This study aimed to assess antifungal activity and toxicity of four terrestrial cyanobacterial strains from the genus *Nostoc*.
Methods: Antifungal activity was assessed against two *Candida* strains, *C. guilliermondii* spp. and *Candida* spp.^{L}, using disk diffusion and microdilution methods. Four types of cyanobacterial extracts were tested: aqueous, ethanolic, methanolic, and chloroform. Toxicity was detected by *Artemia salina* bioassay using sonicated and centrifuged cultures.
Results: Using the disk diffusion method, antifungal activity was found in all strains, but only in chloroform extracts (inhibition zones of 9/10 mm). On the other hand, the activity was detected by microdilution method in three aqueous extracts (T126, T122, T123) and one methanolic (T126) which was the most potent (MIC values of 0.45 and 3.64 mg mL^{-1}). The toxicity in *A. salina* bioassay has not been detected in tested strains.
Conclusion: Tested *Nostoc* strains exhibited antifungal activity, but depending on the extract type and the method, whereby strain T126 proved to be the most potent. The absence of toxicity indicated the potential of tested strains for biotechnological use.
Keywords: *Artemia salina* bioassay, Antifungal activity, *Candida*, cyanobacteria, toxicity
Acknowledgments: The authors gratefully acknowledge the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-47/2023-01/200125). This research was also supported by the Science Fund of the Republic of Serbia (Grant No. 7726976), Integrated Strategy for Rehabilitation of Disturbed Land Surfaces and Control of Air Pollution–RECAP.

ANTIBACTERIAL ACTIVITY OF ESSENTIAL OILS FROM CHAEROPHYLLUM COLORATUM L.

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Objectives: Essential oils (EOs) are secondary metabolites that can be extracted from different parts of the plant materials by using well known techniques. The aim of this study was to determine the antibacterial activity of *Chaerophyllum coloratum* L. essential oils obtained from fresh roots, stems, and inflorescences.
Materials and methods: Antibacterial activity was evaluated against two Gram-positive (*Bacillus subtilis* subsp. s*pizizenii* ATCC 6633 and *Staphylococcus aureus* ATCC 6538) and three Gram-negative bacteria (*Escherichia coli* ATCC 8739, *Pseudomonas aeruginosa* ATCC 9027 and *Salmonella abony* ATCC 6017) by using the disk diffusion assay. Sterile filter paper disks (9 mm in diameter) were impregnated with 30 µl of the EOs dissolved in hexane at concentration of 100 mg/mL.
Results: The obtained results showed that the infloresscences EO did not have any activity against the tested bacterial strains. The EO of the stems showed a bactericidal effect against *B. spizizenii* (inhibition zone 15 mm) and *S. abony* (13 mm). And finally, the root EO was active against *B. spizizenii* and *S. aureus* with inhibition zone diameter of 17 mm.
Conclusion:. In conclusion, the EOs isolated from different plant organs of the same plant can be quite different regarding the antibacterial activity.
Keywords: *Chaerophyllum coloratum* L., Essential oil, Antibacterial activity.

ANTIBACTERIAL POTENTIAL OF *ACHILLEA COARCTATA* POIR. ESSENTIAL OILS IN THE TREATMENT OF *STAPHYLOCOCCUS AUREUS*

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Objectives: The plants that belog to *Achilleae* genus are well known medicinal herbs that are widely used in folk medicine. The aim of this study was to determine the potential use of essential oil obtained from aerial parts of *Achillea coarctata* Poir. in the treatment of infections caused by *Staphylococcus aureus*.
Materials and methods: The fresh aerial parts of the plant (flowering stage) were collected at four different locations in Serbia and hydrodistillated immediately after harvest. *In vitro* antibacterial activity was evaluated against *Staphylococcus aureus* ATCC 6538 by using the disk diffusion assay. Sterile filter paper disks (9 mm in diameter) were impregnated with 3mg of the essential oil.
Results: All of the tested samples exhibited bactericidal activity against *S. aureus*. Samples from Rujan and Preševo valley demonstrated the highest antibacterial activity with inhibition zone diameter of 60 mm and 58 mm, respectively. Essential oils obtained from *Achillea* collected in Pirot and Pčinja valley exerted antimicrobial effects with inhibition zones of 49 mm and 33 mm, respectively.
Conclusion: The obtained results lead to the conclusion that *Achillea coarctata* essential oils possess biological activities against *Staphylococcus aureus* and can be used as natural antimicrobial agents.
Keywords: *Achillea coarctata* Poir., Essential oils, Antibacterial activity, *Staphylococcus aureus.*

WORKING PROBLEMS DURING THE MOLECULAR DIAGNOSTICS OF *CHLAMYDIA TRACHOMATIS*, DISPLAZ OF NUMBER OF SAMPLES AND ANALYSIS FROM 1.03.02023 TO 27.08.2023

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Since 2017, molecular diagnostic(PCR)has become golden standard for diagnosing chamydia in genital,ocular and other foreskin samples.In period from 01.03.2023 to 27.08.2023 1416 samples were tested strictly for chamydia i our laboratory and other 297 samples that had more requirements were tested.
In work we use commercial test for rapid isolation (RealBest). For certain samples such as conjunctival swabs ad some other swabs we preform complete isolation of genomic DNA by using RB or amplisense K1 tests,adn the samples were released in pairs, one with rapid and one with full isolation. Individual samples were released for verification and reproducibility of the analysis With Sacace test. Multiplex were preformed with VIASURE 7 test and look for 7 pathogens.
The results is follows:out of 1416 chlamydia samples 63(4.5%) were positive and from the multiplex PCR out of 297, 6 were positive(2%). Reproducibility was over97%wich ever test was used. Only in one case rapid isolation failed.
Conclusion: I must mention that the number of samples is large and the problems that I face every day as well as my colleges start from the sampling itself and sample, trough transport adn everything that happens before the sample reaches the laboratory. Compared to DIF method the results are lower.
Keywords: *Chlamydia*, PCR, problems

DETECTION OF WEST NILE VIRUS FROM HUMAN CLINICAL SPECIMENS BY A REAL TIME PCR METHOD

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West Nile (WN) virus is the causative agent of West Nile fever. It is most often transmitted to humans and animals by the bite of an infected mosquito, from the genus *Culex*. In 80% cases of infection the disease is asymptomatic, and 20% have a mild clinical picture. Neuroinvasive form, occurs in 1 out of 150 cases of infection. At the Institute of Microbiology, VMA, the RT PCR West Nile test is performed as a routine diagnostic from clinical and biological samples.

Method: In the period from March 2022 to February 2023, 46 human samples (14 cerebrospinal fluid and 32 plasma), mostly from hospitalized patients 36/46 (78.29%), were tested with RT PCR kit for qualitative detection of WNV.

Results: 8/46 (17.39%) were positive, of which 3 cerebrospinal fluid and 5 plasma, and 6/8 samples belonged to hospitalized patients. Of the total number of positive samples, 5/8 (62.5%) came from men, and 3/8 (37.5%) from affected women. A total of 75% of the affected persons were ≥ 46 years old.

Conclusion: Given the fact that the number of WN virus patients is increasing, rapid detection by RT PCR test is of great importance for clinical diagnostics.

Keywords: West Nile virus, blood, cerebrospinal fluid, Real-Time PCR.

IMPROVED HOST-VIRAL CHARACTERIZATION FROM PAIRED SAMPLES IN COVID-19 PATIENTS

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Objectives: Altered gene expression has already been shown in severe COVID-19 patients, but its variations over time have not been sufficiently examined. This study encompassed identification of changes in transcriptional signatures during a defined time frame and across different relevant tissues.
Methods: Prospective analysis was performed on time-matched and tissue-matched paired nasopharyngeal swabs (NPS) and blood (BL) samples from 18 COVID-19 patients with acute and resolved infection. It included metagenomics, evaluation of the total expression and analysis of the host splicing profile to reveal potential therapeutic targets.
Results: Metagenomics analyses showed SARS-CoV-2 dominance during and after the acute infection, with a significant reduction in NPS (0.008 vs. 0.002, p=0.019). Although the unpaired DEG analysis failed, pairing identified 78 genes and 242 altered pathways with meaningful clinical interpretation and new candidate drug combinations with up to 65% overlap.
Conclusions: This is the first demonstration of how the power of blood analysis is vastly maximized by pairing, even though both NPS and BL give relevant insights into expression changes. It could suggest future sampling designs when it comes to bioinformatic processing of insights into the full-action of pathogens and potential drug targets.
Keywords: Sample pairing, transcriptome, SARS-CoV-2, COVID-19, therapeutics

RESULTS OF RT-PCR TESTING FOR SARS COV-2 IN HUO-YAN LABORATORY 2 NIŠ

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Objectives: Detecting SARS-CoV-2 from throat and nose swabs in the period from 31.07.2020. to 31.06.2023.
Materials and methods: The research included 515.575 samples from 7 different districts of Serbia that were tested in the period from 31.07.2020. to 31.06.2023. displayed annually. All samples were tested with BGI's Real-Time Fluorescent RT-PCR kit for detecting SARS-CoV-2.
Results: In the period from 31.07.2020. to 31.12.2020. total of 78.587 samples was tested and SARS-CoV-2 was detected in 25.531 (32.48□). In 2021. out of a total from 241.481 tested samples, SARS-CoV-2 was detected in 36.897 samples (15.27□). During 2022. 175.053 samples was tested and SARS-CoV-2 was detected in 41.069 samples (23.46□). In the period from 01.01.2023. to 31.06.2023. total of 20.454 samples tested, SARS-CoV-2 was detected in 2.420 (11.83□).
Conclusion: Based on the results obtained, the highest percentage of positive samples was detected in the period from 31.07.2020. to 31.12.2020.
Keywords: SARS-CoV-2. RT PCR testing

COMPARISON OF THREE COMMERCIAL TESTS FOR THE SARS-COV-2 DETECTION IN THE SAMPLES DURING 2022

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Objectives: Comparison of the sensitivity of three different RT-PCR tests in the analysis of samples for SARS-CoV-2 detection.
Materials and methods: In the laboratory of the Department for Molecular Microbiology, Institute of Public Health of Serbia „Dr Milan Jovanovic Batut“ in 2022, a total of 125.116 samples were received for detection of the SARS-CoV-2 using the RT-PCR metod. This study presents the results obtained by retesting 200 borderline positive nasopharyngeal swabs. Three different tests were used to detect and confirm SARS-CoV-2 positive samples: 2019-nCoV (Sansure Biotech Inc., China), Xpert Xpress SARS-CoV-2 test (Cepheid, GeneXpert) and Bio-Speedy (Bioeksen).
Results: Using the 2019-nCoV test the borderline positive samples with high Ct values ($38 \leq Ct \leq 41$) were retested in order to confirm results obtained. 100 borderline positive samples were retested using Xpert Xpress test, and 73 (73%) of them were confirmed positive. The rest of 100 borderline positive samples were retested using Bio Speedy test, and 30 (30%) of them were confirmed positive.
Conclusion: Based on the results presented in this study it can be concluded that retesting of borderline positive samples using two different methods is necessary step in order to obtain more reliable results.
Keywords: SARS-CoV-2, Ct, RT-PCR, Bio-Speedy, Xpert Xpress

THE SPECTRUM OF THE CARCINOGENIC GENOTYPES OF HPV-INFECTED WOMEN IN VOJVODINA

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Objectives: The incidence of cervical cancer in Serbia is still among the highest and is approximately twice the average in Europe (10.7 to 100,000). This study aimed to determine the distribution of carcinogenic HPV genotypes according to age and cytology among women in Vojvodina.

Methods: 1148 women from 18 to 83 years of age were included in the study. Extraction of HPV DNA was performed using SaMag STD DNA Extraction Kit. Fourteen HPV types were determined by the HPV HCR genotype-titre-FRT PCR Kit.

Results: The prevalence of HPV was 51.9%. We observed that 63.3% of women had a single infection, while 36.7% had multiple HPV infections. The most prevalent were HPV 16 (21.3%), HPV 31 (12.8%), and HPV 51 (7.8%). The age-specific prevalence was: ≤20 (56%), 21–30 (64.9%), 31–40 (48.4%), 41–50 (47%), 51–60 (38.7%), and older than 61 years (66.7%). A statistically significant difference was found for HPV 16 ($p<0.0001$), HPV 31 ($p=0.033$), and HPV 66 ($p=0.009$), depending on the severity of the cytological results.

Conclusion: Given the significant prevalence of HPV and the incidence of cervical cancer, it is crucial for Serbia to develop a comprehensive national strategy for its prevention.

Keywords: HPV genotyping; cervical intraepithelial lesion; Vojvodina

IN VITRO ANTIMICROBIAL ACTIVITY OF *VERBASCUM NIVEUM* TEN EXTRACTS AGAINST *CUTIBACTERIUM ACNES*

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Objectives: *Verbascum* species have a long tradition in the treatment of wounds, rheumatic pains, superficial infections, and various conditions associated with skin inflammation. Some *Verbascum* species have shown antimicrobial properties, so we aimed to test the antimicrobial activity of different extracts of *Verbascum niveum* Ten (a species we did not find any available literature data on) against *Cutibacterium acnes*.
Methods: The aim of this study was to test the antimicrobial activity of six different extracts (flower and leaf extracts were made with three different solvents (50% ethanol, distilled water, and 80% propylene glycol)) towards *Cutibacterium acnes*. Ten serial doubling dilutions of each sample were prepared (0.20 mg/ml – 100 mg/ml) in microdilution assay and the results were expressed as minimal inhibitory concentrations (MIC).
Results: Our results indicate that all tested extracts possess strong antimicrobial activity. The MIC values were in the range between <0,20 mg/ml and 3,12 mg/ml. Ethanol and propylene glycol folium extracts showed the strongest activity.
Conclusion: According to our results, all studied extracts are potential antimicrobial agents with strong activity against *Cutibacterium acnes*.
Keywords: *Verbascum niveum* Ten, *Cutibacterium acnes*, antibacterial activity
Acknowledgements: This research was supported by the Ministry of Education and Science of the Republic of Serbia (Grant No. 451-03-68/2022-14/200113) and the Faculty of Medicine University of Niš Internal Scientific Project No. 15.

ROUND TABLE: CURRENT STATE OF ANTIBIOTIC RESISTANCE

INVITED LECTURES

UNDERSTANDING THE BURDEN OF ANTIMICROBIAL RESISTANCE IN THE WHO EUROPEAN REGION ANDSOUTH-EASTERN EUROPE: A DATA-DRIVEN APPROACH TO INFORM PREVENTION STRATEGIES

Tomislav Meštrović, on behalf of the IHME/Oxford GRAM Team

The primary objective of the Global Research on AntiMicrobial resistance (GRAM) Project is to provide an all-encompassing set of estimates that reveal the true burden of antimicrobial resistance (AMR) so that tailored, data-driven prevention efforts can be incorporated into policy and practice. In this project, deaths and disability-adjusted life-years (DALYs) caused by and associated with AMR in the WHO European region were estimated by utilizing a five-component methodological approach and the largest array of data sources to date. The components included determining the number of deaths linked to infection, the proportion of infectious deaths caused by a particular infectious syndrome, the proportion of infectious syndrome deaths resulting from a specific pathogen, the percentage of resistance of a particular pathogen to the antimicrobial drug of interest, and the excess risk of mortality or duration of infection associated with this resistance. Two counterfactual scenarios were used to estimate the disease burden: deaths attributed to AMR (assuming that infections caused by resistant pathogens would be replaced with susceptible ones) and deaths associated with AMR (assuming that drug-resistant infections would not occur at all). The results have shown that in 2019, the global death toll caused by AMR was a staggering 1.27 million (95% UI 0.911–1.71), with 4.95 million (3.62–6.57) deaths associated with this public health hazard. In the WHO European Region, 133,000 (90,100–188,000) deaths was attributable and 541,000 (370,000–763,000) associated with bacterial AMR – with a rather high burden in South-Eastern Europe. Precise estimates of the morbidity and mortality impact of AMR are crucial for making informed decisions about public health investments in each country in the region, while tailored, strategies are essential for policy decisions regarding screening efforts, antimicrobial stewardship initiatives and novel antibiotic development.

SYNDROMIC TESTING FOR THE DIAGNOSIS OF INFECTIOUS DISEASES: CHALLENGES AND OPPORTUNITIES

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The increasing global burden of antimicrobial resistance has highlighted the need for the development of new approaches in the application of antimicrobial therapy. Microbiological diagnosis of infectious diseases is directly related to the antimicrobial regimen chosen for treatment, with the need for as short a time as possible until obtaining the results of identification and antimicrobial susceptibility testing. Conventional methods of microbiological diagnostics, which rely on biochemical and phenotypic analyses, can usually take days to detect pathogens. However, in the last two decades, significant progress has been made in the practice of clinical microbiology resulting from the development of new platforms for molecular diagnostics. Multiplex PCR tests (also known as "syndromic" panels) combine tests for numerous pathogens and resistance genes in a single test and have changed the way we diagnose infections, leading to improved patient care and the clinical course of infections. They are now recognized in some clinical practice guidelines as a "game changer" in the diagnosis of infectious diseases. These syndromic panels, if thoughtfully implemented and carefully interpreted, have the potential to improve patient outcomes through improved clinical decision-making, optimized laboratory workflow, and improved antimicrobial stewardship. Panels have the ability to impact and control infection by significantly reducing the time to diagnosis and clinical decision-making. Syndromic diagnostic panels are now commercially available to aid in the diagnosis of common, serious infections such as bloodstream infections, respiratory, gastrointestinal and central nervous system infections. From a laboratory perspective, these tests reduce the labor time required by technicians for both sample setup and analysis compared to conventional diagnostic methods, potentially helping to streamline processes and free up technician time for other, more labor-intensive tasks. The lab space required for most platforms is also minimal and most will interface with the most common electronic information systems.

FREQUENCY OF MULTIDRUG - RESISTANT INVASIVE ISOLATES IN SERBIA - CAESAR DATA

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Objectives: Antimicrobial resistance (AMR) is a global medical problem that is increasingly attracting the attention of experts and the general public. It is becoming a serious problem in Serbia as well. It arises and spreads due to the selective pressure of antibiotics, due to their excessive use and abuse, both in medicine, veterinary medicine and agriculture. Surveillance of antimicrobial resistance in Serbia is carried out in the National Reference Laboratory for AMR and through participation in the CAESAR (Central Asian and European Surveillance of Antimicrobial Resistance) network. Our country has been a member of this network since 2013.
Methods: Clinical antimicrobial susceptibility data for 8 bacterial species (*Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Acinetobacter* spp., *Staphylococcus aureus*, *Enterococcus faecalis*/*faecium*, *Streptococcus pneumoniae*) were collected from 24 clinical laboratories included in National AMR surveillance network, with estimated total national population coverage of 78%. All laboratories included in National AMR surveillance network used EUCAST guidelines for antimicrobial susceptibility testing.
Results: In 2022, 3.431 primary isolates of invasive bacteria were confirmed. The data show that a high level of resistance to the 3rd generation cephalosporins, carbapenems, but also to colistin was recorded in *Klebsiella pneumoniae* - 91.7%, 65.7% and 35.4%, respectively. Even though resistance to carbapenems in *Escherichia coli* was low - 1.5%, it was worrying. *Pseudomonas aeruginosa* and *Acinetobacter* spp. show resistance to carbapenems - 49.4% and 97.5% respectively, while the resistance to colistin in these two microorganisms was low, at the rates of 1.3% and 1.9%, respectively. Resistance among Gram-positive bacteria were the following: methicillin resistance in *Staphylococcus aureus* – 28.6%, vancomycin resistance in *Enterococcus faecium* – 53.1% and penicillin resistance in *Streptococcus pneumoniae* – 40.5%.
Conclusion: According to the report of National Reference Laboratory for AMR, Serbia is still among European countries with the highest percentage of resistant isolates. Our data correspond to the values of the countries of Southern and Eastern Europe.
Keywords: invasive isolates, antibiotics, resistance

ANTIMICROBIAL RESISTANCE (AMR) IN EUROPE AND BALKAN REGION – OVERVIEW OF CURRENT SITUATIONS

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Objectives. To overview antimicrobial resistance (AMR) in Europe with focus on the Balkan region, and especially North Macedonia
Methods: (source of data). Data on AMR: European AMR Surveillance Network (EARS –Net), coordinated and funded by ECDC, produced an annual reports on AMR since 2002. Such reports are also produced by the WHO since 2013 as the CAESAR (Central Asian and Eastern European Surveillance of AMR) system for surveillance of AMR in non- EU European and Central Asia countries. EARS – Net performs survelliance of AMR in eight bacterial pathogens of public health importance: *E.coli, Kl.pneumoniae, P.aeruginosa, Acinetobacter, St.pneumoniae, S.aureus, E.faecalis* and *E.faecium*. Only data from invasive (blood) isolates are included. The methodology of collecting, checking and processing of data in CAEASAR system are in accordance with the EARS-Net. For the last two years, instead of two separated reports, now is only one report (one book) for the Europe, for EU/EAA and non EU/European countries – AMR surveillance in Europe 2022 (2020 data) and the last one published on April 14. 2023 (2021 data).
Results: 16 countires reported 2021 data to CAESAR, while 29 countries reported 2021 data to EARS – Net. *E.coli* is the most common invasive isolate in almost all west and north countries. In some Balkan countries (Serbia) *Acinetobacter* is the most common isolate, and in the North Macedonia, in last two years, *K.pneumoniae* is the most frequently isolated bacteria from the blood, especially in the ICU units. For resistance of *E.coli* to third generation cephalosporines, 12 of 45 countries reported percentages below 10%, whereas AMR percentages above 50% were observed in 4 countries (N.Macedonia, Russia, Turkiye and Ukraine). 7 of 45 countries reported AMR% below 10%, while 19 reported AMR% of 50% or above of *K.pneumoniae* to 3rd generation cephalosporines. 25 countries observed resistance of *Acinetobacter* to carbapenems above 50%. 11 of 44 countries reported MRSA % below 5%, 13 countries above 25%. VRE (*E.faecium*) were observed above 50% in 5 countries including North Macedonia and Serbia.
Conclusions: While there is an evident west to east gradient in AMR percentages for gram-negative bacteria, it is less obvious for gram-positive bacteria.
Keywords: antimicrobial agents, resistance, invasive strains

CLINICAL SIGNIFICANCE OF ANTIMICROBIAL RESISTANCE

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Antimicrobial resistance (AMR) is a global health and development threat. Misuse and overuse of antimicrobials are the main drivers in the development of drug-resistant pathogens. The cost of AMR to the economy is significant. In addition to death and disability, prolonged illness results in longer hospital stays, the need for more expensive medicines and financial challenges for those impacted. Epidemiological studies showed that 5-10% of patients acquired infection during their treatment at the hospital. The most common localization of hospital-acquired infections are urinary tract (caused by multi-drug resistant Gram-negative bacteria). Hospital-acquired respiratory infections can be caused by *S. aureus (*significant percentage of the isolated strains were methicillin-resistant), *S. Pneumoniae* and atypical bacteria. Polymicrobial flora, resistant strains of Gram-negative bacteria, VRE and MRSA strains can be expected in long-term bladder catheterization, which requires microbiological verification of susceptibility and continuous monitoring of local epidemiological situation. Antibiotics are becoming increasingly ineffective as drug-resistance spreads. The most common carbapenemases at the Clinical Center of Niš are OXA- 48 and NDM. New antibacterials are urgently needed to treat carbapenem-resistant gram-negative bacterial infections as identified in the WHO priority pathogen list. Microbiological diagnosis plays a key role in the timely diagnosis and rational therapy of bacterial infections.

Keywords:antimicrobial resistance, hospital infections, infectious agents

ORAL PRESENTATION

ANTIMICROBIAL RESISTANCE OF CARBAPENEMASE-PRODUCING *ENTEROBACTERALES* TO NOVEL ANTIBIOTICS AND THEIR COMBINATIONS WITH CARBAPENEMASE INHIBITORS AT THE CLINICAL CENTER NIŠ

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Background: Bacterial resistance to carbapenems including **occurrence of carbapenemase producers** is an important growing threat to public health. We investigate the antimicrobial susceptibility of Enterobacterales colected from patients at Clinical center Nis to novel antibiotics and to new antibiotics and their combinations with carbapenemase inhibitors.
Materials/methods: A total of 248 **carbapenemase producers** collected from various clinical samples were tested to carbapenems, ceftazidime–avibactam, meropenem–vaborbactam, ceftolozane–tazobactam, imipenem–relebactam and cefiderocol. Minimal inhibitory concentrations (MICs) were determined by MIC test and susceptibility interpreted according to European Committee on Antimicrobial Susceptibility Testing guidelines. Detection of KPC, IMP-, VIM-, OXA-48 and NDM carbapenemases were performed by **NG-Test® CARBA 5.**
Results: Carbapenemase producers were identified as follows: 192 *Klebsiella pneumoniae*, 49 *Enterobacter cloacae*, 7 *E.coli*. We detected presence of NDM (54,3%), OXA-48-like (42.7%) and KPC enzymes (3%). Susceptibility of NDM and OXA-48 producers to **imipenem** were 25.8%/57.6%, to **meropenem 19.3/26.9,** respectively, **and neither of isolates were sensitive to ertapenem and ceftolozan-tazobactam**. Susceptibility of NDM and OXA-48 producers to **imipenem-relebactam were 22.5/53.8%, to meropenem-vaborbactam 48.3/65.3 to ceftazidim- avibactam 5.7%/93.7%, and to cefiderocol** were 96.7/96, respectively.
Conclusions: Carbapenemase producers of both classes showed the highest sensitivity to cefiderocol. A significant difference in the sensitivity of NDM and OXA-48 producers was observed with ceftazidime-avibactam. Continuous monitoring of resistance and determination of the carbapenemases class are one of the prerequisites for the rational use of new antibiotics.
Keywords: Carbapenems, Imipenem-Relebactam, Meropenem-vaborbactam, ceftazidime–avibactam, ceftolozane–tazobactam, Carbapenemase, Enterobacterales

LAYING THE GROUNDWORK FOR THE FIGHT AGAINST NOSOCOMIAL INFECTIONS: HOW WE HAVE DONE IT?

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Objective: Nosocomial infections in the intensive care unit (ICU) patients have a significant impact on outcomes. In 2019. according to the Annual Epidemiological report(1), 7.4% of patients staying in the ICU for more than 48 hours presented with at least one acquired healthcare-associated infection. The main two directions for the fight against ICU nosocomial infections are infection control practices and antimicrobial stewardship programs. The first comprises a set of different interventions that are targeted for nosocomial infection prevention and escalation limitation. A multidisciplinary team with multiple actions to treat steps may improve a local milieu.
Materials and Methods: Retrospective analysis of the data of taken interventions for infection control in ICU patients treated in the Clinic for Anesthesiology Reanimation and Intensive Care of the University Clinical Center Niš, during the year 2021.
Results: Decreased number of positive microbiological isolates of multidrug-resistant bacteria.
Conclusion: Providing infection control in the ICU aims to reduce associated morbidity, mortality, prolonged ICU stay, antimicrobial resistance, and cost. A multidisciplinary team with dedication and consistency should be engaged for the realization process.
Keywords: infection control, nosocomial infections, cross infections, intensive care unit

1.European Centre for Disease Prevention and Control. Annual Epidemiological Report for 2019 – Healthcare-associated infections acquired in intensive care units. In: ECDC. Annual epidemiological report for 2018. Stockholm: ECDC; 2023.

IMPORTANCE OF RESISTANCE TO CIPROFLOXACIN IN *CAMPYLOBACTER* SPP.

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Objectives: *Campylobacter jejuni* **(***C. jejuni*), resistant to fluoroquinolones, was discovered in the late 80s of the last century in Europe.
Methods: This is retrospective study on resistance of *Campylobacter* spp. to fluoroquinolones, on the first place ciprofloxacin**.**
Results: In *Campylobacter* strains, resistance to fluoroquinolones is due to a mutation in the gyrA gene. To understand the role of multidrug efflux transporters in *C. jejuni*, Jeon et al. (2011) described the action of a CmeG-tagged MFS transporter (Cj1375). Although information on the global use of fluoroquinolones is limited, human use was estimated at more than 800 tons (van Diest et al, 1999). Resistance was not the result of the spread of a single resistant clone, but of numerous clones that had been selected by fluoroquinolone therapy. The resistance to quinolones in *C. jejuni* and *C. coli* strains in Australia remained low, which was attributed to the infrequent use of antibiotics in the treatment of diarrhea and to the legal ban on the use of fluoroquinolones in food animals in Australia.
Conclusion: Multidisciplinary approach and **t**he agreement between Food, Veterinary and Microbiology Authorities could bring the solution of this huge problem**.**
Keywords: *Campylobacter* spp., resistance, ciprofloxacin

POSTER PRESENTATION

IN VITRO ACTIVITY OF CEFTAZIDIME/AVIBACTAM AND IMIPENEM/RELEBACTAM AGAINST CARBAPENEM-RESISTANT *KLEBSIELLA PNEUMONIAE*

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Objectives: This study aimed to investigate activity of two novel antibiotics, imipenem/relebactam and ceftazidime/avibactam against carbapenem-resistant *Klebsiella pneumoniae* (CRKP) due to the development of colistin resistance, a last-resort medication.
Material and Methods: The study included samples from the respiratory tract of patients hospitalized in University Clinical Center Kragujevac from January to April, 2023. *K. pneumoniae* and carbapenemase-encoding genes were detected by multiplex-PCR assay (BioFire-Firm Array *Pneumonia panel*) and the obtained isolates underwent susceptibility testing using the VITEK-2 system, broth microdilution method, and gradient E-test.
Results: Out of 52 *K. pneumoniae* isolates, 75% carried carbapenemase-encoding genes. The most prevalent were $bla_{\text{OXA-48}}$ (58.97%), followed by bla_{KPC} (23.08%) and bla_{NDM} (10.26%), while 7.69% showed coexistence of $bla_{\text{OXA-48}}$/bla_{NDM}. Among CRKP, 79.49% were resistant to colistin, 33.33% to imipenem/relebactam and 23.08% to ceftazidime/avibactam, respectively. Isolates carrying $bla_{\text{OXA-48}}$ gene were more resistant to imipenem/relebactam (26.09%) than ceftazidime/avibactam (8.70%). A total of 22.22% of bla_{KPC} strains and 75% of bla_{NDM} were resistant to both novel drugs. Interestingly, all $bla_{\text{OXA-48}}$-positive isolates exhibited colistin resistance, as well as 55.56% of bla_{KPC}-positive. Against colistin-resistant isolates, ceftazidime/avibactam showed greater activity then imipenem/relebactam (resistance rate 19.35% v.s 35.48%).
Conclusion: Although our study showed significant activity of ceftazidime/avibactam and imipenem/relebactam against CRKP, constant research on new antibiotics is necessary.
Keywords: carbapenem-resistant, *Klebsiella pneumoniae*, colistin, ceftazidime/avibactam, imipenem/relebactam

SENSITIVITY OF ACINETOBACTER SP. HOSPITAL ISOLATES TO ANTIMICROBIAL DRUGS AT THE UNIVERSITY CLINICAL CENTER NIŠ IN THE PERIOD 2020-2023

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Acinetobacter baumannii is one of the most important causes of hospital infections with high resistance to antibiotics; in this regard, great efforts are being made today to develop new antibiotics. The objective of our paper is to test the sensitivity of *Acinetobacter sp.* to antibacterial drugs with special focus on its increasing resistance.

Material / Methods: The research included 1899 *Acinetobacter sp.* isolates from different samples (aspirate, wound swab, blood, drain content, pleural fluid, CVC tip) of patients hospitalized at the University Clinical Center (UCC) in Niš. The Microbiology Center of the Public Health Institute in Niš (PHI) used a disk diffusion method to test sensitivity under the EUCAST protocol (v3 2020-v4.2 2023) to the following antibacterial drugs: aminoglycosides (gentamicin- 10 µg, amikacin 30 µg, tobramycin 10µg), fluoroquinolones (levofloxacin 5µg and ciprofloxacin 5µg), trimethoprim-sulfamethoxazole (1.25-23.75), carbapenems (meropenem 10µg and imipenem 10µg). Sensitivity to colistin (0.25-16µg/ml) was tested using the broth microdilution method, and to tigecycline using the MIC test (0.016-256µg).

Results: Resistance to aminoglycosides: in the period from 2020 to 2023, the rate of resistance to tobramycin was 86%. The rate of resistance to gentamicin was 96%, while amikacin recorded an increase in resistance from 96% to 98%. One of the key groups of antibacterial drugs for the treatment of hospital infections are carbapenems. The level of resistance to meropenem and imipenem increased from 95% to 97.5%. Resistance to trimethoprim-sulfamethoxazole recorded a significant rise from 81% in 2021 to 89.6% in 2023. Fluoroquinolones remained at 97% of resistant isolates. In 2023, the first cases of resistance to *Acinetobacter spp* to colistin (2%) were recorded in the PHI Niš. MIC values for tigecycline indicate that in 67% of isolates (MIC≤1 µg/ml) tigecycline cannot be used in the treatment of infections caused by *Acinetobacter spp*.

Conclusion: Increasing resistance to carbapenems and emerging resistance to colistin require continuous monitoring of resistance, implementation of prevention measures and introduction of new antimicrobial drugs.

Keywords: *Acinetobacter spp*, sensitivity to antimicrobial drugs, increased rate of resistance to carbapenems

SESSION: CURRENT PARASITOSIS

INVITED LECTURES

HELMINTHS AND THEIR PRODUCTS CAN TREAT OR RELIEVE VARIETY OF CHRONIC INFLAMMATORY DISORDERS BY REGULATING INFLAMMATION AND GUT MICROBIOTA DISBIOSIS.

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Helminths are extremely successful parasites, affecting around a quarter of the world's population (Bethony et al., 2006). Important insights have recently been made into relationship between the host mucosal immune response, commensal bacteria, and helminths. Namely, coevolutionary dynamic that has persisted for several hundred million years probably resulted in this three-way partnership and complex adaptations which shaped the physiology of each of these very different organisms in health and disease. Helminths are macrobiota that trigger potent regulatory components of immune responses capable to control inflammation, protect intestinal barrier function and mitigate tissue damage. There is growing evidence that helminth infection mediate the suppression of bystander inflammatory responses (including autoimmunity and allergy disorders) and that this could be a consequence of alterations in the intestinal microbiota modulating metabolic and immune functions of the infected host (Floudas et al., 2019). Crosstalk between these two disparate groups of endobiota can play an essential role in host intestinal immune function and homeostasis (Gause et al., 2016). Even more, homeostasis in vertebrates may now require the presence of both commensal microbiota and macrobiota, including helminths. The absence of either of these organisms could lead towards a dysregulated immune system, which may favor harmful inflammatory responses that can contribute to a variety of disease states. Since, both helminths and the microbiota are frequently linked to expanded regulatory T cell (Treg) activity this could be a central explanation for the beneficial effects of certain probiotic bacteria, and controlled helminth infection, in ameliorating inflammatory diseases such as allergy and autoimmune disorders. Here we will comment on the effect of infection and/or products of some helminths on the composition of the microbiota in some chronic inflammatory and autoimmune diseases with special reference to our results achieved by applying *Trichinella spiralis* products. Application of excretory secretory products of *T. spirals* alleviated the course of the disease in an animal model of multiple sclerosis and helped the microbiota to re-establish homeostasis, which was disturbed by the induction of the disease. (Funded by Ministry of Science, Republic of Serbia, Co. No. 451-03-47/2023-01/200019)
Keywords: helminths, microbiota, immune response, amelioration of allergy and autoimmune disorders

DISTRIBUTION OF *LEISHMANIA INFANTUM* VECTORS UNDER CLIMATE CHANGE SCENARIOS.

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Objectives: The aim of this study was to evaluate the current and possible changes in the spatial distribution of *Leishmania infantum* vectors in Italy under climate change scenarios.

Materials and methods: To assess the historic distribution, a database was assembled including unpublished results from samplings performed from 1975 to 2009, while records from 2009 to 2013 were obtained from literature. Records from 1979 to 2013 were used for modeling using the bioclimatic variables derived from CHELSA and the MaxEnt algorithm. Five future CMIP5 models obtained from CHELSA were chosen based on their lowest amount of interdependence. For each model, two periods were projected, with two Representative Concentration Pathways 4.5 and 8.5. For each sandfly species including in the analysis areas of stability, gain and loss in the two periods were evaluated, and latitudinal and altitudinal variation assessed.

Results: Our findings show that phlebotomine distribution exhibits high variation among the predictions obtained for the five CMIP5 models, and a consensus towards an increase both in areas of presence or elevation ranges cannot be made.

Conclusion: This study emphasizes the need of conducting focused research on the most pertinent species in order to support the development of regional surveillance plans and predict the effects of climate change.

Keywords: Leishmania; climate change; modeling; sandfly; Italy

NEGLECTED ZOONOTIC FILARIOIDS

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Objectives: In the past twenty years, zoonotic infection by nematodes of the family Onchocercidae are gaining the interest of the scientific community. This is the case of filarioids infecting dogs and cats, which are transmitted by blood-feeding insects. Amongst those filarial nematodes, some release microfilariae (mfs) in the bloodstream (e.g., Dirofilaria spp., Acanthocheilonema spp., Brugia spp.) and are easily diagnosed, being thus considered the most prevalent. Conversely, those with mfs in the skin dwelling (Onchocerca lupi) have been less studied likely due to the complexity of retrieving mfs. Thus, the latter parasite have been underdiagnosed for a long time by the scientific community.
Materials and methods: In this talk we provide an overview summarizing the biology of these zoonotic filarioids infecting dogs and wild carnivores spotting the many limitation in currently available diagnostic tools and the research needs for the future.
Conclusion: Data suggest that there is a need for specific diagnostic tools to better understand the epidemiology of these pathogens and to highlight the potential introduction of species alongside cases of human infections.
Keywords: Zoonosis; Filarioids; Diagnosis; Neglected.

ECHINOCOCCUS MULTILOCULARIS – AN EMERGENT PATHOGEN IN CROATIA AND EUROPE.

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Alveolar echinococcosis is considering its clinical course a serious and potentially fatal condition. The definitive host of this parasite is usually the red fox, but in endemic areas dogs and cats can also be affected. Intermediate hosts are various species of rodents, while humans can accidentally become infected as well. The incubation period of the disease is long, ranging from 10-20 years. In the human body, the larva grows into a cyst that contains many small, fluid-filled bubbles filled with protoscoleces. Due to its structure the larva tends to grow infiltratively; furthermore, it can spread in a metastatic manner and may prompt a vigorous inflammatory reaction of the affected organ. The primary site of infection is habitually the liver, but as the larva grows, it can infiltrate many surrounding structures near the affected organ. The first endemic clinical case of alveolar echinococcosis in Croatia was demonstrated in 2017, and since then, there has been a notable increase in clinical cases of this parasitic disease. Considering the recent emergence and surge in the number of patients with alveolar echinococcosis in Croatia, it is of utmost importance to focus on providing further education to healthcare professionals regarding this serious parasitic disease.
Keywords: *Echinococcus multilocularis*, alveolar echinococcosis, Croatia

ORAL PRESENTATION

AN IMPORTED CASE OF CUTANEOUS LEISHMANIASIS

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Introduction: Leishmaniasis is a vector-borne disease caused by several species from genus Leishmania. Cutaneous leishmaniasis is the most common form of leishmaniasis. It is manifested by lesions on unprotected parts of the skin that leave scars. Clinical course of the disease and therapy depend on the species of Leishmania. Carriers of leishmaniasis are flies of the genus Phlebotomus, and the reservoirs of infection are humans and animals.
Methods/Case report: The patient had been working in Iraq. Due to skin changes that persisted for three months he was referred to the IZJZS by an infectologist from Pancevo General Hospital, under suspicion of cutaneous leishmaniasis. The changes were localized on the hands in the form of plaques with central ulcerations. There were similar cases among colleagues.
Results: Microscopic examination of Giemsa-stained skin samples showed intracellular amastigotes Leishmania spp.
The patient was hospitalized in the Clinic for Infectious and Tropical Diseases. He was treated with fluconazole and liposomal amphotericin B, and released home with crusts.
Conclusion: Clinical picture, epidemiological data, and microbiological diagnosis are key to the diagnosis of cutaneous leishmaniasis.
Keywords: Leishmania, amastigot, vector-borne disease

POSTER PRESENTATION

COMPARATIVE ANALYSIS OF THE OUTPATIENT CONSUMPTION OF ANTIPARASITICS IN THE REPUBLIC OF SRPSKA AND THE REPUBLIC OF SERBIA

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Objectives: Parasitic diseases are widespread infectious diseases worldwide. They are mostly present in poor countries, but also can be found in developed countries. The aim of this study is to conduct an observational analysis of the outpatient consumption of antiparasitic drugs during the period from 2017 to 2021 in the Republic of Srpska, and to compare the data to the consumption in Serbia (from 2017 to 2020).
Materials and methods: Data are expressed as defined daily doses/1000 inhabitants/day (DDD) using the WHO ATC/DDD methodology.
Results: The most used antiparasitic drugs in both countries are metronidazole and mebendazole, while tenonitrozole is rarely used only in the Republic of Srpska. The total consumption of metronidazole for systemic use ranged from 0.38 to 0.45 DDD, while mebendazole was prescribed up to 4 times less. The consumption of systemic metronidazole in Serbia was, on average, 2 times higher compared to the Republic of Srpska, while the consumption of mebendazole is approximately the same. Metronidazole consumption for vaginal use is significantly lower than systemic consumption in both countries.
Conclusion: Given that the consumption of metronidazole for systemic use is significantly higher than for vaginal use, it is necessary to conduct a detailed pharmacoepidemiological analysis with the aim of evaluating the effectiveness of the therapy and rationalizing prescribing and consumption of antiparasitics.
Keywords: *antiparasitics, outpatient consumption, Republic of Srpska, Serbia*

THE IMPORTANCE OF MANDATORY SEROLOGY TESTING OF WOMEN FOR TOXOPLASMOSIS IN THE PERIOD OF PLANNING PREGNANCY

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Toxoplasma gondii is the causative agent of toxoplasmosis, a globally widespread zoonosis. The infection is mostly asymptomatic in immunocompetent individuals, but it is an important cause of intrauterine infections of the fetus.
Objective: Through our analysis, we wanted to determine the frequency of seropositive women in the reproductive period, who were referred to our laboratory for serological testing, in the period from January 1, 2018. until December 31,2022. year, from the territory of the South Banat district.
Methods: The study included serum analysis of 774 women for the presence of IgG class antibodies to *Toxoplasma gondii*, using the ELFA method on a mini VIDAS device (bioMerieux, France).
Results: IgG antibodies to the presence of *Toxoplasma gondii* were detected in 186 women (24,03%). The largest number of positive findings was recorded in the 30-39 age group (118/186; 63,44%). Among the tested samples there were also 3 serums with measured limit values.
Conclusion: By analyzing the obtained results, it can be concluded that 75,58% of the examined women are seronegative, which represents a high risk of congenital toxoplasmosis. This draws attention to the importance of mandatory serological testing of pregnant women for toxoplasmosis. It also points out the importance of this testing in women in connection with family planning and testing and treatment of sterility and familiarizing them with preventive measures to prevent the occurrence of infection.
Keywords: *Toxoplasma gondii*, antibodies, women

SESSION: NUTRITION AND HEALTH

INVITED LECTURES

FOOD SAFETY DURING THE COVID-19 PANDEMIC

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The European Food Safety Authority (EFSA) has been closely monitoring the situation related to the epidemic of the coronavirus disease (COVID-19), which has affected a large number of countries around the world. Currently, there is no evidence that food could be the source or carrier of infection with the mentioned virus. (6)

The European Center for Disease Prevention and Control (ECDC) announced that, although in China animals are the most likely source of initial infection, the virus is transmitted from person to person - mainly through droplets when people breathe, cough or exhale. (3)

In terms of food safety, the World Health Organization has issued precautionary recommendations that include advice on implementing proper hygiene measures when handling and preparing food, such as hand washing thorough food handling and avoiding possible cross-contamination between cooked and raw food.

Safe food contributes to healthy lives, a healthy economy, a healthy planet and a healthy future. Practicing food safety in our home and everyday life will help reduce foodborne illness. (1,2)

The World Health Organization (WHO) estimates that annually more than 600 million peoplefall ill and 420,000 die from the consumption of food contaminated with bacteria, viruses, parasites, toxins or chemicals. However, these figures represent only a visible part of the "Iceberg" because comprehensive foodborne disease surveillance data are not always available. If food is not safe, people cannot benefit from its nutritional value and cannot have normal and expected psychophysical development.(13)
Although COVID-19 is not transmitted through food, the pandemic has focused on issues related to food safety, such as hygiene, antimicrobial resistance, zoonoses, climate change, food fraud and the potential benefits of digitizing food systems. It also determines the weaknesses and sensitivities of the food production and control system. In the near future, reducing disruptions in the food supply chain remains one of the highest priorities of all governments, as consumers must have safe access to food. (4.7)

Illnesses associated with unsafe food are most often caused by bacteria, viruses, parasites or chemicals that we ingest through contaminated food or water. 600 million people or 1 in 10 people in the world get sick from consuming contaminated food, and 420,000 die annually. In addition, children under the age of 5 contribute 40% of the burden of diseases related to unsafe food or 125,000 deaths each year.
Given that SARS-COV-2 is a respiratory virus and not a foodborne pathogen, the risk of foodborne transmission of COVID-19 is negligible (Trnčić et al. 2021). Cooking at sufficiently high temperatures with good hygiene practices protects consumers from a wide range of foodborne infections and also inactivates SARS-CoV-2 if it was present in the food.
The World Health Organization (WHO) recommends thoroughly cooking food, especially meat, feathers, eggs and seafood, and bringing food such as soups and stews to boiling point to be safe. (11)
Scientific evidence shows that the coronavirus can persist in the environment on different types of surfaces that could come into contact with food. Research has shown durability on steel for up to seven days, and on plastic and glass for up to four days.Other areas were explored, e.g. copper, aluminum, paper, cardboard, wood and rubber. Persistence on food packaging or other materials does not mean that these materials are the source of infection. There is currently no evidence of transmission of SARS-CoV-2 via food packaging or other materials.(15)

Food safety and proper nutrition are essential prerequisites for the health and well-being of the population of a country and should be integrated into all policies, not only in health policy, but also in the national economy, agriculture, tourism and trade. (9)

Keywords: food, COVID-19, transmission risk

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PATHOPHYSIOLOGY OF OBESITY

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Obesity represents a state of excess adipose tissue mass that adversely affects health and has become an epidemic worldwide. The BMI-based definition for overweight (25≥ kg/m^2) and obesity (30≥kg/m^2) has been established owing to its association with particular morbidities and increased mortality. Besides, the assessment of fat distribution may be provided by a measurement of the waist-to-hip ratio (>0.9 in women, and >1.0 in men), which is highly associated with worse health outcomes. Accordingly, three leading causes of death globally are associated with obesity, including cardiovascular disease, type 2 diabetes mellitus, and different types of cancers (breast, colorectal, endometrial, prostate, renal, etc.), whereas obesity is recognized as a poor prognostic factor for other cancers and diseases, such as COVID-19.

The pathophysiology of obesity is very complex and involves the interaction of various cytokines, hormones, and neurotransmitters, with secreting adipocytes being the cellular basis of obesity. Additionally, disturbed regulation of appetite and satiety mechanisms is associated with excessive calorie intake in relation to exercise, resulting in weight gain. Adipokines participate in the regulation of food intake, lipid storage and metabolism, insulin sensitivity, vascular homeostasis, blood pressure regulation, angiogenesis, and immune responses, therefore their alteration, together with the chronic low-grade inflammation, significantly contributes to obesity and its related consequences. Hence, obesity is associated with increased plasma levels of leptin (leptin resistance), retinol-binding protein 4, insulin (insulin resistance), and ghrelin, including decreased adiponectin and peptide YY levels. Chronic inflammation, increased availability of lipids and insulin, and changes in adipokines signaling contribute to the conversion of healthy cells to invasive tumor cells and metastasis promotion.

Obesity care involves attention to three essential elements of life: dietary habits, physical activities, and behavior modification. Lifestyle management results in a modest (3-5kg) weight loss compared with no treatment. Adjuvant pharmacotherapy (centrally and peripherally acting medication) should be advised for patients with BMI ≥30 kg/m^2, or those ≥27 kg/m^2, with concomitant obesity-related disease. Setting an initial weight-loss goal of 8-10% over 6 months represents a realistic target.

Keywords: obesity, chronic low-grade inflammation, adipocyte, adipokines, insulin resistance

COMPARATIVE ANALYSIS OF CHEMICAL COMPOSITION AND ANTIBACTERIAL ACTIVITY OF ESSENTIAL OILS OF SELECTED AROMATIC PLANTS FROM SERBIA

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Objectives: In the last few decades, one of the major problems in the field of medicine is the spread of antibiotic resistance of bacteria. This is the comparative study of chemical composition and antibacterial activity of essential oils isolated from the aerial parts of plant species *Angelica sylvestris*, *Angelica pancicii* and *Artemisia absinthium* against human pathogens.
Methods: Quantitative and qualitative data on the essential oils were obtained by GC and GC-MS analyses and antibacterial activity of the essential oils and antibiotics investigated using microwell dilution method. The synergistic effects of essential oils and antibiotics were also investigated using the checkerboard method.
Results: In the *A. sylvestris* oil 32 components were identified (97.4% of the total oil) and the main compounds were limonene (75.3%) and α-pinene (9.6%), while in the *A. pancicii* oil 40 components were identified (98.8% of the total oil), and the main compounds were the β-phellandrene (54.9%), α-pinene (14.5%) and α-phellandrene (4.5%). In the *A. ansinthium* oil 53 components were identified (96.2% of the total oil) and the main compounds were sabinene (21.5%), ortho-cymene (19.2) and (z)-epoxy-ocimene (11.0%). The minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) were in the range MIC/MBC=0.11/54.40 mg/mL, 0.10/48.20 mg/mL and 4.72/37.80 mg/mL (respectively).
Conclusions: This is the first comparative investigation of chemical composition and antibacterial activity of essential oils isolated from the aerial parts of *A. sylvestris*, *A. pancicii* and *A. absinthium* against pathogens from human material. The most sensitive strains were *Acinetobacter sp.* isolated from wounds, *P. aeruginosa* from sputum, as well as, *P. mirabilis* и *Klebsiella* sp. from wounds. The oils exhibited synergism when combined with antibiotics and may reduce the minimum effective dose of antibiotic required and minimize its side effects. In addition, the oils are a promising source of natural antimicrobial agents.
Keywords: *Angelica sylvestris*, *Angelica pancicii*, *Artemisia absinthium*, antibacterial and synergistic effects

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POSTER PRESENTATION

LONGITUDINAL MONITORING OF CHILDREN'S NUTRITIONAL STATUS

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Objectives: Early school age is very important period of life for the growth and development of the organism. Inadequate nutritional status, like malnutrition and obesity, during this lifetime can leave far-reaching consequences for the body in terms of inadequate physical growth and reduced cognitive and motor performance, and social-emotional development.
The aim of the research was longitudinal monitoring of nutritional status of pupils in selected primary schools in Novi Sad.
Materials and methods: The survey was conducted in eight year period on a sample of pupils whose parents gave their written consent for the participation of their children in the research. The nutritional status was determined based on the measured values of body height and body weight and, on the basis of them, the calculated body mass index. At the same time skinfold thickness and blood pressure were measured.
Results: By analyzing the obtained data on the nutritional status of pupils, we found out that there is a large percentage of malnutrition and obesity among pupils. Also was determined certain percentage of pupils with inadequate values of skinfolds at both measured points. And, most worryingly, there were students with elevated values of both systolic and diastolic blood pressure, even in a sample of 7-year-old children.
Conclusion: Such results warns that continuous monitoring of the nutritional status of all pupils is required, as well as a long-term program of multidisciplinary measures and activities, in order to create healthy eating and other habits, to prevent the occurrence of noncommunicable diseases.
Key words: pupils, nutritional status, body mass index, elementary school

EATING DISORDER IN STUDENTS POPULATION - GENDER DIFFERENCES

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Objectives: Eating disorders (binge eating and food addiction) are a growing health problem.
The aim of the study was to examine binge eating and food addiction in the student population. Special emphasis was given to gender differences.
Materials and methods: 343 students participated in the research. The following instruments were used: sociodemographic questionnaire; Eating Disorder Diagnostic Scale (EDDS) – (examines the existence anorexia, bulimia and binge eating); Modificate Yale Food Addiction Scale Version 2.0 - mYFAS) – examines food addiction.
Results: Both groups (with a diagnosis of food addiction and a diagnosis binge eating) had a statistically significantly higher BMI and a statistically significantly higher percentage of obese parents. It was not statistically significant gender differences in binge eating and food addiction. Female students have a statistically significant higher score on the variable related to symptoms withdrawals as characteristics of addiction, and men have a statistically significantly higher score on the describing variable continuous consumption of the object of addiction despite social problems.
Conclusion: There is a gender difference in relation to some characteristics of addiction. In order to form preventive programs, it is necessary to repeat the research on a larger sample of the general population.
Keywords: food addiction; binge eating, Yale Food Addiction Scale

DIETARY HABITS AND PHYSICAL ACTIVITY AMONG MEDICAL STUDENTS

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Objectives: To determine and assess the relationship between the level of physical activity and the diatery habits among medical students.
Methods: The research was conducted as a cross-sectional study on a representative sample of students of the Faculty of Medicine in Kosovska Mitrovica. The International Physical Activity Questionnaire (IPAQ) and the Youth and Adolescent Nutrition Questionnaire (YAQ) served as research instruments. Chi-square and Mann–Whitney test were used as statistical methods, with a significance level of 0.05.
Results: 145 students aged 18 to 30 participated in the research. The average age was 22.1±2.5 years. Students who had physical activity, there was a strong negative correlation between heavy physical activity and the following foods: white flour (r=-0.269, p=0.025), sweets (r=-0.310, p=0.010), bakery products (r=-0.333, p=0.005), store juices (r=-0.240, p=0.047), salting of food (r=-0.334, p=0.006) and positive corelation with the use of lamb meat (r=0.291, p=0.016). Students who has not been physically active, there was a positive correlation with the use of: white flour (r=0.279, p=0.004), sweets (r=0.266, p=0.00), chips (r=0.207, p=0.036), bakery products (r=0.204, p=0.037) and a negative correlation with: green vegetables (r=-0.287, p=0.003), beans, peas (r=-0.201, p=0.041) and other vegetables (r=-0.210, p=0.032).
Conclusion: Students who were more physically active had healthier dietary habits compared to students who were not physically active.
Keywords: Physical activity, dietary habits, students.

DOES SERBIA NEED GUIDELINES FOR NUTRITION IN NURSING HOMES?

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Objectives: The goal of this research was to determine the energy and nutritional values of daily meals in nursing homes in Southeastern Serbia. There are no guidelines on nutrition in Serbian nursing homes.
Materials and methods: In the Public Health Institute Nis, we bromatologically analyzed the macronutrients (protein, fat, and carbohydrates) content of 32 daily meals from 8 regional nursing homes sampled in the period 2022–2023. The obtained results were compared with the recommendations of the European Food Safety Agency (EFSA) for the nutritional needs of the elderly.
Results: The median energy value of the meal was 2208.6 kcal (range: 1389.3 to 3206.8 kcal). The median protein content of the meal was 86.1g (range: 51.2 to 116.2 g). In half of the analyzed meals (16 or 50%), the proportion of energy derived from fats was higher than recommended dietary reference values (20–35%), and 10 (31.2%) meals had a proportion of carbohydrates less than recommended (45–60%).
Conclusion: Taking into account that high dietary fat intake increases the risk of certain chronic diseases, there is an urgent need for the adoption of guidelines on nutrition at nursing homes in Serbia.
Key words: nursing homes, nutrition, macronutrients

RELATIONSHIP BETWEEN NUTRITIONAL HABITS AND RISK FOR BLADDER CANCER IN THE MAČVA DISTRICT, SERBIA

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Objectives: To investigate possible relationships between diet and risk for bladder cancer (BC), a case-control study was conducted.

Methods: A case-control study explored the personal nutritional habits. A total of 9 patients with BC and 18 age- and residence-matched, population-based controls were included in the analysis (by food frequency method). All BC cases and the controls were from Bogatić municipality. The participation of subjects in the study is entirely voluntary, with a written informed consent.

Results: The method of food preparation by frying (p=0.006) and the consumption of pork meat (p=0.03) are significantly more prevalent among patients with BC. There was no statistically significant difference among the study groups regarding the consumption of fresh fruits and vegetables. Patients with BC had a significantly higher usage of canned sour vegetables compared to the control group, with a p-value of 0.02. The control group exhibited a higher frequency of urination compared to bladder cancer cases (p=0.05). Additionally, the control group had higher levels of water intake (p=0.005).

Conclusion: Our findings indicate that the incidence of BC is associated with an increased consumption of pork meat and fried food. Additionally, there is a correlation between BC and the consumption of canned sour vegetables, as well as a decreased intake of water.

Keywords: bladder cancer, diet, canned sour vegetables, pork meat, water intake

CHALLENGES AND OPPORTUNITIES IN SODIUM REDUCTION IN MONTENEGRO

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Objectives: MNE has a strategy to reduce salt intake and is developing multisectoral cooperation between different sectors. Several voluntary and mandatory public health documents and measures were introduced, from 2012 onwards. Key partners of the health and food sectors are connected. Communication strategy has been prepared and implementation has been started.
Materials and methods: The salt content was analyzed in foods that are most often used in dieat. The classical volumetric method of salt determination was used. The data from this study is compared with those obtained during the research from 2012 and 2016 and with the target values from WHO global sodium benchmarks for different food categories. 1138 products analyzed, 928 products from the market and 210 from imports.
Results: Slight decrease in the salt concentrations was noted in meat products of domestic origin and in the category of other breads and bakery products in relation to the previous results. It was concluded that WHO benchmarks are too high.
Conclusion: The producers have accepted to engage in salt reduction activities, but small producers need help and support. Through the continuous cooperation of the health sector, the food industry, nutrition experts, educated and dedicated staff and population, it is possible to achieve the common goal of reducing morbidity and mortality from excessive salt intake.
Key words: salt intake, labeling of food, hidden salt

THE IMPORTANCE OF DIETARY SUPPLEMENTATION IN PATIENTS WITH HASHIMOTO'S THYROIDITIS

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Objectives: Hashimoto thyroiditis (HT) is the most common autoimmune disease and the leading cause of hypothyreosis in which the infiltration of the lymphocytes creates damage to the gland. It is present in 5-15% of the general population and 3-4 times more common in females. The aim is to show the results of the latest research about supplementation in patients with HT.
Materials and methods: The results of the research from the 21st century were used in this paperwork (randomized controlled study, meta-analysis and clinical trials).
Results: Patients with HT, even when euthyroid, have high oxidative stress, excess body weight and metabolic disorders. Research in the world showed that the nutritional status of certain micronutrients is usually not adequate: iodine status is usually low in countries without iodine enrichment; selenium status is generally low in Europe and wide areas of China; iron status is often low in females in the reproductive period; especially before the pregnancy end. It is shown that Se supplementation can cause a decrease of antibodies of the thyroid. In patients with HT, except iodine and Se, it is needed to ensure the adequate supplementation of iron and Mg. The analysis showed that vitamin D deficiency is linked to cognitive damage in patients with HT. The study in China, showed that in 28.4% of patients with HT, a small cognitive damage was diagnosed. In patients with HT, anemia risk can be enlarged by autoimmune diseases like pernicious anemia or atrophic gastritis, and that's why it is important to monitor the status of vitamin B12. In Turkey, a study of 130 patients with the diagnosis HT was discovered that B12 deficiency was present in 46% of patients and that is linked to the presence of the disease. Following Zn levels and intake in deficiency can influence the gland. Results showed that HT patients need to have regular checkups and status control of the vitamins and micronutrients.
Conclusion: The right hygienic-dietary regime followed by the right therapy can keep HT under control, prevent disease progression and enhance life quality. An individual approach is needed with these patients. It is necessary to research this topic more given the meaning and frequency of this disease.

Key words: dietary supplementation, hashimoto thyroiditis, iodine, selenium, vitamin D, vitamin B12, iron, magnesium

MICROBIOLOGICAL QUALITY OF FOOD IN THE REPUBLIC OF SRPSKA IN 2020 AND 2021 - HOW SAFE ARE WE?

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Objectives: Microbiological safety is one of the key segments of food quality. Microbiological contamination of food represents the most common risks for the emergence of acute foodborne diseases. The goal of our research is to make an observational analysis of the microbiological safety of food in the Republic of Srpska in 2020 and 2021.
Materials and methods: Data are obtained from Public Health Institute (PHI). In 2020, 15274 food samples were analyzed for monitoring the microbiological quality, while in 2021 that number was 15409.
Results: The results showed that 150 of the total number of tested samples (1.0%) were contaminated in 2020, while in 2021 there were 127 defective samples (0.8%). Contaminated samples were found for various food categories, of which the most represented were the ice cream category (47 samples in 2020 and 40 samples in 2021) and the "bread, pasta and biscuits" category (36 samples in 2020 and 29 samples in 2021). Also, defective samples are often found for “ready meals” and meat, as well as other categories.
Conclusion: The results indicate that it is necessary to continuously monitor the microbiological quality of food, which is of great public health importance for the population.

Key words: microbiological safety, food, Republic of Srpska

STEPS FORWARD IN FOOD AND CONSUMER GOODS MONITORING IN SERBIA

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Objectives: To communicate implementation of Food safety and Consumer goods safety Monitoring programs (MPs 2023) in Serbia in 2023.

Materials and methods:
MPs 2023 covers a total of 1528 food samples and 1662 samples of consumer goods from the Serbian market for: 1) determining the level of contaminants and frequency of their occurrence; 2) collection of data from monitoring that are used for risk analysis, for certain types of items and thereby contribution to increasing the protection of human health and other interests of consumers; 3) checks of valid standards and maximum permitted quantities prescribed for certain types of items.

Results: MPs 2023 are regulated and documented programs implemented by the Ministry of Health (MoH) through the network of 25 Public Health Institutes (PHIs), in cooperation with Sanitary inspection (SI) of the MoH. Regulations on the MPs as well as instructions for SI and PHIs are in force, laboratory tests are performed by authorized laboratories of PHIs and specialists in hygiene issue opinions on health safety. Reports on the MPs implementation will be delivered to the MoH.

Conclusion: MPs purpose is to protect health and reduce/minimize its subjection to chemical substances/microbiological agents that might represent risk. Sustainable MPs are of great importance for public health.

Key words: monitoring program, food safety, consumer goods safety

ASPARTAME - WHAT DO WE NEED TO KNOW?

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Aspartame is a sweetener introduced to replace the sucrose which is 180-200 times sweeter than sucrose. Its consumption has become more widespread around the world in all age groups, including children.

Objectives: The objective of this paper is to analyze the existing scientific literature on the use of aspartame and its possible effects on the human body to refine current knowledge.

Materials and methods: Scientific basis were used (PUBMED and Scopus,) to analyze articles that included keyword aspartame, published in the last three years. The studies involving the impact of aspartame on obesity, diabetes mellitus, children and fetus, autism, neurodegeneration, phenylketonuria, allergies and skin problems, its cancer properties and its genotoxicity were analyzed.

Results: The intake of artificial sweeteners was expected to reduce obesity rates in developing countries and help those struggling with diabetes. Today aspartame is used in about 6,000 products globally, including chewing gum, confectionery, soft drinks, gelatins, dessert mixes, puddings, yogurt and medicines. The International Agency for Research on Cancer (IARC) and the Joint FAO/WHO Expert Committee on Food Additives (JECFA) have evaluated the potential health risks of aspartame in 2023. IARC and JECFA found the limited evidence that aspartame is carcinogenic in humans. The evidence from animal studies and experimental studies was also limited. Therefore, it classified aspartame as "possibly carcinogenic" (group 2B using the IARC Monographs Hazard Classification). It was concluded that the previously established acceptable daily intake of 0–40mg/kg body weight should not change. It is nearly impossible to exceed this limit, which is the equivalent of a 70kg person consuming 9–14 cans of diet soft drink every day. It is necessary to provide visible and detailed information about the presence of aspartame in products. The recommendation to limit consumption of sugar sweetened drinks, and to drink mostly water and unsweetened drinks, remains appropriate in light of these evaluations. Further research should be conducted to ensure clear information about the impact of aspartame on health.

Conclusion: To conclude, it is imperative for health professionals to judiciously and individually evaluate the overall benefits and risks of aspartame use in consumers before recommending their use.

Keywords: aspartame, health risk, obesity, diabetes, cancer

DETERMINATION OF TOTAL TITRATION ACIDITY OF WHITE WINE

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Objectives: Wine present beverage produced by fresh grapes total or partial alcoholic fermentation. A number of acids are included in wine composition and one of the most important is tartaric acid. Wine acidity can be expressed through its content as total acidity.
Methods: The total acidity of 15 different samples of white wine was determined by application of acid-base titration using NaOH (0.1 M) and phenolphthalein indicator for determination the end point.
Results: Obtained results were expressed as total acidity (g/L of tartaric acid) and ranged from 5.55 to 6.85 g/L.
Conclusion: Acids content in wine is very important because it affects wine taste and have the role of preservatives. Composition and the total content of wine acids depend on grapes quality, climatic conditions as well as the process of wine preparation. Wine titratable acidity, expressed in tartaric acid, should be in the range of 4.0-8.0 g/L. Lower values than 4 g/L of titratable acids in wine can be suspect for the origin or illegal preparation process. The acid – base titration with phenolphthalein indicator as simple and cost-effective method is suitable for acidity determination of white wine.
Key words: wine, acidity, acid - base titrations

HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY METHOD FOR THE DETERMINATION OF PRESERVATIVES IN DIFFERENT FOOD MATRIX

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Objectives: Preservatives are defined as ingredients that can be of natural or synthetic origin, and whose role is to prevent, slow or stop the growth of microorganisms or any deterioration of food and extension of its shelf life. The objective of the present contribution was the development of a fast and simple HPLC method for the identification and determination of preservatives in different food matrix.
Method: Samples of soft drinks were prepared and analyzed with high performance liquid chromatography method. After a prior filtration to remove the particulate matter, samples were injected directly. The determination of the preservative was performed employing a HPLC system equipped with UV diode array detection. The HPLC working parameters were optimized and the method was validated by establishing the analytical criteria of performance.
The results obtained for the determination of benzoic and sorbic acid on beverage samples from different producers showed values of preservative content between 80 and 100 mg/L, meeting the regulated limit in our country (150mg/L for benzoic acid, 250 mg/L for sorbic acid).
Conclusion: The presented HPLC method proved that this method is suitable for the monitoring process of the legal presence of these preservative in beverages. Values of preservatives in soft drinks samples were below the regulated limits.
Key words: preservatives, benzoic acid, sorbic acid, liquid chromatography

FLAVONES CONTENTS IN THE ETHANOLIC EXTRACTS OF LEAVES, FLOWERS, AND HERB OF LILAC SAGE (*Salvia verticillata* L.)

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Objectives: Flavonoids are the largest group of plant polyphenols. In *Salvia* L. species, the most abundant flavonoids belong to the group of flavones. *Salvia verticillata* L., lilac sage, is traditionally used for gastrointestinal complaints and colds, and its therapeutic effects have increasingly being investigated, lately. This work aims to determine the flavones contents in the ethanolic extracts of leaves, flowers, and herb of *S. verticillata* collected in Niš.
Material and methods: The plant material (leaves, flowers, and herb) was collected in the period of full flowering, at the beginning of July. Extraction of plant material was performed using ethanol 80% (v/v) by ultrasound method. The contents of flavones were determined by high performance liquid chromatography method.

Results: Apigenin and apigenin-7-*O*-glucoside were dominant in the flowers extract (0.47±0.01 and 11.36±0.81 μg/mg, respectively), luteolin in the herb extract (0.12±0.01 μg/mg), and luteolin-7-*O*-glucoside and salvigenin in the leaves extract (13.47±0.68 and 0.35±0.01 μg/mg, respectively).
Conclusion: *S.verticillata* extracts prepared from flowers, leaves, and herb are characterized by the high contents of flavones. Their content is important because of significant biological activities, primarily antioxidant, antimicrobial, anti-inflammatory, and antitumor.

Key words: *Salvia verticillata* L., extracts, flavonoids, flavones.

BLACK CURRANTS (*RIBES NIGRUM* L.) – BERRIES WITH POTENTIAL ANTIMICROBIAL PROPERTIES

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Objectives: Black currants (*Ribes nigrum* L.) are berries that belong to a group of fruits with numerous nutritional and physiological activities. The use of berries as well as their compounds was proven efficient in alleviating or treating different non-communicable diseases, but evidence suggest that they could be used as agents in prevention of communicable diseases as well.

Materials and methods: Pure, 80, and 70% ethanol extracts of Triton variety were used in the study (1 : 10). They were tested against Gram(+) bacteria *Bacillus cereus, Listeria monocytogenes*, and *Staphylococcus aureus*. Gram(−) bacteria were represented by *Escherichia coli, Pseudomonas aeruginosa,* and *Salmonella enteritidis*. *Candida albicans* and *Aspergillus niger* were used for assessing antifungal activity. The determination of antimicrobial and antifungal activity (the minimum inhibitory concentration [MIC] and minimum bactericidal/fungicidal concentration [MBC/MFC]) was carried out by microwell dilution method.

Results: The best antimicrobial activity showed pure ethanol extract that expressed the lowest MIC/MBC against *B. cereus* (12.5/100 mg/ml) and *L. monocytogenes* (25/50 mg/ml). Among G(-) bacteria, the same extract best affected *S. enteridis* (50/100 mg/ml).

Conclusion: Black currant extracts exhibited antimicrobial effects and might have applications as natural antimicrobial agents and preservative in the food industry.

Key words: Black currants, berries, fruits, antimicrobial activity, prevention.

Acknowledgements

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PREPARATION AND ANTIOXIDATIVE ACTIVITY OF YARROW DRY EXTRACT WITH MALTODEXTRIN AS A CARRIER

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Objectives: The yarrow (*Achillea millefolium* L.) is a widespread medicinal plant used in folk medicine to treat inflammation, pain and digestive disorders. Maltodextrin is a polysaccharide used as an effective binder and excipient. Colloidal silica (SiO_2) is the drying adjuvant. We analyzed the antioxidative activity of the mixture of yarrow dry extract (with maltodextrin as a carrier with or without colloidal silica).

Materials and methods: The aerial part of the yarrow was collected, and extraction was made at the Institute „Dr Josif Pančić“, (maceration) using 80%, 90% and 96% ethanol. Ethanol was removed from the macerate (heating to 55 ^{o}C) simultaneously with the extracts applied to the maltodextrin. The dry extract with the carrier was then mixed with colloidal silica at a ratio of 1:0.1 (w/w) to prevent the extract bind water and extract liquefaction. Blends with the same quantity of extracts and maltodextrin without silica were also prepared. Determination of total phenolics (TP), total flavonoids (TF), DPPH and FRAP tests were performed to assess the antioxidant properties of the samples.

Results: High in antioxidants was a mixture of dry yarrow extract firstly prepared with 80% ethanol and maltodextrin (151.18 mg GAE/g of sample TP, 54.71 mg CE/g sample, IC_{50} = 0.05 mg/mL in DPPH assay and FRAP = 0.95 mmol Fe^{2+}/g of sample). The increases in activity were observed in all mixtures with decreasing concentrations of ethanol used as the extraction solvent from 96 to 80%.

Conclusion: The proposed mixture compositions allowed the demonstration of the potential use of the *A. millefolium* L extract as an active phytomedicine ingredient with antioxidant activity.

Keywords: yarrow extracts, maltodextrin, colloidal silica, antioxidative activity.

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SESSION: ENVIRONMENT AND HEALTH

INVITED LECTURES

HEALTH IN CLIMATE CHANGE

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Introduction: Climate change is our reality and unfortunately, our future. Climate change, together with other natural and human-made health stressors, influences human health and disease in numerous ways. New estimates recently released by the scientific journal Nature found that last year alone, more than 60,000 people in Europe died because of extreme heat – three times more than earlier estimated - and as our planet continues to warm, this number is set to rise year on year. But we should mitigate, adapt, be resistant, and resilient if we want to exist on Earth. According to World Health Organization (WHO) and United Nations Economic Commission fof Europe (UNECE), climate change is one of the greatest threat to global health in the 21st century as "triple crisis" together with environmental pollution and biodiversity loss.

Materials and methods: We reviewed the literature on Google Search, Google Scholar, and PubMed database by keywords "climate change and human health effects," "climate change and mitigation," "climate change and adaptation." We included most recent facts from reviewed articles as appropriate for our research as well some outputs from North Macedonia in the field of climate change and health.

Results: Climate change has caused increased heat, drought, and insect outbreaks. In turn, these changes have made wildfires more numerous and severe. The warming climate has also caused a decline in water supplies, reduced agricultural yields, and triggered heat-related health impacts in cities. Public health can be affected by disruptions of physical, biological, and ecological systems, including disturbances originating here and elsewhere. The health effects of these disruptions include increased respiratory and cardiovascular disease, injuries and premature deaths related to extreme weather events, changes in the prevalence and geographical distribution of food- and water-borne illnesses and other infectious diseases, and threats to mental health. We focused on some public health aspects of climate change impacts as air quality in Europe, the environmental burden of disease in Europe, Sustainable Development Goal (SDG) 13, the COVID-19 impact on climate change, implementation of the Budapest Declaration, Transport Health and Environment Pan-European Programme (THE PEP) in North Macedonia and building climate-resilient health systems. Between 1991 and 2022 temperatures in the WHO European Region have warmed at an average rate of about 0.5 °C per decade. This is more than twice the global average and it makes the Region the fastest-warming region globally. This demonstrates the urgent need to significantly reduce greenhouse gas emissions and to act on the consequences of climate change on human health and well-being. Climate change compromises health systems and causes communicable and non-communicable diseases, including mental illnesses, that result from extreme weather events (e.g., heat waves, floods, drought spells, wildfires) and slow-onset developments (e.g., water scarcity, loss of permafrost). Indirect impacts include the spread of vector-, food- and water-borne diseases, allergies, compromised food and water security, diminished well-being, and reduced labour productivity, especially in vulnerable populations. Heat wave from 13-26.07.2023 in North Macedonia with record duration of 14 days is a clear indicator of climate change already happening.

Conclusion: Climate change impact by devastating floods and unprecedented heat waves, severe droughts and formidable storms, all unequivocal signs of the unfolding climate emergency adversely affect human health. We as Health Professionals should promote health adaptation and mitigation activities to be part of the National Determined Contributions of each country to be able to minimize the

health impact of climate change having in mind the worsening and increasing number of Heat-waves and increasing number of Heat-related illnesses.

Key words: Climate change, public health impact, mitigation, adaptation

ORAL PRESENTATIONS

GENERAL PUBLIC'S KNOWLEDGE AND ATTITUDES TOWARD THE TOXICITY AND EVERYDAY SAFE USE OF VARIOUS ITEMS: PILOT SURVEY IN SERBIA AND CROATIA

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Objectives: Media and social networks share inaccurate information on toxic substances in our environment, raising public concern. Hence, the pilot survey conducted as part of the MeeTox project (Erasmus+ program for small partnerships in adult education) aimed to evaluate public perspectives on toxicity and the safe use of everyday products.

Materials and methods: The survey, completed separately among Serbian and Croatian populations, included 14 general and 15 questions specifically focused on assessing the product's toxicity and safe use.

Results: 101 participants in Serbia and 82 in Croatia responded the survey, with over half holding a university degree (59.4% and 80.5% from Serbia and Croatia, respectively). Most respondents from Serbia had backgrounds in medicinal sciences, while those from Croatia were mainly from natural sciences and teaching. A significant majority from both countries agreed that substances in products can be toxic, with almost half also agreeing that we can influence the toxicity. Majority agreed that although a product complies with regulations, it may still cause harm due to individual organism hypersensitivity.

Conclusion: Participants from both countries demonstrate a shared concern about potential toxicity of substances in products, despite differing educational backgrounds. These results will serve as the foundation for creating educational materials.

Key words: questionnaire, general knowledge, toxicity, health risk, safe product use

MONITORING OF SURFACE WATER PONJAVICA IN THE PERIOD 2017-2022

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Objectives: The monitoring of surface water at bathing areas in the municipality of Pancevo includes Ponjavica, which was once part of the Danube flow. Many connections with the Danube and Tamis were broken by the regulation of watercourses. Nowdays, this still water belongs to the protected nature park "Ponjavica", where the water flows only during heavy rainfall.
Material and methods: The surface waters of Ponjavica in Omoljica and Banatski Brestovac were analyzed in the bathing season period from 2017 to 2022. There were no analyses in 2020. The classes of ecological status are determined according to the Regulation on limit values of polluting substances in surface and underground waters and sediment and deadlines for their achievement ("Official Gazette of RS" N^{o} 50/2012)
The results: 30 samples were analyzed. The most frequent deviations from the third class of ecological status at both measurement sites are for pH, biological oxygen demand and chemical oxygen demand. There is also a trend of a decline in the quality of these waters according to the Serbian Water Quality Index in the observed period.
Conclusion: The infrastructure of these bathing areas should be improved, the grass should be regularly mowed down, the sludge and the reeds removed so that these bathing areas meet the conditions for use for bathing and recreation and in this way realize greater tourist potential.
Keywords: ecological status, surface water

PUBLIC HEALTH ASPECT OF WATER SUPPLY IN EMERGENCY SITUATIONS

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In emergency situations, local self-government units are obliged to provide safe water supply to the population according to legal regulations.

The aim of the paper is to present protocol with an assessment of the risk to the health of the population in emergency situations related to drinking water, which was developed by the Center for hygiene and human ecology of the IPH Niš.

During June 2023, six municipalities from Nišava and Toplica districts declared a state of emergency. Water supply as a general measure to protect the population from infectious diseases is a priority in all emergency situations, regardless of its cause. Program IX of general interest in healthcare, financed by the Ministry of Health Serbia, defines the organization of emergency preparedness, but not the way to act in emergency situations. Public Utilities Company does not have a legal obligation to prepare plans for providing health drinking water on regular occasions recommended by the WHO.

Authorized health institutions from the network of Public Health Institutes that control the healthiness of drinking water are obliged to react in emergency situations by applying a unified water protocol in emergency situations in order to protect the health of the population.

Key words: public health, water supply, emergency situations

POSTER PRESENTATIONS:

ASSESSMENT OF RISK RELATED TO DRINKING WATER AS AN EMERGENCY PUBLIC HEALTH RESPONSE

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In June 2023, the river flow in the Municipality of Ražanj threatened the water supply.
Aim: Assessment of risk of water supply in the Municipality of Ražanj during an emergency situation.
The expert team of the Center for Hygiene and Human Ecology carried out the supervision of the water supply system Ražanj and recommended measures aimed at ensuring the drinking water. In the period between June 15th and 23rd 2023 daily samples were taken from the water supply system and mobile tanks and analyzed in the accredited laboratories of the Center for Hygiene and Human Ecology of PHI Niš.
In order to provide drinking water, mobile water supply tanks from the Aleksinac and Merošina PUCs were included. Out of 53 water samples taken, microbiological incorrectness was not observed in any of the samples, while chemical incorrectness were found in 23 samples (43.4%). Free residual chlorine was in range of 0.6-2.0mg/l. In the period from June 21-23.06.2023 compliance of the values of chemical parameters was detected.
Regular monitoring of drinking water by the authorized health institution and timely implementation of the proposed corrective measures enabled normalization of the water supply and ending of the emergency situation within the time limit provided by the Rulebook.

Key words: risk assessment, drinking water, emergency situation, public health

MICROBIOLOGICAL AND CHEMICAL HAZARDS IN DRINKING WATER SAMPLES FROM PUBLIC WELLS IN THE REGION OF NOVI SAD, 2022

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Objectives: The aim of study was to determine if drinking water originally from public wells (PW) in City of Novi Sad contains microbiological hazards (MH) or physico-chemical hazards (PCH). In terms of study, MH are presence of Thermotolerant Coliforms bacteria, Streptococcus faecalis, Proteus species and Pseudomonas aeruginosa; PCH are increased concentrations of arsenic, nitrates and fluoride.

Methods: There were used IPHV data from 2022, refer to 208 drinking water samples from 19 PW in 5 settlements, sampled and analyzed by standardized-accredited methods.

Results: In 12 of 19 PW, there were the presence of MH - thermotolerant microorganisms, indicators of fresh and old fecal pollution, fecal streptococci, and also Pseudomonas aeruginosa, an indicator of secondary microbiological pollution. In 5 of 19 PW, there were the presence of PCH - increased concentrations of nitrates (four (4) wells) and fluoride (one (1) well).

Conclusion: The water of many public wells is not recommended for use, because there is presence of MH and PCH. It is necessary for the competent services to provide public announcement of the results and do not allow the use of drinking water from wells, also to do the sanitation of the wells and ground.

Key words: Public Health, Drinking Water, Water Microbiology, Nitrate, Fluoride

MONITORING OF WATER SAFETY FROM FREE PUBLIC DRINKING WATER FOUNTAINS IN THE SOUTH BAČKA DISTRICT OF VOJVODINA IN 2022

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Objectives: The objective of this work was to assess the drinking water quality from 19 different free public drinking water fountains situated in 16 settlements of the South Bačka District of Vojvodina, whose purpose is to provide safe drinking water for citizens.

Methods: An assessment of drinking water safety was carried out in 2022 when 177 water samples were collected. The sampling and analysis were performed according to accredited and standardized methods of the Institute of Public Health of Vojvodina, Novi Sad.

Results: More than 79% (141 of 177) of analyzed samples had no hazards. Observed by settlements, the prevalences of microbiological indicators (mainly aerobic mesophilic microorganisms) were highest in the Bački Petrovac (62.50%), Parage (37.50%), and Bački Maglić (33.33%). Arsenic was found in one tested sample, concentration above proposed guideline levels for ammonium in 6.21% (11 of 177), and iron in two (1.13%) analyzed samples. There were no samples above guideline levels for nitrite and nitrate concentration.

Conclusion: Being aware of these results, special attention should be paid to developing strategies on detection of the hazards and their treatment. Future investigations are recommended to find the sources of mentioned hazards and evaluate the possible health impacts.

Key words: Arsenic, drinking water, microbiology, hazards.

HUMAN HEALTH HAZARDS IN DRINKING WATER IN ELEMENTARY SCHOOLS OF KOLUBARA DISTRICT

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Objectives: Access to adequate quantities of safe drinking water is essential for health, a basic human right and a component of effective health care policy. Water, sanitation and hygiene (WASH) are crucial for children and their families to live healthy, prosperous lives. This study aimed to identify microbiological, physical and chemical hazards of drinking water from elementary schools of Kolubara district and distribution of hazards.
Materials and methods: Drinking water was sampled from 146 schools and analyzed at the Institute of Public Health of Valjevo according to accredited national and standardized methods in the period from 2017 to 2021. Health hazards from drinking water were defined according to international recommendations.
Results: 22.82% of 2796 drinking water samples were considered unsafe for consumption, according to national regulations. The identified hazards were thermotolerant coliforms in the 11.02% samples (Escherichia coli, Klebsiella oxytoca and Citrobacter faecalis). Concetrations of nitrates and nitrites above legal limits were detected in the 2.38% samples.
Conclusion: The study showed that microbiological contamination is still the most common cause of unsafe drinking water in elementary schools of Kolubara district, which urges implementation of regular disinfection measures and continuous monitoring and analysis of drinking water samples.
Key words: Drinking water quality, schools, Escherichia coli

EFFECTS OF WATER PURIFICATION ON THE TREND OF NITRATE CONCENTRATION IN RURAL SCHOOLS OF THE MAČVA DISTRICT (TEN-YEAR PERIOD: 2012-2021)

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Objectives: The aim of our study is to determine the influence of water purification methods on the trend of nitrate concentration in drinking water from wells in rural schools within the Mačva district.

Methods: We carried a retrospective ten-year analysis of nitrate concentrations in water samples from wells in rural schools of the Mačva district, along with the usage of water purification methods data from the database of the Institute for Public Health Šabac.

Results: Data on nitrate concentrations in drinking water of rural school wells were processed through a retrospective analysis of 3.970 water samples (the average ten-year nitrate concentration of 24.4 mg/l), of which 235 samples (5.9%) were detected high nitrate concentrations, with the average ten-year nitrate concentration of 113.2 mg/l. In the observed period, the linear trend model suggests that the nitrate concentration is decreasing by 0.9 ml/l per (or a 4% decrease), because of increase in the implementation of appropriate water treatment methods used to reduce nitrate concentration (reverse osmosis and denitrification) in the rural school wells, from 10.8% in 2012 to 38.1% in 2021.

Conclusion: The increased usage of water purification and the concurrent decrease in nitrate levels provide evidence to support the assumption that these measurements have been effective in addressing the nitrate contamination issue in the rural schools in the Mačva district. Further monitoring of nitrate concentrations and the effectiveness of the water treatment measurements is crucial to ensure the long-term sustainability of safe drinking water in rural schools.

Key words: nitrates, drinking water, wells, rural school, water purification

WATER HEALTH MONITORING PROGRAM IN MONTENEGRO

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Objectives: Water health monitoring involves systematic monitoring of drinking water health in order to determine its compliance with prescribed parameter values.
Material and method: Monitoring of water for human use includes water consumption from all public and designated local water supply systems. Metering points are primarily defined for places on the distribution network, primarily schools, kindergartens as well as facilities of public importance.
Results: In the period from 2019 to 2022, a total of 12 033 samples of drinking water were analyzed according to the water health monitoring program. From the total number of analyzed chlorinated waters, 174 (3.29%) did not correspond to the current Regulations. From the total number of analyzed chlorinated waters, 134 (2.53%) did not correspond to the current Regulations. Of the total number of physico-chemically analyzed non-chlorinated waters, 22 (3.01%) did not correspond to the valid Regulations. Of the total number of microbiologically analyzed non-chlorinated waters, 731 (79.89%) did not meet the prescribed standards.
Conclusion: According to the results of sample analysis, a significant percentage of samples that did not meet the prescribed standards were registered, which justifies the necessity of further monitoring, in order to improve the safety of water distributed to consumers, especially in local/rural water systems.

Key words: monitoring, water, health, water supply, risk

CONCENTRATION OF NITRITE IN DRINKING WATER IN THE MUNICIPALITY OF STARA PAZOVA 2016 - 2020

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Objectives: The aim of this work is to determine concentration of nitrite in drinking water and whether the population of the municipality of Stara Pazova is exposed to increased concentration of nitrites.

Materials and methods: In the period 2016 - 2020, 4365 samples of untreated chlorinated water were analyzed to determine the concentration of nitrites in drinking water according to acredited and standardize methodology of Institute of Public Health Sremska Mitrovica. The number of inhabitants who have access to untreated chlorinated water is 65,792. The exposure of the population was determined on the basis of exceeding the prescribed limit value of nitrite in drinking water.

Results: The highest exceedances of the nitrite concentration limit values were found in the settlement of Stara Pazova (45%). The percentage of the population of the Municipality of Stara Pazova that has access to untreated chlorinated drinking water without hazard (increased concentration of nitrites) is 2%, while 98% of the population is exposed to hazard.

Conclusions: The obtained results indicate the need for purification of drinking water and provision of healthy drinking water for the entire population of the Municipality of Stara Pazova and the need for quantitative assessment of the risk of determined concentrations of nitrites for human health.

Key words: nitrite, Stara Pazova, drinking water

DETERMINATION OF SILICA IN THE WATERS OF THE NIŠ AND TOPLICA DISTRICTS

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In our country, the concentrations of all parameters in drinking water are monitored by the Rulebook on Hygiene. of drinking water (Official Gazette of the FRY, 42/98 and 44/99) and the Rulebook on Quality, etc. Requirements for natural mineral water, natural spring and table water (Official Gazette SCG, No. 53/2005. and Official Gazette of RS 43/2013). Allowed or recommended concentrations of silica are not given in these regulations.
Objective of the work: Determining the natural concentration of silica in the waters of the Niš and Toplički districts.Adults are recommended to consume between 20 and 50 milligrams of silicon per day, which means that regular hydration and the intake of sufficient water contribute to general health. Silicon concentrations vary in natural waters from 1 to 50 mg/l Si.
Material and methods: Water samples from Niš, Aleksinac Kuršumlija Prokuplje, Blace and Svrljig waterworks, as well as water from Lukovska, Prolom and Kuršumlijska spas, were analyzed for the presence of silicon. The method used for determination is ICP OES, on Schimadz ICPE 9820 device. The regulations do not provide MDK values for Si in water.
Results: The highest concentrations of silicon in the waters were recorded in the waters of Lukovska spa 9 mg/l, Prolom spa around 6 mg/l, Kuršumlija spa 5 mg/l. in the waters of Aleksinac about 2 mg/l, and in the waters of Nis the concentration is less than 1 mg/l
Conclusion: The work is a continuation of the story about silicon as a mineral with great benefits for human health because it plays a very important role in preventing the occurrence of many chronic diseases.

Keywords: Silicon, water, health

HEALTHINESS OF SWIMMING POOL WATER IN SARAJEVO CANTON: BEFORE AND AFTER IMPLEMENTING LEGISLATION

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Objective: was to compare results of microbiological and physico-chemical analyses before and after implementation of legislation.
Methods: Since December 2018, the legislation on the sanitary-technical and hygienic conditions of swimming pools and the healthiness of pool water has been in force in the Canton of Sarajevo. Until then, testing of the healthiness of pool water was carried out according to the Legislation on the healthiness of drinking water
Results: In the period after the implementation of the legislation, there was an increase in the number of microbiologically positive samples from 4.7% to 17% of samples, which represents a 3.62 times higher probability of identifying a microbiologically positive sample. After the implementation of the legislation, the number of physico-chemical positive samples increased from 12.3% to 29.2%. Higher probability of detecting health problems in the pool water samples was due to pH and chloride values deviating from the reference values prescribed by the legislation.
Conclusion: With the implementation of legal legislation, the frequency of sampling and testing of pool water has increased, as well as the scope of testing. The increased number of samples consequently leads to better health control of pool water in Sarajevo Canton.
Key word: Legislation, Pool water, microbiological analyses, physico-chemical analyses

PUBLIC HEALTH ASPECTS OF USE REMOTE SENSING DATA OF SURFACE WATER QUALITY

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Objectives: Since scientific literature explores the association among surface water quality for bathing / recreational and human health, it is recognized the necessity of developing the real time alert system for population health protection. The aim was to analyze the usefulness of remote sensing data of surface water quality (river Danube) as a real time tool for exchanging information of the possibility of human unsafe surface water exposure.

Methods: We used Sentinel-2 multispectral satellite images for estimates chlorophyll and turbidity level as an indicator of surface water quality of the River Danube (Štrand beach and Oficirac beach) and compared that data with the on-site determined microbiological quality (intestinal enterococci concentration, fecal coliforms, and total coliforms concentration) as indicator of health risk for citizen of Novi Sad, during the period 2017-2022.

Results: The main results shows significantly positive correlation between turbidity and presence of enterococci in surface water at the Štrand beach ($r=0.229$; $p<0.05$), and between chlorophyll and the presence of enterococci in surface water at the Oficirac beach ($r=0.685$; $p<0.05$).

Conclusion: Gathering information from real time remote sensing data of surface water quality could use as an alert tool in order to influencing the prevention of waterborne illness.

Key words: Water, Rivers, Remote Sensing, Public Health

CONCENTRATION OF NO_2 IN THE AIR AND ITS DEPENDENCE ON DAILY TEMPERATURE IN NIŠ IN 2022

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The main source of nitrogen dioxide in the air is the burning of fossil fuels (coal, gas, oil), then the production of electricity from fossil fuels and motor vehicles. In urban areas, the concentration of nitrogen dioxide mainly depends on weather conditions, the presence of ozone and the frequency of traffic in the city. Since traffic is the main source of nitrogen dioxide in cities, the greatest pollution occurs in densely populated areas with frequent traffic.
Nitrogen dioxide together with ozone (O_3), hydrogen peroxide (H_2O_2) and some other gases participate in the formation of photochemical smoke.
Nitrogen dioxide and photochemical smoke have a negative impact on human health, the environment and the development of the entire ecosystem. They affect the respiratory system of people, they can cause asthma or bronchitis and some heart diseases, they can cause difficulty breathing, sore throat, cough and reduced lung capacity.
The aim of the work was to determine the dependence of NO2 concentrations in the air on daily temperature. During 2022, the concentration of NO2 in Nis was measured daily at Trg Kneginje Ljubice. Daily temperature values were taken from the site http: // www. amskv. sepa.gov.rs / pregledpodatakazabirni. php.
The analysis of the obtained results confirmed the dependence of NO_2 concentrations and daily temperatures.
Key words: Nitrogen dioxide, photochemical smoke, daily temperatures

USING THE HEALTH ECONOMIC ASSESSMENT TOOL (HEAT)-WALKING IN THE REPUBLIC OF NORTH MACEDONIA

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Objectives: Physical inactivity is one of the leading risk factors for non-communicable disease mortality. Walking, as much as it seems trivial, futile and worthless is not that unimportant as it may seem. The aim of this study was to make a health and an economic assessment of the benefits of walking in the Republic of North Macedonia by using the Health and Economic Assessment Tool (HEAT).
Methods: We used the 2017-th version of the HEAT which is able to calculate the health effects of regular walking and/or cycling. This study was conducted during 2020 on the territory of the Republic of North Macedonia with multiple cities. The data was obtained using a questionnaire that included 12 questions.
Results: On a daily basis, 22.2% walked under 30 minutes and 77.8% walked over 30 minutes. The average time spent walking was 65 minutes and the average distance spent walking was 4.1km.
Conclusion: This study demonstrated that our population does not follow the recommended amount of daily walking.
Keywords: HEAT, walking, benefits, public health

THE CORRELATION OF PHYSICAL ACTIVITY WITH THE EFFECT OF DRUG THERAPY IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE

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Objectives: The aim of the study was to determine the correlation of physical activity with effect of drug therapy in patients with peripheral arterial disease (PAD).
Materials and methods: The study included 82 patients with diagnosed PAD (Fontaine IIa, IIb), treated at the Clinic for Vascular Surgery of the University Clinical Center in Nis, starting from January 2020 to December 31, 2020.
Results: In the groups of subjects who crossed < 500 m and 500 to 1000 m on average per day, there was no statistically significant prolongation of the claudication distance (PCD) in relation to the applied therapy. Statistical significance regarding the PCD in the group of respondents who crossed > 1000 m on average per day existed ($p = 0.02$) with a note that greater efficiency was achieved in the group that applied cilostazol and acetyl salicylic acid (ASA).
Conclusion: Cilostazol and ASA therapy has a greater effectiveness in PCD compared to pentoxifylline and ASA therapy in the group of subjects who were the most physically active and walked an average of more than 1000 m per day.

Key words: drug therapy, physical activity, peripheral arterial disease

CAN WE BETTER IDENTIFY PATIENTS WITH METABOLIC SYNDROME AND INCREASED RISK FOR THROMBOSIS?

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Introduction: Metabolic syndrome (MetSy) is a significant inflammatory and prothrombotic condition. A lot of data showed that prothrombotic state continues to state of chronic low-grade inflammation (LGI). A significant number of patients during the transition to type 2 diabetes become recognized too late, after thrombosis occurs.
Aim: Compare the laboratory definition of the state of LGI with the newly proposed one for more identification of patients with an increased thrombosis risk.
Material and methods: The investigation was conducted as a cross-sectional study with 70 MetSy patients at University Clinical Center Kragujevac. The diagnosis of MetSy was confirmed according to IDF consensus definition. The most frequently used laboratory definition of chronic LGI defined this condition with CRP values over 2.5 mg/l. We propose to add parameters such as fibrinogen (>3.0g/l) and the total leukocyte number (>$7.0x10^9$) on CRP (>2.7mg/l) considering pathophysiological connection.
Results: The comparative analysis showed that the new proposal is better in separation of absolute lymphocytes and monocytes numbers, insulin resistance, and beta cell burden, where all mentioned parameters are more expressed compared to the previous definition.
Conclusion: Proposed new definition can significantly facilitate recognition of this group of patients at risk and enable the prevention of thrombosis.
Key words: metabolic syndrome, low-grade inflammation, thrombosis risk, prevention

VENTILATION CRITERIA FOR THE INTEGRATED CONTROL AND PREVENTION OF AIRBORNE MICROBIOLOGICAL RISK IN A DIALYSIS CENTRE ROOM

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Introductions: Effective ventilation in the hospital care unit is essential to prevent the spread of infection, as improved air quality reduces the presence of harmful airborne micro-organisms. Monitoring indoor carbon dioxide (CO2) can serve as an indicator of ventilation effectiveness, as high CO2 concentrations indicate inadequate ventilation. However, it's important to note that low CO2 concentrations do not necessarily indicate a low risk of aerosol transmission. This article focuses on a dialysis room where treatment is taking place and the occupant load is high, which may increase the risk of coronavirus infection through physical contact or airborne transmission.
Objectives: The aim of this study is to define the legally required and recommended ventilation criteria in dialysis rooms. Research question: Are the existing legal requirements and recommendations regarding ventilation in dialysis rooms sufficient to comprehensively manage and prevent airborne microbiological risk?
Methods: A systematic literature review.
Results: Existing legal requirements and recommendations for ventilation in dialysis rooms are insufficient in comprehensively managing and preventing airborne microbiological risk.
Conclusion: It is evident that a comprehensive revision of the existing ventilation criteria in national legalisation for dialysis rooms is necessary to enhance the control and prevention of airborne microbiological risk.
Key words: ventilation criteria, airborne microbiological risk, dialysis rooms, prevention

HYDROSOLS AS PRESERVATIVES IN COSMETIC CREAMS

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Objectives: Hydrosols are a byproducts of the essential oils distillation. The antibacterial properties of many hydrosols have been demonstrated, and literature data suggest the possible use of hydrosols as preservatives in cosmetic products. The aim of this study was to investigate the potential use of hydrosols as preservatives in O/W emulsion type cosmetic creams based on the chemical analysis previously performed.
Methods: Commercially available hydrolates from Promontis (Serbia) Anthemis nobilis L., Daucus carota L., Thymus vulgaris L., Melissa officinalis L. and Lavandula angustifolia Mill. were used for preparation of cosmetic creams. The organoleptic tests, electrical conductivity and pH measurements of the samples were performed.
Results: Creams, each made using one of the hydrolates as water phase, had white color, different odours and semi-solid consistency. After 30 days, the color and consistency remained the same, while odours became milder. Electrical conductivity and pH decreased slightly for each sample, without statistical significance. After 90 days of storage all creams exhibited unpleasant odours and discoloration, except the cream containing A. nobilis hydrosol. An acceptable decrease in pH was observed in the sample, along with decreased electrical conductivity.
Conclusion: The creams formulated with hydrosols didn't show satisfactory preliminary stability, except cream with A. nobilis hydrosol. Further research is needed.

Key words: hydrosol, aromatic water, cosmetic formulation, preservatives

MAPPING THE MOSQUITO-BORNE DISEASE RISK IN THE TERRITORY OF THE CITY OF NOVI SAD

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Objective: Create an electronic map to show the spatial distribution of mosquito species that are potential vectors of mosquito-borne disease, especially West Nile fever, in the territory of the City of Novi Sad
Materials and methods: From June to September 2022, adult mosquitos were collected at 12 locations in the territory of the city municipality of Novi Sad using the CDC and the BG-sentinel traps, totaling 264 samples. They were identified to the species/species complex level according to morphological characteristics using the Mosley Tool V2.1. They were pooled by sampling site, the month of collection, and species and tested for West Nile virus (WNV) by real-time RT-PCR/PCR. We used descriptive statistics for data analysis and *Quantum GIS (QGIS)* software, version 3.10, for developing the electronic map of the spatial distribution of mosquito species. The risk zone presented on the electronic maps was evaluated concerning the flight range of individual mosquito species. Accordingly, the risk zone of infectious diseases transmitted by the Culex pipiens mosquito species (in our climate, West Nile fever) was 500 meters and was drawn on the map around each locality where this species was detected. The risk zone of the bite of the invasive mosquito species Aedes albopictus is estimated at 250 meters. It is represented on the map around each locality where this species has been identified.
Results: A total of 2,864 female mosquitoes were collected, including *Culex pipiens* (76.2%), followed by *Aedes vexans* (9.5%), *Aedes albopictus* (9.0%), *Anopheles maculipennis s.l.* (3.5%), *Culiseta annulata* (1.0%), and *Aedes caspius* (0.8%). The total number of collected mosquitoes and the number of *Aedes albopictus* and *Culex pipiens* were statistically higher in urban areas (<0.0001). Five of 48 (10.4%) *Culex pipiens* pools tested positive for WNV. It was detected only in mosquitoes collected in July and August. The pool positivity was not significantly different between mosquitoes collected in July (4/12; 33.3%) and August (1/12; 8.3%, $p = 0.3168$), as well as between mosquitos from urban (3/32; 9.4%) and suburban areas (2/16; 12.5%; $p = 1.000$). *Culex pipiens* was detected at all sampling locations (12) and Aedes albopictus at 11 (92%) sample locations. In contrast, Culex pipiens positive for WNV was found at four sampling locations (three outside and in the city center).
Conclusion: The obtained results are of health and social importance for the City of Novi Sad population, given that it raises awareness about the contagious nature of domestic mosquitoes and the importance of protection measures against them. The results of the Project in the form of created electronic maps indicate the areas of the City's territory which should be avoided at the time of the most significant activity of mosquitoes and towards which the mosquito control measure should be directed as a measure to prevent infectious diseases, all to preserve and improve the health of the population.
Key words: Environment, Health, Mosquito, West Nile virus

HANDEDNESS CONVERSION AMONG CHILDREN IN THE BRANICEVO DISTRICT, SERBIA: A CROSS-SECTIONAL STUDY

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Objectives: The aim of this research is to investigate the percentage of handedness conversion in children who are innately left-handed in the Branicevo District.
Materials and methods: We conducted a study using the Edinburgh Handedness Inventory (EHI) among primary school children in the Braničevo District, Serbia. The researchers obtained ethical approval from the management of the Institute of Public Health Požarevac, and parental consent was obtained from the respondents.
Results: The cross-sectional study was conducted on a sample of 836 children (51.6% girls and 48.4% boys), from two urban (62.2%) and two rural (37.8%) primary schools in the Braničevo District, ranged from the fifth to the eighth grade (20.9%, 29.8%, 24.4%, 24.9%, respectively). In the examined sample of children, the percentage of left-handed and ambidextrous individuals was 7.9% and 1%, respectively. The data in the present study showed that 52.5% (66/139) of left-handed children had been forced to convert to right-handedness. The most common sources of suggestions for the child to write with the right hand were parents (80.6%), followed by people from their immediate environment (16.5%), while teachers gave such suggestions in 2.9% of cases.
Conclusion: Our study demonstrates the impact of various social pressures. It also suggests that there is a higher proportion of left-handedness among younger children compared to their peers of older age. In the future, it is essential to place emphasis on preventing potential side effects in children who have undergone hand conversion. Future cross-cultural studies would provide valuable insights for interventions and support systems for diverse handedness orientations worldwide.
Key words: left-handed, children, parents, handedness conversion, primary school

SESSION: THEORETICAL AND PRACTICAL PROBLEMS OF COMMUNICABLE DISEASES

INVITED LECTURES:

PREVENTION OF HPV INFECTION IN CHILDREN AND ADOLESCENTS: THE FOCUS ON VACCINATION

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Abstract

Human papillomavirus (HPV) infection is the most common viral infection in human population. Although HPV infection is considered a sexually transmitted infection, HPVs can also be transmitted by non-sexual routes including casual physical contact and perinatal vertical transmission. HPV is the etiological agent of common dermatologic, sexually transmitted diseases and HPV-related cancers. There are more than 200 types of HPVs. Worldwide, the risk of being infected at least once in a lifetime among both men and women is 50%. Although historically known as the cause of common cutis and anogenital warts, there have been extensive studies since 1980 exploring the role of HPV in cervical cancer development and in other tumors. The most common HPV types are HPV 16 and 18, which are the main types linked to carcinogenesis. Both HPV 16 and HPV 18 are preventable by HPV vaccination. Three HPV vaccines exist today: the bivalent (2vHPV) vaccine for girls licensed in 2006, the quadrivalent (4vHPV) HPV vaccine for boys licensed in 2009, and the 9-valent HPV vaccine (9vHPV) licensed for both girls and boys in 2014. In 2007, Australia became one of the first countries to introduce the HPV vaccine and in 2020, the HPV vaccine was introduced in more than half of the WHO member countries. In the Republic of Serbia, vaccination against HPV infection is not part of the mandatory national immunization program. It is recommended for children aged 9 before the first sexual intercourse, and primarily for children in the seventh grade of primary school (age 13). Organized vaccination against HPV infection has not been conducted among children, adolescents, and young adults in Serbia before 2022. HPV vaccination of children was introduced in Serbia according to the World Health Organization (WHO) recommendations in June 2022. In 2022 the focus was on the vaccination of children and adolescents from the age group 9–19 years and in 2023 the focus is on children in the seventh grade of primary school.

Key words: HPV infecton, children, adolesecents, HPV vaccine, prevention

Introduction. The most common viral infection in human population, which is predominantly sexually transmitted, is caused by *Human Papillomavirus (HPV)* [1]. The highest prevalence of HPV infection is registered in sub-Saharan Africa (24.0%), Latin America and the Caribbean (16.1%), Eastern Europe (14.2%), and Southeast Asia (14.0%) [2]. In European countries, the prevalence of HPV infection ranges from 2.0% in Spain to 12.0% in Belgium and France [2-3]. The highest prevalence by age is among non vaccinated sexually active adolescents [4-5] and among young women under 25 years of age [6-8].

Skin warts

Although HPV infection is considered a sexually transmitted infection, HPVs can also be transmitted by non-sexual routes including casual physical contact and perinatal vertical transmission [9-10]. Children and adolescents before sexual debut can also be affected by HPV infections. HPV can be categorized into two tropism groups, comprising cutaneous HPV types (cutHPV) and mucosal types (mucHPV) [11]. Typical disease manifestations of HPV infection in children are skin warts [12], commonly transmitted by cut HPV infections [13]. CutHPV, e.g. HPV-1 or HPV-4, are usually found on healthy skin [14], even though they can also be detected in skin lesions such as benign skin warts [9,10,13].

There are different types of warts, including common warts (verruca vulgaris), plantar warts (myrmecias) and flat warts (verruca plana) with different prevalence and age distributions, which could be due to differences in transmission modes [15-16]. Generally, HPV associated skin warts are rare in preschool children, and peak among children aged 10–14 years, followed by a rapid decline at 20 years of age with no difference between girls and boys [15]. Common warts represent 70% of skin warts and occur primarily in children, plantar and flat warts occur in a slightly older population and the greatest incidence is between 12 and 16 years of age [16]. Warts occur more frequently in girls than in boys. It has been proposed that HPV infection of normal skin is acquired very early in infancy [14]. In most cases, among healthy individuals, cutaneous HPV types rise to persistent subclinical infections without causing warts or other lesions of the skin. The natural progression of skin warts in childhood indicates that warts spontaneously clear after 2 years without treatment in 40% of children [16-17].

Anogenital warts

Anogenital warts in children are rare, much less common than in adults; however, in pre-pubertal children, the reported incidence has been increasing dramatically since 1990 [18-19]. In girls, anogenital warts can present in the vulvar, vaginal, urethral, and peri-anal areas. In boys, typically genital warts are located in the peri- anal area, while penile warts are rare. Girls present three times more often with anogenital warts than boys [23]. The clinical appearance of anogenital warts varies from subtle, skin-colored flat warts to moist, pink to brown lesions found particularly in the skin creases and around the vaginal and anal openings [12]. HPV 11 and 6 are the most frequently detected HPVs in anogenital warts in children [18,23-24]. Cutaneous HPV types like HPV 2 or 3 are also detected; however, their incidence is low [23-24]. Among non-sexually abused children with anogenital warts, cutaneous types are more common in older children aged over 4 years, in those with a relative who had skin warts, and in children with skin warts in other anatomical sites [24]. The modes of HPV genital transmission in children remain controversial. HPV can reach a child's anogenital area by vertical transmission or by close contact, which can be either sexual or non-sexual [14,19,20,25].

Sexual contact has been proposed as the most common mode of genital transmission of HPV in childhood by several researchers [25-26]. In the study of Stevens-Simon et al. [24], genital HPV infection was found to be more common among sexually abused than non-sexually abused girls and the majority of them remained subclinical.

However, recent studies suggest that, although sexual contact is a possible cause of HPV transmission, other pathways seem to be more likely including perinatal transmission, autoinoculation and heteroinoculation, and, possibly, indirect transmission via fomites [24-25]. It has been found that the rate of anogenital warts among non-abused children was comparable with the rate reported in abused children [27]. 'High-risk' HPVs have been detected in 4–15% of genital samples obtained from asymptomatic infants, with a decreasing genital HPV DNA carriage rate during the first year of life [28]. HPV also appears to be common in asymptomatic pre-pubertal girls with no known vulval disease studied by Powell et al. [29].

Most cases of anogenital warts in children are likely to be the result of non-sexual transmission, namely prenatal mode [14-15,24-25]. Spontaneous resolution of anogenital warts in children occurs in more than half of the cases and long-term follow-up for children with anogenital warts is recommended, although there are no longitudinal studies available to clarify whether they are at risk of developing carcinoma in young adulthood [31].

Recurent respiratory papillomatosis

A rare diseases caused by HPV infections in children and adolescents are juvenile-onset recurrent respiratory papillomatosis (JoRRP), oral papilloma [32]. JoRRP is most prevalent among children under five, mainly caused by persistent HPV-6 and HPV-11 infections and associated with maternal transmission [32]. Recurrent respiratory papillomatosis (RRP) in childhood occurs at an incidence of 0.3–3.9/100,000 and is considered as the most common benign tumor that affects the larynx in children [32-33]. It is characterized by recurrent growth of benign papillomas along the epithelium of the upper respiratory tract including the larynx, the vocal cords, the arytenoids, the subglottis, and the trachea.

Exolaryngeal sites may become involved, including lungs, oropharynx, oral, and nasal cavity. JoRRP is a potentially life-threatening benign tumor as it has the tendency to grow in size and number causing complete airway obstruction [34]. Children with JoRRP can present with hoarseness, variable degrees of chronic dyspnea, cough, stridor, dysphonia, or weak cry, with hoarseness being the most common presenting symptom [35-36]. The duration of symptoms before definitive diagnosis varies from 2 months to more than 2 years. Perinatal infection may occur transplacentally, via amniotic fluid during gestation and delivery and through direct exposure to cervical and genital lesions during birth [26].

HPV-related cancers

HPV infection is highly associated with cervical cancer in low- and middle-income regions of the world and mostly with the oropharyngeal cancers in developed regions of the world [37-38]. Cervical cancer is one of the most common malignant tumors among women and it has the fourth highest incidence and mortality rates among women worldwide, with 604,000 new cases and 342,000 deaths in 2020. The role of HPV in carcinogenicity was confirmed in 1983 following the cloning of HPV 16 type from cervical carcinoma tissue by Durst and colleagues [37]. It has since become widely accepted that high-risk HPV is a cause of almost all cervical cancers. Many cases of HPV infection are asymptomatic and resolve spontaneously, but cervical cancer may arise in cases of persistent HPV infection of the cervical basal cells [38].

Chronic HPV infection, together with other risk factors for cervical cancer, plays an important role in the development of this cancer as well. The most significant risk factors are smoking, immunodeficiency, long-term use of oral contraceptives, promiscuous behavior, and having more than two pregnancies. Other risk factors include a family history of cervical cancer and other descriptive characteristics, obesity, and poor diet [39-43].

Cervical cancer is still the second most common malignant tumor in females from 15 to 44 years of age [4]. It has a slow progression [44], and if it is discovered at an early stage, it is a highly preventable and highly treatable malignant tumor [45]. It takes more than 10 years after the first exposure to HPV infection to develop some malignant changes in the cervical mucosa [44-45].

As reviewed by Kreimer et al. [46], HPV DNA has been detected by polymerase chain reaction (PCR) in head and neck squamous cell carcinoma (HNSCCs) arising from various anatomic sites. HPV16 is the predominant HPV type, accounting for 90% of HPV DNA-positive HNSCCs. HPV was recognized as a risk factor for oropharyngeal carcinogenesis by the International Agency for Research on Cancer (IARC) in 2007 [47] and a higher frequency of oral sex and a greater number of sex partners are thought to increase the risk of HPV-related cancer in the oropharynx [49].

Today, there are 223 HPV types have been which are officially recognized and are classified into five separate viral genera: *Alphapapillomavirus* (*Alpha*-PV), *Betapapillomavirus* (*Beta*-PV),*Gammapapillomavirus* (*Gamma*-PV), *Mupapillomavirus* (*Mu*-PV), and *Nupapillomavirus* (*Nu*-PV) [49]. Cutaneous HPVs from the *Alpha*-, *Gamma*-, *Mu*-, and *Nu*-PV genera are most commonly etiologically associated with the development of various types of skin warts, which are benign, self-limiting, and not life-threatening neoplasms, but they represent a significant public health problem due to their high incidence, often long-term persistence, and the various forms of discomfort and among them 20 types are oncogenic and high-risk HPV types that show high associations with HPV-related cancers, especially with invasive cervical cancer. HPV infecting the uterine cervix is divided into high- and low-risk groups. HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 68, 69, and 73 are classified as high-risk HPV [50], which is estimated to account for almost 100% of cases of cervical cancer, about 90% of cases of anal cancer, and 40% of vulva, vagina, and penile cancer.

Primary prevention of HPV infection

Three HPV vaccines exist today: the bivalent (2vHPV) vaccine for girls licensed in 2006, the quadrivalent (4vHPV) HPV vaccine for boys licensed in 2009, and the 9-valent HPV vaccine (9vHPV) licensed for both girls and boys in 2014. The most common World Health Organization (WHO) recommendations regarding routine vaccination are related to children age 9–14 because the HPV

vaccine is the most effective if it received before recipients become sexually active, i.e., before they are exposed to HPV infection [51]. The vaccine is also recommended for adolescents, primarily girls and younger women from age 15 to 25 [52]. The CDC recommendations regarding HPV vaccination are somewhat different. Namely, the vaccine is recommended for children aged 11 or 12, but it can also start at the age of nine and is recommended up to the age of 26 [53].

In 2007, Australia became one of the first countries to introduce the HPV vaccine [54-55], and in 2020, the HPV vaccine was introduced in more than half of the WHO member countries. For example, the HPV vaccine has been introduced in 85% of the countries in North America and 77% of the countries in Europe [55]. The three HPV vaccines do not provide complete protection against all oncogenic HPV types, and immunity is not lifelong [56]. In the Republic of Serbia, vaccination against HPV infection is not part of the mandatory national immunization program. It is recommended for children aged 9, before the first sexual intercourse, and primarily for children in the seventh grade of primary school (age 13) [56].

In the Republic of Serbia, vaccination against HPV infection is not part of the mandatory national immunization program. It is recommended for children aged 9, before the first sexual intercourse, and primarily for children in the seventh grade of primary school (age 13) [56]. HPV vaccination of children was introduced in Serbia according to the WHO recommendations. Children aged 15–19 may also receive the HPV vaccine free of charge. Until now, organized vaccination against HPV infection has not been conducted among children, adolescents, and young adults in Serbia. In 2022 the focus was on the vaccination of children and adolescents from the age group 9–19 years. In all countries where the immunization process has started, health policy makers have emphasized that raising the awareness of the population, especially health workers and parents, about the importance of preventing these diseases is crucial in order to better implement vaccination [6,13,17,24].

The Nine-Valent (9vHPVvaccine)

Legislative Regulations in the Republic of Serbia The 9vHPV vaccination in Serbia is recommended for children aged nine and up, before the first sexual intercourse, and primarily for children in the seventh grade of primary school (13 years of age). Active immunization against HPV infection is carried out with the required number of doses (two or three), which is recommended by the WHO depending on the type of vaccine and age [56]. Three doses are given to children aged 9 to 19 keeping in mind the recommendation that the second dose should be administered at least one month after the first dose, and the third at least 3 months after the second dose. All three doses should be administered within one year.

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ORAL PRESENTATIONS:

PREVENTION OF PNEUMOCOCCAL DISEASE AMONG ADULTS IN SERBIA

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Introduction: Mortality rates from invasive pneumococcal disease (IPD) caused by *Streptococcus pneumoniae* are highest among adults aged over 65. Consequently, immunization against pneumococcal disease (PD) is recommended for adults to prevent IPD. The objective of this paper is to analyze the modifications related to PD immunization, as outlined in the Regulation on the Mandatory and Recommended Immunization Program for the population against certain infectious diseases.

Materials and Methods: The text of the enacted law and relevant regulations has been analyzed. Mandatory and recommended immunization against PD have been comprehensively described in accordance with the Regulation.

Results: Immunization against PD is mandatory for individuals with specific clinical conditions such as asplenia, nephrotic syndrome, symptomatic and asymptomatic HIV infection, individuals with multiple sclerosis starting treatment with specific medication, organ and tissue transplantation, malignant diseases, cochlear implantation, and immunosuppression (with a recommendation of two doses of the pneumococcal vaccine). Additionally, immunization is also mandatory for individuals with chronic cardiovascular and pulmonary diseases, diabetes mellitus, chronic liver and/or kidney diseases, those experiencing frequent respiratory infections and otitis, individuals aged 65 and older in nursing homes, and immobile residents in social care institutions (with a recommended single dose of the pneumococcal vaccine). Immunization against PD is recommended for individuals aged ≥65 years without underlying conditions, as well as for those with chronic diseases not covered by active systematic immunization (single dose of the pneumococcal vaccine).

Conclusion: These recommendations are of great importance in preventing PD among adults. Therefore, it is crucial that these guidelines be widely disseminated and effectively implemented by all healthcare professionals, especially among general practitioners in Serbia.

Key words: *Streptococcus pneumoniae*, pneumococcal disease, pneumococcal vaccine, elderly, immunization

A QUARTER OF A CENTURY OF NATIONAL SURVEILLANCE OF HEALTHCARE – ASSOCIATED INFECTIONS IN SERBIA

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Objectives: To describe the development of a national surveillance system for healthcare-associated infections (HAI) in Serbia. Materials and methods: Descriptive methods vas used.

Results: Surveillance of HAIs with feedback is a core component for effective infection prevention and control. It can be organized at the local (healthcare institutions) level, regional, and national levels. The first elements of the national HAI surveillance system were established at the end of the nineties of the last centuries by the low, with the introduction of the Commission for HAI in each healthcare institution. In 1998, the first national point prevalence survey (PPS) of HAI was conducted in 24 Serbian hospitals. Prevalence was 7,5%, and surgical site infections were the most frequent localization of HAIs. The national program health protection of the population from infectious diseases 2002-2010, completely defined the HAI surveillance from local to national level. In the following period, four national PPSs were conducted in 2005, 2010, 2017, and 2023, two last within the European PPSs. The HAI prevalence was 3.5%, 5.3%, 4,6%, and 5.3% respectively. In 2002, the Ministry of Health established the National Expert Commission for HAI, as a multidisciplinary group of epidemiologists and other clinical specialists, in line with the WHO recommendations. This body made a huge effort in the formation of an efficient national HAI surveillance, which is reflected in the huge number of recommendations, especially during COVID-19 pandemic three improved versions of the Rulebook, and other by-laws that it prepared, along with the constant monitoring of the epidemiological situation regarding HAI in the country.

Conclusion: National HAI surveillance is an essential component of effective infection prevention and allows the evaluation of prevention programs, thereby improving patient outcomes.

Key words: healthcare-associated infections, surveillance, Serbia

THE QUALITY OF LIFE IN PEOPLE WITH SENSORINEURAL HEARING IMPAIRMENT DURING THE COVID-19 PANDEMIC

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Objective: The aim of the paper was to review the relevant literature and analyze research that examines the quality of life in people with sensorineural hearing impairment during the COVID-19 pandemic.

Materials and methods: The PubMed and Google Scholar tools were used to search the databases of contemporary scientific information.

Results: The COVID-19 pandemic has affected the quality of life of the entire population, especially in the areas of social and mental functioning. In people with impaired hearing function, the implementation of protective measures during the COVID-19 pandemic, such as face masks and physical distance, can hinder communication significantly, leading to social isolation, which affects the quality of life and may even intensify the symptoms of stress, anxiety, and depression. Research indicates that the use of hearing amplifiers improves the quality of life in people with sensorineural hearing impairment, which makes audiological diagnostics and hearing amplification necessary even during the COVID-19 pandemic, along with implementing all the protective measures. It is also important to provide adequate education and social interaction.

Conclusion: Ascertaining the quality of life in people with sensorineural hearing impairment during the COVID-19 pandemic indicates challenges in psychosocial functioning. Impaired communication can be improved through the use of face masks with a transparent window, hearing amplifiers, cochlear implants, wireless systems, mobile phone apps, written language, and, sometimes, sign language interpreters.

Key words: COVID-19 pandemic, quality of life, sensorineural hearing impairment, communication.

POSTER PRESENTATION:

EPIDEMIOLOGICAL CHARACTERISTICS OF COVID-19 IN MONTENEGRO (2020-2022)

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Introduction: The new coronavirus SARS-CoV-2 causes severe acute respiratory syndrome. It originates from Orthocoronaviridae subfamily, Coronaviridae family and Nidovirales order.

Materials and methods: The aim of the work is to present the incidence of COVID-19 in Montenegro (period from 2020 to 2022.). Descriptive epidemiological method was used in work. Electronic database of the IPHMNE was used as a data source of registered cases of COVID-19. Microbiological diagnosis was performed by PCR and rapid antigen tests. Estimated number of inhabitants for year 2022 was obtained from the Administration for Statistics - Monstat.

Results: Outbreak of COVID 19 in Montenegro, during period 2020-2022, is characterized by four waves. In observed period, 284338 people were registered with COVID-19 infection (average incidence rate 15306.5/100000 inhabitants). Number of registered deaths was 2791 (average mortality rate is 15004/100000 inhabitants). Fatality rate ranged from 0.3% (in 2022) to 1.4% (in 2020 and 2021).

Average incidence rates ranged from the lowest, recorded in municipality of Gusinje - 1894/100000 inhabitants, to the highest recorded in municipality of Budva - 23807/100000 inhabitants. The highest average incidence rate was recorded in age group 30-39 years and it stated 20288,4/100000 inhabitants (53414 registered cases positive for SARS-CoV-2).

The average mortality rate ranged from 70,2/100000 inhabitants registered in municipality of Tuzi to 280,1/100,000 inhabitants recorded in municipality of Andrijevica. The highest average age-specific mortality rate was registered for the age group of 80 years and older and was 1407,4/100000. High mortality was recorded in all age groups above 60 years.

Conclusion: The coronavirus pandemic has caused a global health crisis. For some new public health risks, the lessons learned from this pandemic should be for countries to act in three directions: preparation, response and recovery.

Key words: COVID-19, pandemic, incidence, Montenegro.

EFFECTIVENESS OF VACCINATION IN PREVENTING COVID-19: A COMMUNITY STUDY COMPARING FOUR VACCINES

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The course of the COVID-19 pandemic has been critically altered by the availability of vaccines. To assess the risk of COVID-19 in the vaccinated, as compared to the unvaccinated population, as well as the comparative effectiveness of the BBIBP-CorV (Sinopharm), BNT162b2 (Pfizer/BioNTech), Gam-COVID-Vac (Sputnik V) and ChAdOx1 (AstraZeneca) vaccines in the prevention of clinical infection, we carried out a retrospective study of the incidence of clinical COVID-19 in the Belgrade city municipality of Voždovac among both vaccinated and unvaccinated individuals during a 4-month period between 1 July and 31 October 2021. The study included all individuals with a symptomatic infection confirmed by a positive PCR and/or antigen test. Only those who received two vaccine doses were considered as vaccinated. The results showed that of the Voždovac population of 169,567, a total of 81,447 (48%) individuals were vaccinated by the end of the study. Vaccination coverage increased with age, ranging from 1.06% in those below age 18, to even 78.8% in those above 65 years of age. More than one half (57.5%) of all those vaccinated received BBIBPCorV, while 25.2% received BNT162b2, 11.7% Gam-COVID-Vac and 5.6% ChAdOx1. The overall risk of infection of the vaccinated vs. the unvaccinated was 0.53 (95% CI 0.45–0.61). Compared to the incidence of COVID-19 of 8.05 per 1000 in the unvaccinated population, the relative risk in the vaccinated was 0.35 (95% CI 0.3–0.41). The overall VE was 65%, differing widely among age groups and by vaccine. VE was 79% for BNT162b2, 62% for BBIBP-CorV, 60% for ChAdOx1 and 54% for Gam-COVID-Vac. The VE for BBIBP-CorV and BNT162b2 increased with age. The obtained results demonstrate a significant overall effectiveness of anti-COVID-19 vaccination, which, however, varied significantly among the analyzed vaccines, and was the highest for BNT162b2.

Key words: COVID-19; vaccination; vaccine effectiveness; BBIBP-CorV; BNT162b2; Gam-COVIDVac; ChAdOx1

PREDICTORS OF IGNORING NEWS ABOUT COVID-19 AMONG THE VACCINATED PEOPLE IN SERBIA

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Objective: To explore factors associated with ignoring information about COVID-19 among vaccinated people in Serbia.

Method: Participants were surveyed in September and October 2021 after having received the third vaccine dose at a referral vaccination center. An anonymous questionnaire was used to collect data. Aside from general socio-epidemiological data, study participants were asked about the channels of communication that they used to obtain information about COVID-19. On a list of potential responses, we included an option "I do not follow news on COVID-19", which was observed as the outcome in this study.

Results: A total of 366 vaccinated people were included. Most of them were females (228, 62.3%) of average age 41.6±15.5 years (age range 18-87). Overall, 31 individuals (8.5%) did not follow the news about COVID-19. The logistic regression model showed that being younger (odds ratio [OR]=0.96, 95% confidence interval [CI] 0.92-1.00, p=0.047), being a smoker (OR=1.42, 95%CI 1.02-1.97, p=0.038), not using immunity boosters (OR=0.32, 95%CI 0.18-0.59, p=0.001) and having less trust in health care workers (OR=0.53, 95%CI 0.34-0.81) were associated with ignoring news about COVID-19.

Conclusion: It is essential to build trust in health care workers and institutions to deliver accurate, clear and compelling information about health issues.

Key words: COVID-19, information, news, avoidance

CLINICAL PICTURE OF COVID-19 PATIENTS AFTER VACCINATION INFECTED WITH THE COVID-19 VIRUS

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Objective: SARS-CoV-2 Omicron strain appeared at the end of 2021. Vaccination against this virus happened to be the key moment in the fight against the pandemic.

The goal of our study was the assessment of clinical picture severity in vaccinated patients during the dominance of SARS-CoV-2 Omicron strain.

Methods: Our study was conducted as retrospective study in the General Hospital Novi Pazar, from January to June 2022. Data were obtained from hospital records.

Results: The study included 1362 SARS-CoV-2 positive patients, from which 968 patients (71%) continued with treatment after release Outpatient treatment included 968 patients (71%), 42.4% of which have been vaccinated and 56.6% unvaccinated. Most of the patients were vaccinated with Sinopharm, 20.43% with double and 28.22% with triple dose. 394 (29%) patients were hospitalized, of which 77.4% were patients over 60 years of age with comorbidities. The most common comorbidity was diabetes mellitus (29.80%). 36.3% of total number of hospitalized patients were vaccinated and 63.7% were unvaccinated. The most represented vaccine was Sinopharm (34.26%). 15 hospitalized patients died (71.4% unvaccinated). In the group of patients older than 60 years, 50% of outpatients and 15% of hospitalized patients were vaccinated.

Conclusion: SARS-CoV-2 Omicron strain covered all age categories. Older unvaccinated patients with comorbidities were more likely to develop severe respiratory disease with the necessity of hospitalization and consequent outcome. Vaccination remains an important protective factor against severe respiratory distress syndrome and subsequent death.

Key words: COVID-19, Omicron, vaccines.

SEROCONVERSION AFTER POST-EXPOSURE PROPHYLAXIS AGAINST RABIES VIA REDUCED ESSEN PROTOCOL IN THE POPULATION OF THE REPUBLIC OF SERBIA

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Objective: To describe the serological status after post-exposition prophylaxis against rabies via reduced and complete Essen regime with Verorab® vaccine on the national level.

Methods: This retrospective observational study was conducted by using information from RFFIT database, from which patient demographic data, Rabies virus neutralizing antibody (RVNA) titer, immunization scheme, vaccine lot and HRIG administration were exported for further use. We included cases where the PEP (reduced or complete Essen regime) was implemented in the period 2017-2019.

Results: We found that patients who are not successfully immunized via reduced Essen regime are significantly older than persons who are successfully immunized. Moreover, no relationship between RVNA titer and vaccine potency/lot and HRIG administration was found. Additionally, patients who did not receive HRIG during PEP have significantly higher RVNA values compared to patients who received HRIG.

Conclusion: This real-world evidence data could be used for further improvement and rationalization of rabies prophylaxis in Serbia and other countries where human rabies prophylaxis is implemented.

Key words: rabies; Essen; PEP; Serbia, RVNA, RFFIT

EPIDEMIOLOGICAL CHARACTERISTICS OF LEPTOSPIROSIS IN MONTENEGRO FOR THE PERIOD FROM 2011-2022

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Leptospirosis is an acute septicemic infectious disease of humans and animals. According to data from the European Center for the Control and Prevention of Infectious Diseases for 2020, 21 countries reported 565 confirmed cases of leptospirosis.

Objective: To present the epidemiological characteristics of leptospirosis in the territory of Montenegro for the period 2011–2022. years.

Method: A descriptive study was used for the preparation. Data from the Center for Control and Prevention of Infectious Diseases of the Institute for Public Health of Montenegro were used.

Results: In the observed period, 19 cases of leptospirosis were registered, and 242 people became ill with zoonosis. The percentage of leptospirosis patients among zoonosis patients ranged from 2.7% to 29.4%. 84% of registered cases were male. The largest number of cases was registered in Podgorica 14 (74%). The incidence in the observed period ranged from 0.16/100,000 inhabitants to 0.8/100,000 inhabitants, while the average incidence rate is 3.2/100,000 inhabitants. 94.4% of the patients were adults. The largest number of cases (10 cases) was registered during the summer months. During the observed period, there were no registered deaths.

Conclusion: It is necessary to work on education, early detection of the disease through timely scheduled medical examinations of workers with increased risk and treatment of recognized cases. Treatment and/or vaccination of carrier animals (eg, dogs) and rodent control can help reduce the risk of contracting leptospirosis in humans.

Key words: leptospirosis; incidence; Montenegro.

FACTORS ASSOCIATED WITH NEGATIVE TREATMENT OUTCOMES OF CHILD AND ADOLESCENT TUBERCULOSIS IN SERBIA (2005-2016)

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Objective: The aim of the study was to analyze trends and to identify predictors of negative treatment outcomes of child and adolescent tuberculosis (TB) in Serbia in the period 2005-2016.

Methods: Retrospective analysis of 596 child and adolescent TB cases registered over the twelwe years period in all health facilities in Serbia was performed as well as univariate and multivariable logistic regression analysis to identify independent factors associated with tuberculosis treatment outcomes.

Results: From 2005 to 2016 the TB notification rate for all forms of child and adolescent TB slightly increased from 3.6 per 100,000 population in 2005 to 4.38 per 100,000 in 2016 (p value for trend>0.05). The treatment success rate was stable at the level of the global target. Factors independently associated with negative treatment outcomes were age below 5 years (OR=2.70; 95% CI: 2.33–3.12), and social vulnerability (OR=2.50; 95% CI: 2.17–2.94).

Conclusion: In order to further improve TB control in Serbia, it is necessary to sustain TB vaccination coverage and implement multidisciplinary approch to adress social vulnerability.

Key words: Tuberculosis; Serbia; children; adolescents; negative treatment outcomes

TUBERCULOSIS AS A PUBLIC HEALTH PROBLEM IN THE REPUBLIC OF NORTH MACEDONIA

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Objectives: The aim of the paper is to present the incidence and prevalence of active tuberculosis patients in the Republic of North Macedonia (RSM) for the period from 2010 to 2021.

Materials and methods: Data from the Centers and the Institute of Public Health in RSM were used for the material. Data on incidence and prevalence according to certain demographic characteristics, sex, age and regional division were used.

Results: In 2013, the prevalence of active tuberculosis was registered in the Republic of North Macedonia of 20.8 per 100,000 inhabitants or 428 cases. In 2019, the prevalence of active tuberculosis was registered in the Republic of North Macedonia of 10.4 per 100,000 inhabitants or 215 registered cases. In 2021, an incidence of active tuberculosis of 7.05 per 100 thousand inhabitants or 129 newly infected persons was registered. In the analyzed period 2010-2021, the incidence rate, as well as the prevalence rate, shows a decreasing trend.

Conclusion: The Republic of North Macedonia is counted among the countries with a low incidence rate among the countries in the European region.

Key words: tuberculosis, public health problem, Republic of North Macedonia

MPOX IN SERBIA – WHAT DO WE KNOW NOW?

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Objectives: Mpox, a disease caused by the monkeypox virus was declared as a Public Health Emergency of International Concern in 2022, primarily affecting men who have sex with men (MSM). In May 2022, a surveillance system was established in Serbia, to detect outbreaks and implement preventive measures.

Methods: The surveillance data of Mpox cases was analyzed. All cases met the World Health Organization case definition and were confirmed by real-time polymerase chain reaction. Clinical data were collected using a standardized case report form. We described the epidemiologic, sociodemographic, and clinical characteristics of cases.

Results: During June - October 2022, a total of 43 Mpox male cases were identified, with a mean age of 34.4 years (SD 7.4). A total of 72% total self-reported as MSM, and 35% diagnosed with human immunodeficiency viral (HIV) infection. Among HIV-positive cases, 80% reported risky sexual behavior (p=0.03) and had higher education level compared to HIV-negatives (p=0.01). Fever was present in 86% of the cases. The anogenital area was the most affected by a rash (62.5%).

Conclusion: Mpox outbreak in Serbia during 2022 was mainly identified in MSM, frequently among HIV-positives. The high proportion of anogenital lesions suggests probable transmission mode and promote awareness of risk groups.

Key words: Mpox, sexually transmitted disease, MSM, outbreak

LATE PRESENTERS IN NEWLY DIAGNOSED HIV INFECTIONS IN SERBIA 2012-2021

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Objectives: We aimed to describe the newly diagnosed HIV infections reported in 2012-2021 focusing on late presenters among them.

Materials and methods: We used data from the exhaustive case-based surveillance system for HIV/AIDS cases. A late presenter is a person with laboratory confirmed HIV infection with <350 CD4+ T-lymphocyte/mm3 at the time of diagnosis excluding acute HIV infection, while asymptomatic case was a laboratory confirmed HIV infection without any symptom/sign.

Results: In 2012-2021, 1640 confirmed HIV infections were reported in Serbia with increasing trend ($p<0.05$). Late presenters accounted for 58% (732/1274) of cases with reported initial CD4+ T cell count including 39% (498/1274) with advanced HIV infection (CD4+<200mm3). The median annual proportion of late presenters was 58%. Among asymptomatic cases with reported initial CD4+ cell count, 37% (245/662) were late presenters.

Conclusion: A large proportion of late presenters among newly diagnosed HIV infections were notified in Serbia in 2012-2021 resulting in later start of antiretroviral treatment. We recommend exploring late diagnosis' reasons through qualitative and mix-method studies.

Key words: HIV, Serbia, late presenters, asymptomatic cases

INCIDENCE OF SYPHILIS ON THE TERRITORY OF NOVI SAD, SERBIA, IN THE PERIOD FROM 2020 TO 2022

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Objectives: Syphilis is caused by spirochete *Treponema pallidum* subspecies *pallidum*, which can be transmitted via sexual exposure or vertical transmission during pregnancy. Recent epidemiological reviews report increases in syphilis incidence worldwide. This study was conducted to provide data on the incidence of syphilis in the city of Novi Sad, Serbia.

Materials and methods: The survey covered the results of testing conducted at the Institute of Public Health of Vojvodina in the period from 2020 to 2022. Patients were tested for syphilis using specific and nonspecific treponemal serologic tests.

Results: In 2020, among 3118 tested patients 98 were syphilis-positive, of which 77.6% were males. In 2021, among 3247 tested patients 162 were positive, also mostly men (81.5%). In 2022, among 4011 tested patients 260 were positive, of which 87.3% were males. Among the syphilis-positive male patients, the majority were in the 30-50 age group, while a smaller but still significant number were in the 20-30 age group.

Conclusion: From 2020 to 2022, the number of tested and syphilis-positive patients showed a trend of growth. Screening, surveillance and prompt treatment, along with public health measures, are crucial to prevent disease occurrence and transmission.

Key words: syphilis, testing, incidence, Novi Sad

OUTBREAKS OF INFECTIOUS DISEASES IN THE POPULATION OF BELGRADE, 2012-2022

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Objectives: To analyze the epidemiological characteristics of the outbreaks of infectious diseases in the population of Belgrade in the period 2012-2022.

Materials and methods: A descriptive epidemiological study was applied in this paper.Data from epidemiological questionnaires and information from the Center for Disease Control and Prevention of the Institute of Public Health Belgrade was used for the analysis of outbreaks.

Results: In the period 2012-2022. 1,208 outbreaks of infectious diseases were registered among the population of Belgrade in which a total of 27,706 patients.915 outhospital outbreaks (24,419 patients) and 293 intrahospital outbreaks (3,287 patients) were registered.The largest number of outbreaks was recorded in 2022-339, while the largest number of patients was registered in 2016-8445.In relation to the total number of outbreaks, the participation the outbreaks of respiratory infectious diseases is the largest and amounts to 62.7%, the share of outbreaks of intestinal infectious diseases is 32.0%, parasitic infectious diseases-3.1%.From the group of respiratory infectious diseases, the largest number of outbreaks were caused by COVID-19-68.2% and scarlet fever and streptococcal infections-14.8%. From the group of intestinal infectious diseases, the most frequent outbreaks were salmonellosis-121 (31.3%) and diarrhea and gastroenteritis-63 (16.3%).The largest number of outbreaks was registered in the municipalities of Savski venac (271).Most outbreaks were registered in December-172 (14.2%).

Conclusion: Outbreaks of infectious diseases in Belgrade continue to represent a serious public health problem.It is necessary to strengthen activities on the prevention of outbreaks, especially in health institutions, preschools and institutions of social health care.

Key words: outbreaks, infectious diseases, Belgrade

REVIEW OF THE FOOD POISONING EPIDEMIC SALMONELLOSIS

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Introduction: *Salmonella spp.* are a major cause of food-borne outbreaks, and poultry products are regularly implicated in *S. Enteritidis* outbreaks. *Salmonella* contamination is mostly associated with produce such as poultry, cattle and their feeds but other products such as dried foods, infant formula, fruit and vegetable products and pets have become important.

The aim: of our paper was to show an outbreak of food poisoning in a restaurant in the city of Niš.

Method: We received notifications of an increased number of patients with symptoms of gastroenteritis after eating in a restaurant in the city of Niš. Epidemiological investigation and survey of patients and restaurant employees was conducted. We used menu-based questionnaire and surveyed patients by phone. Suspicious foods were sampled and swabs taken from work surfaces. We established that in the period from February 15, 2023 to March 6, 2023, 1,551 people were exposed. There were 19 cases associated with this 2023 outbreak. Onset dates ranged from 15 February to 6 March 2023. Symptoms included vomiting, diarrhoea, fever and abdominal pain. Six cases were hospitalized (6/19 with information available). The age of cases ranged from 2 up to 49 years and 11 were male. Eight cases were from age group 20-29 years, about 50%. A confirmed case was defined as a person with laboratory-confirmed S. Enteritidis infection. The majority of cases were resident within the same region as the restaurant. Food exposure data from the menu-based questionnaire was available for all 19 cases. It was isolated from the feces of patients with Salmonella Enteritidis, as well as from the dressing food. The isolation was performed by the reference laboratory at the Institute for Public Health of Serbia „Dr. Milan Jovanović Batut“. Five Salmonella carriers were discovered among the staff. The restaurant staff was healthy. After control measures were taken, the outbreak was stopped and declared on March 6, 2023.

Conclusion: Thermal processing of risky foods, adequate storage and exceptional hygiene and rigorous health control of employees working in restaurants are necessary.

Key words: salmonella, outbreak, food-poisoning, restaurant

WEST NILE VIRUS INFECTION IN POPULATION OF NIŠAVA DISTRICT 2012 – 2021

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Objective: The study analyzes the epidemiological features of West Nile virus (WNV) infection in population of Nišava district for period 2012-2021.

Method: The descriptive study was applied. Annual reports on the movement of infectious diseases in the Republic of Serbia in the period from 2012 to 2021 were used as a source of data. In analyzing data, the crude and age-specific and standardized incidence rates were used.

Result: In the observed period, a total of 139 people infected were with WNV and only 5 were reported with FWNV. In the observed period, 5 people died from FWNV in 2012 and 2013. Out of the total number of patients in 2012, 2 patients died and the mortality rate was 1/100,000, while in 2013, out of 4 patients, 3 died and the mortality rate was 1.15/100,000. The patients were male and over 60 years old. In 50% of patients, the presence of co-morbidities was registered. In 2020 and 2021, the lowest number of patients was reported. In the year 2020 there was none and only 1 from imported malaria in 2021.

Conclusion: WNV infection in Nišava district can have serious consequences for public health. There is a possibility of underrreporting because the milder forms of the disease are not laboratory research and may remain unrecognized. Prevention of WNV infection requires a multidisciplinary approach, continuous engagement and cooperation of veterinary and health services.

Key words: West Nile virus infection, incidence rate, case fatality rate, Nišava district

HPV IMMUNIZATION IN THE NIŠAVA AND TOPLICA DISTRICT: RESULTS OF THE FIRST ORGANIZATION IMMUNIZATION

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Introduction: Vaccines against HPV infection have been available since 2006 and recommended by World Health Organization since 2009. The organized vaccination against HPV infection has been conducted among children, adolescents, and young adults for the first time in June 2022, in Serbia. The 9vHPV (Gardasil 9) vaccination in Serbia is recommended for children aged nine and up to 19 years of age and primarily for children in the seventh grade of primary school (13 years of age).

The aim of the paper was to show the number of vaccinated children with HPV vaccination in the Nišava and Toplica Districs.

Material and Methods: Descriptive study was done. Data sources were weekly reports from health institutions and data base of the Center for disease prevention and control. The observed period was from 6 Jun, 2022, up to 8 September 2023. Data were presented as the mean and standard deviation (SD) or as frequencies and proportions.

Results: 3663 doses of HPV vaccine were delivered to the children from 9 to 19 years of age in the observed period. The total number of children aged 9–14 years who were vaccinated with the first dose was 949 (760 girls and 189 boys). There were four times more girls than boys who received the first dose of HPV vaccine in this age group. 504 children aged 9–14 years received the second dose of the vaccine. In the age group 15–19, there were 956 children (800 girls and 156 boys) who received the first dose of the vaccine, 795 received the second and 459 received the third dose. There were five times more girls than boys who received the first dose in this age group. The vaccination of boys aged 15 years and over was significantly lower compared with boys from 9 to 14 years of age. There were no reported side effects of the HPV vaccination to the Expert team at the Center for disease control and prevention.

Conclusion: We presented the results of the first organized vaccination of children and adolescents against HPV infection in the Nišava and Toplica Districts. There were significantly more vaccinated girls, than boys. The vaccination of boys aged 15 years and over was significantly lower compared with boys from the age group 9-14 years of age. In order to preserve and improve the health of the whole population as well as of groups of individuals at higher risk, the promotion of HPV vaccination, health education measures, the promotion of healthy sexual behavior, and the support of the government are also important.

Key words: HPV immunization, age, HPV vaccine

FREQUENCY OF ONCOGENIC TYPES OF HPV INFECTION AMONG FEMALE STUDENTS OF BELGRADE UNIVERSITY IN A PERIOD OF 10 MONTHS

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Objectives: The purpose of this study is to show the frequency of Human Papilloma Virus (HPV) infection in female students of Belgrade University, aged 19 to 26 years. HPV infection is one of the most common sexually transmitted infections (STIs) in the world and has a negative impact on the health of every affected person, as well as on their social life (1). HPV belongs to the *Papillomaviridae* family,DNA viruses, which are classified into two categories: low-risk LR-HPV, which are the cause of anogenital and skin warts and high-risk HR-HPV which in addition to oropharyngeal cancer, lead to cancers of the cervix, anal region, vulva, vagina and penis. The prevalence of HPV infection is higher in Latin America and Sub-Saharan Africa and lower in Asia and Europe (2).

Methods: Data obtained from medical records in the last 10 months was classified by genotyping positivity and then statistically processed. Cervical swabs for HPV detection and genotyping were performed by PCR method in female students during preventive gynecological examination in the period from 01.09.2022. until 30.06.2023. This method was used to detect the following 14 high-risk human papillomaviruses: 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66 and 68.

Results: Using analytical methods, it was shown that out of a total of 767 tested, 211 female students received a positive result, which makes the incidence rate 0.316. It is believed that 32 out of 100 female students is infected with an oncogenic type of HPV during a period of 10 months

Conclusion: According to the data of the Republic Institute of Statistics in the school year 2022/23. 248,508 students were enrolled in all higher education institutions and at all levels of study in the Republic of Serbia. Out of the total number of students enrolled, 145,666 (58.6%) students are female (3). In an earlier survey of female students, 70% declared that they were sexually active, which means that exposure to STI is present in 101,966 female students. Evaluation of HPV infections shows that most infections are transient and that the incidence of cervical malignancies is higher in women with persistent HPV infection (4). Certainly, the detection of highly oncogenic HPV types and the monitoring of infection indicate an increased risk for the earlier mentioned cancers and are of great importance for public health. Understanding HPV-induced cancers can motivate the community and improve the HPV vaccination and cervical cancer screening program (5).

Key words: Students, HPV

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SESSION: THEORETICAL AND PRACTICAL PROBLEMS OF NON-COMMUNICABLE DISEASES

ORAL PRESENTATION:

MALIGNANT TUMORS MORTALITY IN SERBIA AND EUROPE

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Objectives: Comparative analysis of cancer mortality in Serbia and Europe.

Materials and methods: In analysis of cancer mortality rates were used data from the Cancer Registry in Serbia, and available data for 46 countries of 53 members of the European region for 2020. The comparison shows mortality rates standardized by the method of direct standardization to the population of the world calculated per 100.000 inhabitants.

Results: After heart disease, malignant tumors are the second leading cause of death in the Old Continent. In Serbia 20.767 people died of malignant tumors in 2020. The highest standardized mortality rates from malignant tumors, compared to the average rate in the Serbia, were recorded in North Banat and Middle Banat, and the lowest in Toplica and Moravica region. The standardized cancer mortality rate in Serbia (155.5) was higher than the same average mortality rate in Europe (139.2), which placed our citizens in the group of European residents with an average mortality rate from all cancer localizations.

Conclusion: During the last two decades, mortality rates from cancer in Serbia have increased by a third. Estimates say that by 2040 the number of cancer deaths in our country and in Europe increased by approximately one third.

Key words: malignant tumors, mortality, Serbia, Europe

IMPORTANCE OF DETECTION OF SENTINEL LYMPH NODE IN PATIENTS WITH BREAST CANCER AND MELANOMA

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Objectives: This study was to assess the role of sentinel lymph node (SLN) biopsy following labeling by 99m technetium human serum albumin colloids (^{99m}Tc-HSA) in patients with breast cancer and melanoma without clinical evidence of nodal involvement.

Materials and methods:This study included 135 patients with breast cancer and cutaneous melanoma in the period between 2022 and 2023. A total of 0.3 ml (50-74 MBq) of 99mTc-HSA was injected intradermally or subareolarly. Dynamic lymphoscintigraphy was performed followed by early and late static scintigraphy. During the surgery, a gamma probe was used to localize SLN. All SLNs were pathohistological examined.

Results: Analysis included women with breast cancer (54) and melanoma (27) (mean age 57±15), as well as 44 men (mean age 61±12) with melanoma. The distribution of SLN was unilateral in 113 (84%), bilateral in 10 (7%), and 12 (9%) patients had SLN in different basins. Overall 197 SLNs are removed and analysed. Metastatic disease was detected in eighteen lymph nodes (9%), with a range of 1 to 4 nodes involved. The success rate of SLN identification was 100%.

Conclusion: It can be concluded that sentinel node biopsy is a highly accurate method for staging and treatment of breast cancer, and melanoma patients.

Key words: sentinel lymph node, breast cancer, melanoma, 99m technetium human serum albumin colloids

POSTER PRESENTATION:

HEALTH STATUS OF WOMEN IN THE REPUBLIC OF SERBIA IN THE PERIOD 2001-2020. YEAR - A BRIEF OVERVIEW OF THE MOST COMMON CAUSES OF ILLNESS, DEATH, AND SCREENING COVERAGE

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Objectives: Chronic non-communicable diseases are the leading cause of morbidity and mortality among women. Preventive examinations, screening, and systematic examinations enable the reduction of the frequency of risk factors for the occurrence as well as early detection of the disease. The study aims to gain insight into the most common causes of illness and death among women in the Republic of Serbia and to cover them in screening examinations.

Material and methods: Part of the results of the twenty-year monitoring (2001-2020) of women's health status, which included four population health surveys conducted in 2000, 2006, 2013, and 2019, is presented. Standard descriptive and analytical statistical methods were used.

Results: The five most common groups of diseases registered in women's health care services are: diseases of the genitourinary system, factors affecting the state of health and contact with the health service, pregnancy, childbirth and puerperium, infectious and parasitic diseases and tumors. Diseases of the circulatory system and tumors are the most common causes of death in women, with participation between 70% and 80%. When it comes to screening for malignant diseases, there is a significant increase in the coverage of women aged 25-69 with a Pap test from 2006 (38.5%) through 2013 (57.1%) to 2019 (64%). There is also noticeable progress in the percentage of women aged 50-69 who have had a mammogram, from 2006 (10%), in 2013 (30.6%), and in 2019 (42.5%).

Conclusion: Preventive, systematic and screening examinations are important for the prevention and early detection of women's diseases. Further research and targeted interventions are needed to reduce morbidity and mortality among women.

Key words: health status, risk factors, chronic non-communicable diseases, preventive examinations, screening

EPIDEMIOLOGICAL CHARACTERISTICS OF THE MALIGNANT NEOPLASMS IN THE SUMADIJA DISTRICT (1999-2020)

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Objectives: To analyze morbidity and mortality from malignant tumors in the population of Šumadija district for the period 1999-2020.

Methods: The study was designed as a descriptive epidemiological study. The Register of Cancer in Central Serbia 1999-2015.) and Register of Cancer in Republic of Serbia (2016-2020) was used as a source of information about patients and deaths.

Results: In the area of Šumadija district in the period from 1999 to 2020, the total number of new cases of all malignant tumors (ICD C00-C97) was 37 059 and 16 342 died. The leading localizations in the incidence of malignant tumors in men are lung and bronchus cancer (18.2%), colon and rectal cancer (12.7%), prostate cancer (10.2%), and in women breast cancer (22.4%), colon and rectum cancer (8.3%), lung and bronchus cancer (7.6%), cervix cancer (7.0%). Men most often died from lung and bronchus cancer (30.1%), colon and rectum cancer (12.3%) and prostate cancer (8.4%), while women died from breast cancer (17.9%), lung and bronchus cancer (17.2%) and colon and rectum cancer (10.7%).

Conclusion: Prevention and early detection of cancer should be a priority of the national health policy of each country.

Key words: Sumadija district, morbidity, mortality, malignant tumors

INCIDENCE AND MORTALITY OF BREAST CANCER IN THE REGION OF SUMADIJA AND WESTERN SERBIA

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Objectives: Breast cancer is the most common malignancy in women around the world. Information on the incidence and mortality of breast cancer is essential for planning health measures.

The Aim: To analyze trends in the incidence and mortality of breast cancer in the region Sumadija and Western Serbia during the period from 2016 to 2020.

Material and Methods: The study was designed as a descriptive epidemiological study. The Register of Cancer in Republic of Serbia was used as a source of information about patients and deaths. Linear trend and regression analysis were used to analyze the trend of incidence and mortality.

Results: The average standardized incidence rate of breast cancer for the observed period was 113.16/100 000 females. The observed period showed an increasing trend of standardized incidence rate ($y=0.5714x+111.16$; $R^2=0.0935$). The average standardized mortality rate of breast cancer was 41.15/100 000 females. The observed period showed an increasing trend of standardized mortality rate ($y=0.07x+39/81$; $R^2=0.008$).

Conclusion: Targeted interventions, including primary prevention, supplemented with early detection, are needed to reduce the number of patients with breast cancer in future decades.

Key words: breast cancer, incidence, mortality, Sumadija and Western Serbia

INCIDENCE AND MORTALITY OF CERVICAL CANCER IN THE REGION OF SUMADIJA AND WESTERN SERBIA

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Introduction: Cervical cancer is the fourth most common cancer among women globally. The burden faced by low-income and middle-income countries is significantly greater than high-income countries.

The Aim: To analyze trends in the incidence and mortality of cervical cancer in the region Sumadija and Western Serbia during the period from 2016 to 2020.

Material and Methods: The study was designed as a descriptive epidemiological study. The Register of Cancer in Republic of Serbia was used as a source of information about patients and deaths. Linear trend and regression analysis were used to analyze the trend of incidence and mortality.

Results: The average standardized incidence rate of cervical cancer for the observed period was 27.5/100 000 females. The observed period showed a decreasing trend of standardized incidence rate ($y=-0.5429x+29.4$; $R^2=0.4312$). The average standardized mortality rate of cervical cancer was 10.34/100 000 females. The observed period showed a decreasing trend of standardized mortality rate ($y=-0.1086x+10.72$; $R^2=0.0476$).

Conclusion: Reducing the incidence and mortality from cervical cancer can be contributed to by education and the expansion of screening.

Key words: Cervical cancer, incidence, mortality, Sumadija and Western Serbia

KNOWLEDGE ABOUT CERVICAL CANCER AND AWARENESS OF HUMAN PAPILLOMA VIRUS INFECTION AND THE HPV VACCINE AMONG FEMALE STUDENTS

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Introduction: The persistent infection with carcinogenic *Human Papilloma Virus* (*HPV*) is the leading cause of cervical cancer.

Objectives: The study explored students' knowledge about cervical cancer and awareness of *Human Papilloma Virus* and HPV vaccine.

Material and Methods: The questionnaire-based survey was done among 1616 first-year female college students at the University of Niš. It examined socio-demographic characteristics, measured score of knowledge about cervical cancer, assessed awareness regarding HPV infection and HPV vaccine and inquired about source of information about cervical cancer and HPV.

Results: The average cervical cancer knowledge score was 16.35±7.92 (Min 0, Max 30) with medical professions education, parent's education level, place of residence and relationship status having significant effect on the score. The awareness about HPV and HPV vaccine was low with only 14.2% of students having heard about both HPV and its vaccine. The most commonly reported sources of information were the media, while the most competent one was organized health education.

Conclusion: The health promotion campaigns and educational programs are necessary in order to reduce cervical cancer burden and should be directed particularly towards those who have demonstrated low cervical cancer knowledge and low awareness regarding HPV and its vaccine.

Key words: cervical cancer, HPV, HPV vaccine, knowledge, awareness

OVARIAN CANCER INCIDENCE IN SERBIA

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Objectives: Analysis of ovarian cancer incidence in Serbia.

Materials and methods: In analysis of cancer incidence rates were used data from the Cancer Registry in Serbia, and available data of members of the European region for 2020. The comparison shows incidence rates standardized by the method of direct standardization to the population of the world calculated per 100.000 inhabitants.

Results: Ovarian cancer is the sixth most frequent cancer in Serbia and with 750 new cases in 2020, it accounted for 3.9% of all cancer cases in women. With standardized incidence rates of 19.9 in 2020, Serbia was in the group of European countries with the highest rates of ovarian cancer. The highest standardized mortality rates of ovarian cancer, were recorded in North Backa and Sumadija, and the lowest in Pcinja and Zajecar region. The standardized ovarian cancer incidence rate in Serbia was higher than the same average mortality rate in Europe (8.8), which placed our females in the group of European women with the highest incidence rate from ovarian cancer.

Conclusion: During the last decade, incidence rates from ovarian cancer in Serbia have increased. Estimates say that by 2040 the number of cancer deaths in our country and in Europe increased by approximately for 14%.

Key words: ovarian cancer, incidence, Serbia

SMOKING AND PASSIVE SMOKING AS RISK FACTORS FOR DEVELOPMENT LUNG CANCER

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Aim: The objective of this study was to analyze the role of active and passive smoking in lung cancer (LC) risk of patients with this disease.

Methods: The research was conducted as a case-control study.A total of 139 participants with LC and the same number of frequency-matched controls were included. Risk analyses were done using unconditional logistic regression which provides results in the form of crude odds ratio. The odds ratios and their 95% confidence intervals (CI) were computed.

Results: From the analysed data we found that current smokers have 7,58 (95% CI, 3,41-16,85) while ex-smokers have 3,18 (95%CI, 1,27-7,98) times greater risk to become ill, compared to never smokers. Persons exposed to passive smoking have 19,00 (95%CI, 1,2-314,9) times greater risk for LC, compared to non-exposed.

Conclusion: Our results support the statements that cigarette smoking is by far the most important cause of the on-going epidemic of LC in Macedonia, and that passive smoking may increase that risk. Concerted control of smoking appears to be an urgent priority in LC prevention, including efforts to prevent adolescents from starting to smoke, and encouraging cessation among established smokers.

Key words: lung cancer, risk factors, smoking, passive smoking.

BEHAVIORAL AND METABOLIC RISK FACTORS IN PATIENTS WITH DIAGNOSED ACUTE CORONARY SYNDROME IN MONTENEGRO

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Objectives: The purpose of the study was to assess the presence behavioral and metabolic risk factors in patients with diagnosed acute coronary syndrome (ACS) in Montenegro from 2013 to 2023.

Materials and methods: The presence behavioral and metabolic risk factors was analyzed in patients with ACS treated in general hospitals during 10 years. The sample of the observed period included 7853 (4918 males and 2935 females) registered patients in the Registry. The age of the patients was between 15 and 103 years.

Results: The study has shown a 73.48% prevalence of hypertension among ACS patients. Prevalence of diabetes mellitus was 29.85%, while 71.39% patients was physically inactive. The prevalence of overweight and obesity was 80.04%. Tobacco smoking was identified among 32.86 % patients. Hypercholesterolemia was present in 40.91% of patients, while hypertriglyceridemia was present in 28.87% of patients.

Conclusion: The high presence risk factors in study group strongly indicate the necessity of promoting healthy lifestyles and more connected social implementation of prevention programs to reduce ACS.

Key words: acute coronary syndrome, risk factors, registry, prevention

QUALITY OF LIFE IN SUBJECTS SUFFERING FROM CHRONIC POST-TRAUMATIC STRESS DISORDER

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Objectives: Armed conflicts across the territory of Balkan have led to a large number of people becoming afflicted with PTSD. A third of those with PTSD develop a chronic and life changing form of PTSD or one that is complex, which even now affects their day-to-day functioning. Life quality is a wide concept, which encompasses physical health, mental state, the level of independence and social relationships.

Methods: Using the Quality-of-Life Questionnaire, published by the World Health Organization (WHOQoL) and a socio-demographic questionnaire we aimed to estimate the changes in life quality in people with chronic PTSD (n=30) and those in remission (n=30).

Results: Out of all studied realms of life quality we found poorer quality of life only in the realm of physical health in subjects with chronic PTSD. Other realms of everyday functioning showed no differences between subjects. A declining physical health in chronic PTSD sufferers and a disturbed quality of life could be associated with different etiology and with altered interoceptive processing.

Conclusions: The results of the present study indicate that better medical and psychiatric care should be provided to people suffering from PTSD to prevent the development of somatic decline.

THE INFLUENCE OF PSYCHOSOCIAL WORKING CONDITIONS ON THE HEALTH AND WELL-BEING OF PRIMARY SCHOOL TEACHERS

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Objectives: The objective of this study is to determine the relationship between health and well-being in the group of the teachers working at primary schools.

Methods: The study is carried out using survey method. The population of the study consists of 325 teachers working at public primary schools in the city of Niš. The data used in the study were COPSOQ II and SPANE. Hierarchical regression analyses were used to investigate how the organization and occupation aspects of working conditions relevant to outcomes.

Results: Showed that the most common diseases in the study population are diseases of the musculoskeletal system, hypertension and allergic diseases. Self-rated good health positively correlated with self-efficacy and negatively with burnout and somatic stress. The work influence, possibilities for development, commitment, awards, role-clarity,the quality of leadership,a sense of coherence, job satisfaction, mutual trust and social support, justice and equity, health and self-efficacy positively predicted the affect balance which refers to psychological well-being. The quantitative demands, job insecurity, stress and depressive symptoms were negative predictors of the same outcomes.

Conclusion: Teacher stress and burnout require increasing attention given their impact on a wide range of important outcomes in relation to the position of the teacher in the context of Serbia.

Key words: teacher stress, well-being, COPSOQ

WORK ABILITY AFTER THE OCCUPATIONAL INJURIES

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Objectives: The objective of this study is to present the results of assessment of work ability of workers after the occupational injuries.

Methods: The occupational injury followed by absence from work has been estimated and formed the basis of the analyses.

Results: Male workers have a slightly higher injury rate, the number of days away from the work and permanent work disability. Leading causes of temporary work inability include being compressed by mechanical objects and struck by flying or falling objects. These injuries resulted in an average of 89.8±14.9 lost work days per injured workers. The fractures, sprains, ruptures of organs, and lacerations were resulted in 140 or more lost work days each and in 74.7% permanent work disability. Workers 41 years and older had the most average lost work days (119.7±18.5) and permanent work disability (58.3%). Occupational injuries caused a permanent work disability at 39.4% of injured workers. The number of sick leave days raised by the age of injured workers.

Conclusion: The injury rates are highest among the youngest but the temporary and permanent work disability is highest among the oldest. When injuries do occur, older workers are usually more severely hurt and fatalities occur more frequently among older workers.

Key words: occupational injuries, work ability, sick leave

INJURIES IN AUTONOMOUS PROVINCE OF VOJVODINA: SITUATIONAL ANALYSIS OF THE PROBLEM

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Objectives: to determine magnitude of injuries of people who were hospitalized in health care institutions in the Autonomous province of Vojvodina (APV), define the type of injuries.

Materials and methods: Retrospective study, data was obtained from the Hospitalization report, i.e. from the hospitalization database of the Institute of Public Health of Serbia "Dr Milan Jovanović Batut". Data on gender, age, type of injury (type of injury coded with International Classification of Diseases X codes from the range S00-T98), number of days of hospitalization were analyzed. The observed period was 2022. year

Results: In year 2022, in health care institutions in AP Vojvodina due to injuries 7577 patients were hospitalized i.e. 4.5% of all hospitalized persons. Majority of hospitalized were males (54.5%). Average duration of hospitalization was 7.5 days. Almost half of hospitalized patient were aged 19-64 (46%), followed by those older than 65 year (38.4%) and younger than 19 year (15,7%). The most frequent injuries thar required hospitalizatuion in both gender were injuries of the hip and thigh (S70-S79) 24,4.Every fifth man were hospitalized due to injuries of the head and every third women due of injuries to the hip and thigh. In children younger than 19 years old the most frequent injuries were injuries of the head. Dominant injuries in the 19-64 age group were knee and lower leg injuries, and hip and thigh injuries were more common in those aged ≥65 years.

Conclusion: Knowing the epidemiological profile of hospitalized patient due to injuries allows us to monitor and control certain risk factors, and these data are important for programs of injury prevention.

Key words: epidemiology, injuries, hospital, type of injury

INFLUENCE OF THE BURNOUT SYNDROME ON THE QUALITY OF LIFE IN PROFESSIONAL PRIVATE SECURITY EMPLOYEES IN CENTRAL SERBIA

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Objectives: The quality of life of working staff can be affected by burn out. The objective of the study was to explore the influence of the burnout on the quality of life in professional private security employees in Central Serbia.

Materials and methods: A multicenter cross-sectional study was performed on a representative sample. A semi-structural epidemiological questionnaire with 20 questions has been specially designed for this study, the Maslach Burnout Inventory Human Services (MHSS) and generally questionnaire SF-36 questionnaires were used.

Results: The response rate was 80%, (353/439). Men represent 93.5% of all the respondents and they were significantly older than women: 44.09±11.44 vs. 36.91±7.92 (F=8.752; p=0.003),224 (64.3%) respondents were married, about one third did not have children (33.7%), and more than half of the respondents had completed high school (54.7%). There were 300 (78.00%) who were in the service, about 22.7% held managerial positions, 288 (81.6%) worked in shifts, and most of the respondents, as much as 277 (78.5%), worked from 8 to 12 hours a day. Male sex, marital union, two and more children and direct contact with clients were significantly associated with lower quality of life. The mean value of total quality of life (TQL) was 78.66±13.77. The mean value of composite scores was 79.98±17.57 for PHC and 77.33±13.14 for MHC score. A physical functioning (PF) was a domain with the highest average value (93.68), while the average score for vitality (VT) was 62.15 and for general health (GH) was 66.60. Widowed employees had statistically the lowest total quality of life score in our study.

Conclusion: Based on presented results about one third of employees had symptoms of total burnout. Male sex, marital union, two and more children and direct contact with clients were significantly associated with lower quality of life of the employees. The accelerated development of the professional private security sector in the Central Serbia requires additional research of burnout and the quality of life of this group of employees.

Key words: burnout, quality of life, private security employees

ANALYSIS OF DIABETES MORTALITY RATE AMONG OLDER ADULTS IN SERBIA AND SURROUNDING COUNTRIES

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Objectives: Analysis of the mortality rate (MR) from *Diabetes mellitus* (DM) in patients over 65 in Serbia and surrounding countries, examining regional variations.

Materials and methods: Data from the European Health Information Gateway website for 2010-2020 were used. Serbia's 2021 mortality was based on data from the Institute of Public Health of Serbia. The mortality rate are per 100,000 population.

Results: The DM mortality rate in Serbia is variable, trending upwards. The highest MR was recorded in 2017 (total: 204.74; DM type 2: 126.66), the lowest in 2014 (total: 151.9; DM type 2: 87.80). When compared to surrounding countries, significantly higher DM MR was observed in North Macedonia and Bosnia and Herzegovina, while it was the lowest in Romania during the study period. In 2021, the MR in Serbia was 184.15, with the MR of type 2 DM being about 2.5 times higher than that of type 1 (130.72 versus 53.43). Vojvodina had the highest type 1 DM mortality (71.50), while Šumadija and Western Serbia had the highest type 2 DM mortality (147.46).

Conclusion: Serbia ranks high in DM mortality among those over 65 in the region. Effective prevention of DM complications and MR reduction is needed, especially in Šumadija and Western Serbia.

Key words: Diabetes mellitus, Mortality rate, Older adults, Serbia

SESSION: APPLICATION OF INFORMATION AND COMMUNICATION TOOLS IN THE HEALTHCARE SYSTEM

INVITED LECTURE

KEY ASPECTS AND TRENDS IN INTERNET ADDICTION RESEARCH: NOVEL INSIGHTS FROM THE TEXT MINING OF PUBMED ABSTRACTS

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Objectives: Internet addiction (IA) is a behavioral addiction, characterized by problematic, excessive and compulsive internet use. The health-related aspects behind IA, such as causes, symptoms, neurobiological basis, environmental and genetic risk factors, are the active areas of research. Despite this growing body literature, text mining approaches focusing on accumulating knowledge are largely missing. This study was aimed as an initial step towards bridging this research gap through the evaluation of the word usage patterns in the related PubMed abstracts.

Methods: The IA-related abstracts were automatically retrieved from the PubMed databases by searching all publication records. A strict approach was undertaken by considering only abstracts, which include the term 'internet addiction' in their title in order to ensure utmost relevance. After this initial step and the pre-processing step, the resulting data was used for the visualization of abstract distribution according to the publication year, word cloud generation, automatic extraction of keywords from the analyzed data, generation of the word co-occurrence network and topic modelling. The data analysis was performed by using Orange datamining software v. 3.34.

Results: 1182 records were found in PubMed as result of the search query and downloaded for the detailed analysis. This corpus comprised all available abstracts up until the search date (4 September 2023). The distribution of the abstracts by publication year revealed a steady increase since 2007. In particular, this timeline highlighted a dramatic increase since 2020. The generated word cloud provided a visual comparison of the most common words. The obtained keywords represented the inferred characteristic words. The word co-occurrence network underlined the relationships between the most frequent words. The topic modelling results indicated the presence of two topics, which hints at two potential research directions within the IA field.

Conclusion: This work quantitatively analyzed the content of the current internet addiction literature available PubMed by applying text mining methods. Interestingly, the substantial increase in the number of publications since 2007 reflects the dynamics and rise of this research field. Notably, the observed drastic increase since 2020 coincides with the declaration of the COVID-19 outbreaks as a pandemic by WHO. The breakdown of the retrieved abstracts into constituent their words and the subsequent analysis uncovered textual patterns, such top words, keywords, word co-occurrences and potential topics, which collectively reflect the key aspects and trends. To the best of the author's knowledge, this is the first such study in this area. Overall, this work provided valuable insights and demonstrated the usability of text mining in this domain. More effort in this research direction is largely needed. It is expected to expand the current knowledge with complementary insights.

Keywords: Internet addiction, PubMed database, Automated abstract extraction, Text mining

INVITED LECTURE

META-ANALYSIS AND META-RESEARCH: TWO SIDES OF THE SAME MEDAL

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Abstract: The advancements in modern science have greatly enhanced our capacity to explore the biological foundations of health and disease, while the development of information and communication technologies has brought about enduring transformations in the way we share and access scientific knowledge. However, with new opportunities for knowledge improvement and the development of innovations, new obstacles appear in preserving the scientific integrity and validity of scientific research. Science, like other human pursuits, is susceptible to bias. It is well acknowledged that biased influences, a lack of methodological knowledge and statistical proficiency in research methods affect the generalization of scientific results. Meta-analyses, which seek to bring together all available data relating to a certain topic, have therefore gained considerable popularity. However, they encounter inherent challenges and biases. Inadequate research methodologies exacerbate the situation. Nevertheless, the field of science possesses the capability to evaluate its methodologies, reporting practices, reproducibility of experiments, assessment processes, and the incentives that drive scientific research. The field of meta-research, a relatively recent scientific discipline, encompasses a variety of theoretical, observational, and experimental investigations aimed at examining the nature of research and its methodologies. The objective is to comprehend and enhance how we execute, convey, authenticate, assess, and acknowledge research. It employs an interdisciplinary approach to examine, advocate for, and safeguard a sound and appropriate manner of conducting science while preserving the imperative of ensuring that the anticipated modifications in scientific research practices are grounded in empirical data.

Keywords: meta-analysis, meta-research, systematic review, data extraction, screening

META-ANALYSIS AND META-RESEARCH: TWO SIDES OF THE SAME MEDAL

The advancements in modern science have greatly enhanced our capacity to explore the biological foundations of health and diseases, while the development of information and communication technologies has brought about enduring transformations in the way we share and access scientific knowledge. The utilization of scientific literature as a research fundamental component has transitioned from traditional library and print journals to online bibliographic databases and electronic access to scientific publications, e-books, and other related resources. Various innovative approaches have been developed aiming to enhance and foster the openness and reproducibility of scientific research findings. These include the use of open databases, the provision of guidelines for scientific reporting, the utilization of appropriate statistical analysis, and the establishment of pre-registration repositories.

Improving the efficiency of scientific research and bringing more credible and applicable research results can be one of the key drivers for advancing human development. However, with new opportunities for knowledge improvement and the development of innovations, new obstacles appear in preserving the scientific integrity and validity of scientific research. Science, similar to other human pursuits, is susceptible to bias. Alongside the creation of new scientific fields, old biases continue to persist, while novel ones continually arise, hence introducing distinct norms and challenges. Nevertheless, the field of science possesses the capability to evaluate its methodologies, reporting practices, reproducibility of experiments, assessment processes, and the incentives that drive scientific research. The field of meta-research, a relatively recent subject encompasses a variety of theoretical, observational, and experimental investigations aimed at examining the nature of research and its methodologies. The objective is to comprehend and enhance how we execute, convey, authenticate, assess, and acknowledge research. Meta-research employs an interdisciplinary approach to examine, advocate for, and safeguard a sound and appropriate manner of conducting science. It's imperative to ensure that the anticipated modifications in scientific research practices are grounded on empirical data, given the likelihood of their substantial impact.

Science continues to play a pivotal role in advancing human civilization; nevertheless, there is a dearth of empirical information about optimal strategies for promoting excellence in scientific endeavors. The field of science and its associated literature may be characterized as a complex labyrinth of empirical observations, logical reasoning, subjective inclinations, fallacious reasoning, and the most significant accomplishments of the human intellect. However, it is well acknowledged that biased influences, lack of methodological knowledge and statistical proficiency in research methods affect the generalization of scientific results. To determine the best approach, science needs science. About 4,000,000 new papers are added to Google Scholar every year, bringing the total number of pages it indexes to almost 180,000,000. Millions of individuals actively participate as co-authors in the production of scholarly articles. An increasing number of individuals are engaging in research activities. Health record databases encompass a substantial number of consumers, reaching into the hundreds of millions. Social media databases provide the potential to utilize data about billions of active monthly users. But although the volume of research data being created is substantial, it is characterized by fragmentation and a lack of transparency. The practice of fully sharing data and preregistering techniques remains infrequent across the majority of academic disciplines. Finally, as the level of study complexity rises, a multitude of options become available for the design of studies and the data analysis. Hence, it is imperative to ensure the preservation of rigorous methodologies and standards of analysis to account for the wide range of potential outcomes.

Across scientific literature, it is shown that the use of questionable research procedures is present, to obtain more visually appealing outcomes. Since it often showcases the primary research findings, the visual representation in scientific papers holds significant importance, thus facilitating critical assessment by the reader. The visual representation of data serves not only to depict the presented facts but also to direct the reader to the methodology and statistical analysis employed in the study; the inadequately chosen data visualization may lead to reader confusion. Furthermore, empirical evidence has demonstrated that specific categories of charts utilized for the presentation of findings in the field of

biomedical research frequently provide outcomes that are contrary to the intended objective of providing clear and transparent visual representation. Several researchers have highlighted the presence of limitations in graphical approaches that are not tailored to certain types of data, like the use of bar graphs for representing continuous data.

After acknowledging the significance of ensuring satisfactory visual representation, the imperative should be to provide the accessibility of primary research material to the wider audience. However, it is worth noting that the data utilized in published academic research are frequently not accessible to the public. In addition, a significant proportion of studies that do provide access to their original data do not facilitate the replication of all the reported findings based only on the provided data. Insufficient availability of primary data and suboptimal utilization of visual aids in the presentation of research findings in published studies have a substantial impact on the transparency and reproducibility of research outcomes within the field of biomedical sciences. Efforts aimed at replicating research have revealed substantial rates of non-reproducibility, thus leading to a reproducibility crisis in science. Meta-analyses, which seek to bring together all available data relating to a certain topic, have gained considerable popularity. However, they encounter inherent challenges and biases. Inadequate research methodologies exacerbate the situation. A multitude of novel scientific disciplines continually arise, merge, divide, and undergo evolutionary transformations.

So, what are the most effective methods for scientists to engage in training, work, collaboration, and contribution within scientific and wider communities? The use of meta-research can facilitate the dissemination of effective research methodologies while also enabling the eradication of inefficient techniques. The effective adaptation of publication and peer review processes, scientific education, financing, and academic reward systems is imperative in response to the dynamic changes occurring worldwide. There is even speculation that researchers may become obsolete in the next decades, as they can be potentially replaced by artificial intelligence. Meta-research presents a promising opportunity to safeguard the integrity of scientific endeavors, cultivate public endorsement for research initiatives, and effectively counteract the rise of antiscience movements. The implementation of a real-time correcting mechanism might potentially expedite the scientific process, which often relies on self-correction and may be time-consuming. The genesis of novel initiatives frequently stems from errors, deficiencies, or challenges found throughout field-specific research endeavors. Engaging in interdisciplinary collaboration with academics from many fields and gaining insights into the practical obstacles encountered in a particular domain might prove to be a very fulfilling endeavor for a meta-researcher. To advance our objectives, it is imperative to cultivate a sense of scientific inquisitiveness, with an attitude of intellectual modesty and a steadfast dedication to enhancing our pursuits.

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INVITED LECTURE

USEFUL TOOLS IN META-ANALYSIS

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Abstract: A growing body of evidence in clinical medicine has aggravated, in a way, decision-making, and knowledge from various studies is usually necessary to make a specific clinical decision. Systematic reviews were developed as a tool for clinicians to implement evidence-based medicine. Conducting a systematic review may necessitate a large quantity of resources and can take years. Therefore, automation is needed to conduct and upkeep systematic reviews. Useful tools for conducting systematic reviews ensure a comprehensive, rigorous, and efficient review process. These tools include Reference Management Software: Tools like EndNote, Mendeley, or Zotero help researchers organize, store, and cite sources, simplifying the citation management process. Screening and Data Extraction Software: Platforms such as Rayyan for screening articles for inclusion/exclusion and data extraction, enhancing collaboration among reviewers. Statistical Software: Statistical packages like R, Stata, or MetaXL aid in data analysis, meta-analyses, and the synthesis of study findings. Systematic Review Management Platforms: Software like Review Manager assists in protocol development, facilitating the systematic review workflow. Reporting Guidelines adhering to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines ensure transparent and standardized reporting of the review process and findings. Online Databases access to databases like PubMed, Web of Science, and Scopus is crucial for conducting comprehensive literature searches to identify relevant studies. Citation Tracking Tools, tools like Google Scholar, help researchers identify related research and track citations, aiding in identifying additional studies. Researchers can use these tools to enhance the quality, efficiency, and transparency of their systematic reviews across various disciplines.

Keywords: Systematic reviews, meta-analysis, automation; data extraction, screening

USEFUL TOOLS IN META-ANALYSIS

In biomedical literature, the number of studies that have been published has considerably grown in the last few decades. A growing body of evidence in clinical medicine has aggravated, in a way, decision-making, and knowledge from various studies is usually necessary to make a specific clinical decision. The available studies are usually diverse in terms of their design, implementation quality, and subjects being studied, meaning they may address the research question in different ways, making it challenging to synthesize evidence and draw conclusions [1].

A systematic review comprehensively summarizes medical literature that employs explicit approaches to search, evaluate, and combine data on a particular topic. The necessity for precision in producing systematic reviews has resulted in the creation of a formal process for their conduct [2]. This procedure has specific steps to identify original studies, the techniques used to evaluate their methodological integrity, how the data will be extracted, and the statistical methods to analyze and report the data [3]. By documenting all decisions relating to the inclusion and exclusion of studies during the review process, transparency and reproducibility will be ensured. Systematic reviews and meta-analyses (SR/MAs) are characterized by the high level of evidence as represented by the evidence-based pyramid. Thus, a properly conducted SR/MA is deemed a sensible option for keeping health clinicians apprised of the latest evidence-based medicine.

Systematic reviews are undertaken through a demanding but slow and resource-consuming procedure. This implies that undertaking a systematic review may necessitate a large quantity of resources and can take years [4]. Therefore, automation is needed to conduct and upkeep systematic reviews [5]. The number of tasks needed to create a systematic review can range from four to fifteen, depending on the depth [6]. The methods and steps may vary slightly depending on the field of study and the specific research question. Thus, it's essential to adhere to established guidelines and best practices to ensure the quality and reliability of your systematic review [7,8]. The automation process, using of useful tools, can be broken down into the following stages.

- **Framing the research question**

Framing the research question is an initial step in this process. There is no one right way to frame review questions [9]. For preventing any misinterpretations and facilitating the critical appraisal of studies to be included or excluded from the review, all research questions should be clearly articulated. It has been suggested that the PICO approach (population, intervention, control, and outcome) should be employed for this purpose [10]. Automation of this task can be of assistance in recognizing missing evidence and empower creative processes of recognizing questions of personal experience and proficiency. Global evidence maps and scoping studies are efforts to automate the initial part of systematic reviews [11,12].

At this stage, it is also important to write the protocol of study. Competence in medicine, library science, clinical regulations and statistics is essential for this task. Automation and support for protocol writing may include logical reasoning to examine the completeness of the inclusion criteria, detect any possible bias in the inclusion criteria, and determine the consistency and feasibility of the inclusion criteria. For this purpose, it can be used Cochrane's Review Manager software. This tool provides a protocol template that serves as a reminder to the reviewer to consider every part of a Cochrane protocol, like inclusion criteria, search techniques, analysis, extraction, and statistical plan [13].

- **Identifying relevant publications**

At this stage, a thorough search of multiple sources without language constraints should be done. The study selection criteria should match the review questions and should be predetermined. Reasons for including and excluding studies should be documented [6]. Systematic reviews require an enormous amount of time, especially for filtering and sifting through citations from searches, particularly when there are many citations, ranging from the hundreds to thousands [2]. Comprehensive screening of

citations for systematic reviews is a laborious and prolonged task, yet critical. Failing to identify eligible studies undermines the accuracy of the review.

To complete this task, systematic review authors make use of a range of electronic or manual approaches, and this must be verified by a co-author to ascertain that all potentially suitable studies and those requiring further full-text assessment have been identified. Finding and selecting studies can be a tricky and laborious task and consequently, reviewers utilize a range of techniques to reduce the difficulty. At the beginning, it was performed manually, usually by simple highlighting references. Improved methods have included the applying reference manager software such as EndNote, Zotero, or Mendeley, if available. The reference manager is a useful tool to collect all retrieved records from each search. Retrieving records from different databases requires removing duplicate citations from the result lists. Difficulties with referencing and elimination of duplicates come from discrepancies in indexed metadata (e.g., DOI, ISBN, page numbers may not be provided), and typos (e.g., in article title).

Selecting studies for inclusion based on pre-defined criteria is very important, but also demanding step in this process. The role of automation is to draw attention to key information, reducing the cognitive load of the task and thus saving time. Novel tool for this purpose is Rayyan [2]. Two major features set Rayyan apart from the other tools are its ability to help in abstract and title screening and its capacity to collaborate on the same review. This tool also can be used in the process of extraction data along with the RevMan software or spreadsheet. This tool was recommended as a useful tool for organizing and keeping track of citations in a systematic review and meta-analysis [14,15].

- **Assessing the quality of the study**

Assessing the quality of studies included in a meta-analysis is a critical step in ensuring the validity and reliability of the synthesized findings. This process typically involves a thorough evaluation of each individual study's methodology, sample size, data collection techniques, and the potential for bias. Common tools like the Cochrane Risk of Bias tool or the Newcastle-Ottawa Scale are often employed to systematically assess various aspects of study quality. Cochrane collaboration proposed domain-based evaluation of different domains. There are different forms of assessment Rob2 tool for randomized studies [16], ROBINS-I for non-randomized studies of interventions [17], ROBINS-E for non-randomized studies of exposure [18], ROB-Me – a tool for assessing risk of bias due to missing evidence in a synthesis and *robvis* for visualization [19].

The researchers examine factors like the design of the study, the selection of participants, the measurement tools, and the statistical methods for determining the strength of the evidence in general. By rigorously measuring the quality and reliability of the constituents of the study, the meta-analyzer can make informed decisions about the results of the cumulative analysis, thereby increasing the credibility of the analysis and its robustness.

- **Summarizing the evidence**

Summarizing the evidence in a meta-analysis involves synthesizing the results of multiple individual studies to draw overarching conclusions about a specific research question or hypothesis. This process typically includes quantifying the effect sizes and their associated uncertainties across the included studies. By pooling data, meta-analysts can calculate weighted averages or combined effect estimates, such as odds ratios or standardized mean differences, to quantify the overall impact of an intervention or relationship between variables. Additionally, forest plots and heterogeneity statistics are often used to visually represent the results and assess the consistency of findings among the studies. This comprehensive summary of evidence allows researchers to not only provide a more accurate estimate of the true effect but also assess the generalizability and robustness of the findings across different study populations and contexts, ultimately enhancing our understanding of the topic under investigation.

- **Interpreting the findings**

Interpreting the findings in a meta-analysis involves a careful analysis of the synthesized evidence to derive meaningful insights and draw valid conclusions. Firstly, researchers must consider the magnitude and direction of the combined effect size accompanied with confidence interval, statistical significance and to assess the practical significance of the results. Secondly, the assessment of heterogeneity among the included studies is crucial, as it helps determine the consistency of findings across different research contexts and populations. Thirdly, subgroup analyses and sensitivity analyses can also be employed to explore potential sources of variation. At this and previous stage of research, useful tools are different statistical packages R, Stata, or MetaXL. Overall, thorough interpretation of meta-analysis findings should focus on not only the statistical significance but also the clinical or practical relevance of the observed effects, considering the strengths and limitations of the included studies to make informed decisions or recommendations based on the collective evidence.

Growing demands to conduct systematic reviews and meta-analysis lead to the development of different tools to facilitate and speed up the process of the research. according to our knowledge, there is no single tool that would unite all phases of research. which requires researchers to acquire the skills of using multiple tools.

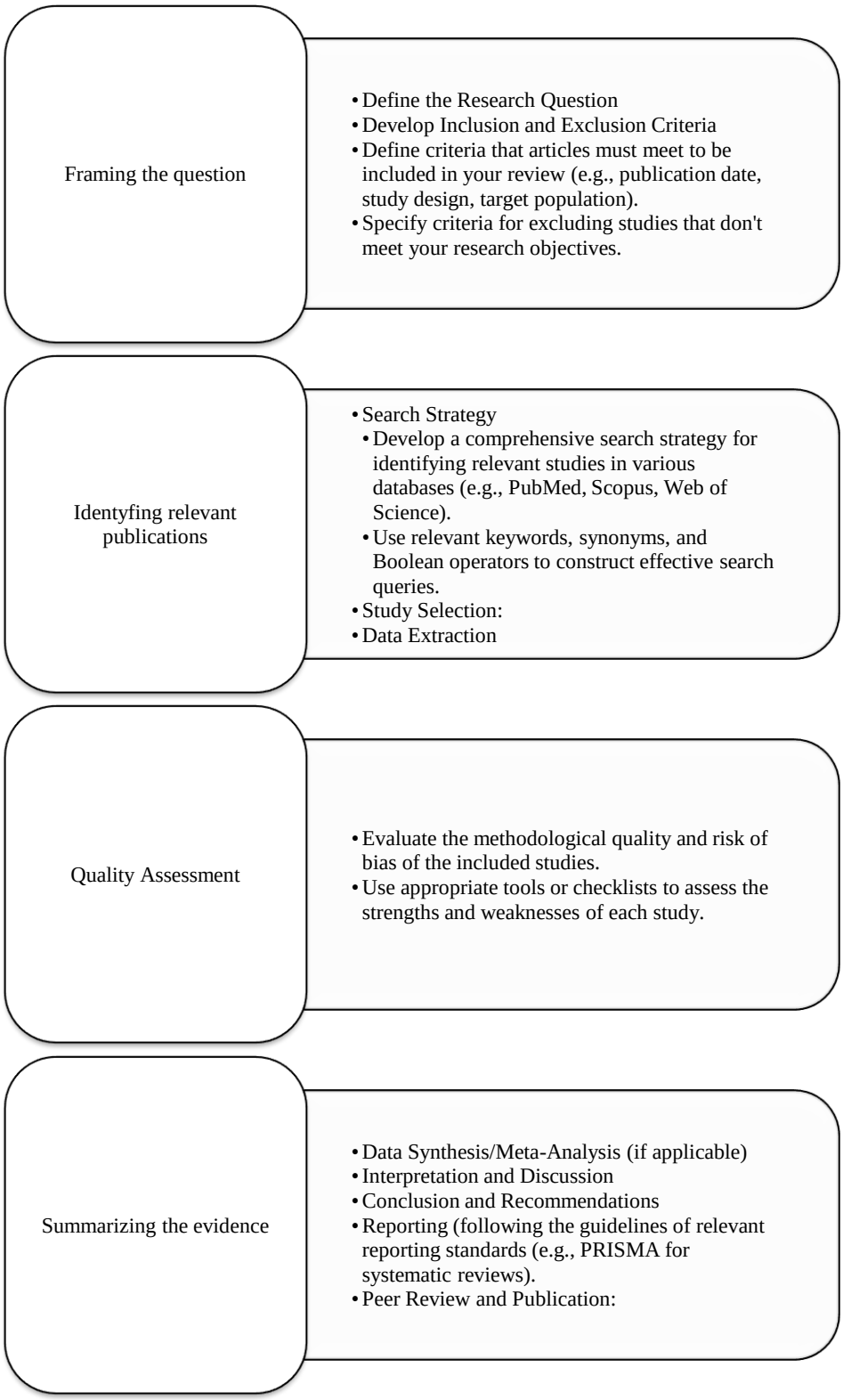

Figure. Methods in systematic review process

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ORAL PRESENTATION

SAMPLE SIZE CALCULATION FOR THE 2-INDEPENDENT SAMPLE T-TEST USING THE G*POWER SOFTWARE

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Abstract: Appropriate sample size calculation and power analysis have become major issues in research and publication processes. However, the complexity and difficulty of calculating sample size and power require broad statistical knowledge. The null and alternative hypothesis, effect size, power, alpha, type I and II error should be described when calculating the sample size or power. The process of sample estimation consists of establishing research goals and hypotheses, choosing appropriate statistical tests, choosing one of several possible power analysis methods, and inputting the required variables for analysis. G*power is a statistical software for sample size and power calculation, using graphical user interface (GUI). The software supports sample size and power calculation for various statistical methods (F, t, $\chi 2$, z, and exact tests), it is easy to use and free. This article aimed to explain the basic concepts of sample size calculation and power analysis, the process of sample estimation, and how to calculate sample size using the G*Power software in 3.1.9.7 version (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany; http://www.gpower.hhu.de/), with example how to calculate sample size for the 2-independent sample t-test.

Keywords: Sample size, Software

ORAL PRESENTATION

COMPARATIVE ANALYSIS OF MORTALITY RATES FROM INFECTIOUS DISEASES IN BELGRADE PUBLISHED BY THE SECRETARIAT FOR ADMINISTRATION/SECTOR FOR STATISTICS AND BY THE CITY INSTITUTE OF PUBLIC HEALTH OF BELGRADE IN THE PERIOD 1995 – 2021

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Abstract

Objectives: Comparison of data about mortality from infectious diseases published by different information sources in Belgrade between 1995 and 2021.

Materials and methods: The comparison was made between data published annually by Belgrade Secretariat for Administration (hereinafter ZIS) and Institute of Public Health of Belgrade (hereinafter IPH). Mortality rates were calculated per 100.000 population. Joint Point Regression was used to analyze trends.

Results: We analyzed annual specific mortality rates according to ZIS and IPH for the period between 1995 and 2021, with and without COVID-19 in the last two observed years. The average specific mortality rate, excluding COVID-19, in ZIS was 7.65 per 100.000 (3.39 – 13.10), while in IPH it was 3.53 per 100.000 (1.06 – 6.35). Joint Point regression shows in both sources statistically significant decreasing trend in the first half of the observed period, and statistically significant increase in the second half, with more pronounced slope for the IPH (0.33:0.26 annually), except for the period of pandemic where a significant decrease of reported deaths of all other infectious diseases, excluding COVID-19, was registered by IPH. With COVID-19 included into the analysis, both sources registered steep increase in the last two years, but with 5.9-time higher rates in ZIS compared to IPH.

Conclusion: Our analysis shows that further improvement in notification of outcomes of infectious diseases is needed, but also that it is necessary to improve communication between institutions and exchange of information that will be considered in periodic analysis and reports.

Keywords: Specific mortality, Infectious diseases

ORAL PRESENTATIONS

PUBLIC HEALTH UTILITY OF CAUSE OF DEATH DATA

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Abstract
Objective: Lozano and Naghavi established a five categories typology of "garbage" codes (GC).

Methods: Serbian mortality data in the period from 2005. to 2019. were analyzed using ANACONDA (Analysis of Causes of National Deaths for Action) software. Trend of five categories was estimated using Joinpoint Regression analysis.

Results: The trend of the overall GC shows a decrease in the total number from 47.3% (50424) in 2005. to 40.5% (41175) in 2019. The trend of Category 1 in the examined fifteen-year period records a statistically significant slight decrease from 5.6% to 4% (APC=-1.1; p=0.039). Category 2 is relatively constant during the whole period with an average of around 1%. Category 3 is the most represented and accounts for almost half of all GCs. It has increased significantly from 2005 to 2019 (APC=1.3; p<0.001). Category 4 significantly increased from 1.7% to 3.5% during the examined period (APC=4.8; p<0.001). Category 5 records a statistically significant trend decline, especially from 2009. to 2019. (APC=-7.98; p<0.001).

Conclusion: Our research implies the following country error pattern: frequently using garbage codes, commonly of intermediate cause of death. Additional and continuous professional education of physicians is needed and should focus on the most common GC among the leading causes of death.

Keywords: Cause of death, data quality, trend analysis, Serbia

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SESSION: EXPERIENCES OF IMPLEMENTING HEALTH EDUCATION IN THE COMMUNITY

INVITED LECTURES

THE ONE HEALTH APPROACH SUPPORTS GLOBAL HEALTH

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One Health approach has been gaining traction globally since the introduction of the Tripartite partnership of Food and Agriculture Organization, World Health Organization and World Organization for Animal Health in 2010, later joined by UN Environment forming a Quadripartite. Emerging infectious diseases, antimicrobial resistance, climate change, food safety, food and water security and other public health threats, especially emergencies caused by pandemics and natural disasters, have moved One health to the forefront of global health conversation. All have an environmental, a public health, animal health, agricultural and plant health dimension and an integrated approach is most efficiently achieved through structured coordination mechanisms on all levels: global, regional, national and local. In both advisory and executive roles, coordination mechanisms ensure timeliness and sustainability, lower morbidity and mortality, reduce the risk of cross border spill-over and save resources. Reflecting the global trend of establishing numerous international mechanisms, multisectoral collaboration in Serbia is present both through international projects and on a national level and is increasingly legislated.

Both persisting modern health challenges and emergencies require the One health approach as they all happen on human-animal-environment interface. Only by building mechanisms for multisectoral collaboration can we tackle and prevent todays and future health threats.

Keywords: One health approach, coordination mechanisms, international cooperation, global health challenges, emergencies

NETWORKS AS THE WAY TO THE GOVERNANCE OF THE HOSPITAL EVOLUTION

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The hospital has undergone a progressive differentiation of its structure and its pathways based on the clinical classification of patients, with the separation of the spaces dedicated to patients in need of urgent care (characterized by a short time for intervention and a high level of resources needed) and the ones destined to patients with chronic diseases took place. In the last century, the hospital evolved towards high technological concentration and high level of space optimization with diminished spaces and time for less complex/intensive care cases (1). The Center for Research in Healthcare Innovation Management IESE Business School proposed in 2016 a list of characteristics for the hospital of the future, which included among many: increased complexity, high concentration of spaces and processes (with outsourcing of non-core activities), personalized medicine, reorganization of knowledge-driven services, fewer on-site patients, care processes on many widespread locations, centers of innovation, centrality of research and training of professionals, integrated care and team-oriented processes (2).

The hospital, however, is a complex system. In order to sustainably achieve value objectives in a complex context with the aim of integrated care an important tool is represented by Networks. Goodwin gave the following definition of Network: "any moderately stable model of connections between organizations or between organizations and individuals, in which these ties represent some form of recognizable responsibility (however weak and in any case ready to be overcome), of a formal or informal, weak or strong, loose or tight, limited or unlimited nature" (3). The author stresses the notion of co-responsibility among organizational actors as the key to creating Networks. The governance of networks among complex elements is to be achieved applying Mintzberg's mechanism of mutual adaption (4) and at all levels, institutional, organizational and professional as shown by Valentijin (5).

To clarify the concept and its relevance it is important to assess the presence and level of development of Networks. At the Italian national level there are currently many hospital networks at various degree of formalization. Four basic types are distinguished: the Emergency-Urgency Network, the Time-dependent networks, the Oncological Networks, and the Networks of hospitals with primary care settings (6).

At the international level, to propose some examples from different continents, hospital/primary – community care networks are present in Australia with Primary Health Networks (7), that interconnects local hospital public and private hospitals. In Switzerland, specific virtuous examples at the national level are constituted by the National Dementia Network (8) and the Palliative Care Network (9) and, in Japan, the Japanese Network of Cardiovascular Departments for Adult Congenital Heart Disease (10) and the Dementia Care Network (11). All this Networks, however differing in socio-economic context and healthcare service delivery, show a high degree of integration at the institutional and organizational level. In conclusion, Networks prove to be an effective tool to govern hospital evolution as far as they are interpreted as coordination/integration inside and across multiple organizational levels of co-responsibility (12).

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HEALTH LITERACY AS A GLOBAL HEALTH CHALLENGE

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Health literacy, as an independent form of literacy, has become increasingly important for social, economic, and health development. Just as the broader and more modern concept of health encompasses physical, mental, and social well-being, a broader understanding of literacy implies the different circumstances necessary for navigating and applying knowledge.

In nearly all aspects of our lives, we encounter questions and decisions related to health that require knowledge, skills, and awareness. Health and literacy are dynamic concepts that are interconnected, and to some extent, they determine our ability to function in a constantly changing society.

Today, in the era of the new "healthy society," health policies require "informed patients" and "active citizens," and "health" has become a very complex social system that demands knowledge and skills to respond to illness in a timely and adequate manner. Health is one of the global priorities, resulting from scientific evidence of the link between health and economic development.

The intensive development of global health has also led to numerous challenges that constitute a complex set of problems affecting the health of people worldwide. Global warming, global divides, and global security are considered to be of strategic importance as they represent a generational challenge for sustainable development and the health of future generations. Many global health challenges are interconnected, such as global warming and natural disasters, floods, lack of drinking water, and deforestation, contributing to the loss of demographic balance, economic disparities, poverty, hunger, and the endangerment of entire populations. These challenges include a wide range of issues such as infectious diseases, non-communicable diseases, lack of access to basic healthcare, poor environmental

conditions, low vaccination rates, health inequalities, and many other issues. In addressing these challenges, health literacy plays an important role.

The goal of global health is to improve the health of all people in all countries, promoting well-being and eliminating diseases, disabilities, and premature deaths that can be prevented. Activities that ensure the achievement of this goal combine health promotion with prevention measures at all levels of healthcare. In line with this, the development and strengthening of health literacy become an important strategy for achieving this goal. This involves education, access to reliable sources of information, the promotion of critical thinking, and collaboration between health organizations, governments, and civil society to ensure that all people have the opportunity to be informed and active in preserving and enhancing their health.

Health literacy represents a broad field, and the concept of health literacy can have multiple meanings depending on the context in which it is observed. It can be examined within various settings, such as healthcare institutions, the healthcare system, or digital spaces, within the community, or through individual skills.

The term "health literacy" was first used in 1974 to describe how health information impacts the educational system, healthcare system, and mass communication, while the concept of health literacy itself was introduced into the literature in the 1990s. The emphasis on health management and disease prevention in the early 2000s placed a greater focus on individual health literacy skills. The concept of health literacy has evolved from describing and defining adult population literacy skills to understanding that appropriate, if not advanced, literacy skills are necessary for accessing, navigating, and understanding health and the healthcare system.

Within the European Health Literacy Consortium, the problem of inconsistent definitions was recognized, leading to the first systematic literature review in this field in 2012. After critically evaluating all elements of the previously identified 17 different definitions of health literacy, a new, more comprehensive definition was created from a public health perspective.

"Health literacy is linked to literacy and encompasses people's knowledge, motivation, and competencies to access, understand, appraise, and apply health information to make judgments and take decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course."

Within this definition, it is important for an individual to possess four dimensions of health literacy:

- Access relates to the ability to seek, find, and obtain health information.
- Understanding pertains to the ability to comprehend health information being assessed.
- Appraisal, which involves the ability to interpret, judge, and evaluate health information obtained.
- Application relates to the ability to communicate and use information to make decisions to maintain and improve health.

Factors that determine individuals' level of health literacy are numerous. They can result from individual characteristics of the person or stem from healthcare professionals, the healthcare system, or the environment.

Today, digital spaces have become a central environment for communication and engagement, learning and work, as well as disease prevention and health promotion. This has led to the development of a new dimension of health literacy, known as digital health literacy.

Digital health literacy can be defined as the "ability to search, find, understand, and evaluate health information from electronic sources and apply the knowledge gained to access or solve health problems."

For example, the COVID-19 pandemic has demonstrated the importance of equal access to digital platforms. Digital technologies, such as mobile phones, have enabled rapid contact tracing, symptom checking, seeking advice, and obtaining necessary information, as well as public communication and education. Access to digital platforms is particularly crucial when mobility is restricted or when people live in rural or remote areas. Compared to traditional communication strategies, digital spaces support "accessibility and expanded access to health information for various population groups, regardless of age, education, race or ethnicity, and location," thereby potentially fostering further development of health literacy.

Health literacy is a significant predictor of an individual's health status and, as a determinant of health, is important in analyzing the healthcare system of every country. A satisfactory level of health literacy is required for citizens to actively participate in making informed health decisions and engage in healthcare.

Just as there is a universal right to healthcare, there is a need for a universal right to health literacy. To achieve this, it is necessary to create political awareness of the importance of health literacy and involve decision-makers, professionals, and society as a whole in a shared responsibility. Strengthening health literacy should be a long-term strategy that requires continuous investment.

Low levels of health literacy expose society to significant costs, contribute to social and economic losses, and can prevent individuals from participating in society and achieving their life goals. On the other hand, health-literate individuals engage in continuous interaction with their environment. They can balance autonomy and dependence in their relationship with healthcare professionals, patient organizations, and other social services.

Strategies for enhancing health literacy should be developed as part of lifelong learning skills, and healthcare professionals should embrace improving health literacy as part of their regular activities related to patient health protection.

If we aim to achieve the ultimate goal contained in the definition of health literacy, we need to promote greater independence and empowerment of individuals and communities. Enhancing the health literacy of the population involves more than just conveying health information, although that remains a fundamental task. If the goal is to promote greater independence in making health decisions and empowering individuals and communities, it is necessary to emphasize the importance of education and strengthen political actions to ensure that health communication is not only focused on personal health but also on the social determinants of health.

In today's world, the volume of information, including health information, available in all media has increased, making the digital information environment even more complex than it already was. People's need for information is growing. This poses additional challenges and barriers as we try to find relevant information, critically reflect on information, and use information to make health decisions in our everyday lives. Reliable information is crucial for people to understand recommendations and know how to protect themselves and others. It is of great importance that information is accessible, easily findable, easily accessible, understandable, and usable.

An additional problem is information overload, which has made it difficult to distinguish between accurate and inaccurate information, allowing for the emergence or creation of misconceptions and false beliefs. The spread of a large amount of incorrect information and the frequent dissemination of fake news called an "infodemic," further underscores the importance of health literacy. Health literacy, the ability to find, understand, evaluate, and apply health information, is therefore more important than ever for people to navigate information environments and use health information to inform their health and behavior. Health literacy is more relevant than ever in preparing individuals for situations requiring a quick response.

Above all, health literacy should be viewed as social responsibility and solidarity, and it is necessary for both people who need information and services and individuals who provide them to ensure their availability to the general population.

Improving health literacy is an important political and social goal and is of great importance for global health and sustainable development.

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ORAL PRESENTATIONS

KNOWLEDGE, ATTITUDES, AND BEHAVIOR OF PARENTS AND HEALTH CARE WORKERS RELATED TO IMMUNIZATION AGAINST HUMAN PAPILLOMAVIRUS

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Introduction:

The HPV immunization program began in 2016, first as a pilot project and then to be implemented as a national program.

The objective of this review is to gain insight into the knowledge, attitudes, and behavior of parents and health workers related to HPV immunization in Serbia based on a review of the literature.

Method:

The electronic databases MEDLINE and SCI index were searched for all studies published in English and Serbian in the period from 2006 to 2023.

Results:

Having a female child, more knowledge about the HPV vaccine, parents' medical education, urban place of residence, recommendations from a health professional, and HPV vaccination free of charge are predictors associated with parents' intention to vaccinate their child.

The factors associated with the gynecologists' intention to recommend the vaccine included their positive attitudes towards boys' vaccination, negative attitudes towards frequent changes in the recommendations, and beliefs that the vaccine application would decrease condom usage, while the factors associated with the pediatricians' intention to recommend the vaccine included the parents' attitudes.

Conclusion:

The findings provide useful information for the development of effective public health interventions that may lead to an increase in HPV immunization coverage in Serbia.

Keywords: Human Papillomavirus Viruses, Parents, Gynecologists, Pediatricians, Vaccination

PLANETARY HEALTH IMPACT OF ANTIBIOTICS

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Pharmaceuticals not only account for an estimated 25% of all medical greenhouse gas emissions, but also exert direct ecotoxicological effects via sewage systems. The effects of antibiotics in the environment are related to their potential to maintain, cause and diseminate resistance, and to exert a number of negative effects on the entire ecosystem. In order to minimize the impact of antibiotics on the environment and on other community members, especially future generations, planetary health approach based on cooperation between human, animal and environmental health partners could offer potential solutions to commonly tackle this important public issue.

Objectives: Therefore, the objective of this study is focused on evaluation on differences between medical (M) (students of medicine, dentistry and veterinary medicines as the prospective antibiotic prescribers) and nonmedical students (NM), since their knowledge, attitudes and practice in relation to usage of antibiotics can greatly impact antibiotic-related issues in the future.

Materials and methods: This cross-sectional questionnaire-based study was performed on 800 students in 2019 at the University of Novi Sad, Serbia.

Results: Almost 57% of interviewed students had good knowledge score and the identified predictors of adequate antibiotic knowledge were students enrolled in medical program, higher grade average and appropriate use of antibiotics during last infection. While 67% of the total sample of students believed that antibiotics should not be used for common cold, this percentage was significantly higher among M than NM students (79.3% and 52.8%, respectively). The results of the multivariate regression highpoint M having a two times higher likelihood of self-medication with antibiotics than NM students (OR = 2.0; B = 0.715; $p < 0.001$) and identified the following predictors of self- medication: being medical student (B = 0.715; $p<0.001$), more frequent (B = 0.628; $p<0.001$) and irregular (B = 0.584; p = 0.001) antibiotic use, a family member engaged in medical profession (B = 0.789; $p<0.001$), living in dormitory (B = 0.679; p = 0.007) or rented apartment (B = 0.621; p = 0.002), using antibiotics until symptoms resolved (B = 1.616; $p<0.001$) or until the bottle was finished (B = 0.628; $p<0.001$) during the last infection. Common cold, flu, sore throat and fever were the predominant health problems that provoked self-medication both in M and NM students.

Conclusion: Although a high number of students showed adequate knowledge about antibiotics, numerous misconceptions were recorded, including self-medication. Planetary health represents a promising interdisciplinary approach to promote alternative solutions for a resilient future. There is much to be gained by making future generations more knowledgeable and aware about the impact they have on planetary health.

Key words: Self-medication, antibiotics, resistance, students, planetary health

TRUST IN HEALTH INFORMATION SOURCES IN SERBIA: OPINION OF PUBLIC HEALTH PRACTITIONERS

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Objectives: Misinformation surrounding COVID-19 vaccination efforts, known as an infodemic, has led to a significant decrease in vaccine demand. The Laboratory for Infodemiology and Infodemic Management organized consultations with public health practitioners and conducted a survey to understand this issue better.
Methods: During April 2023, training sessions were held at three Institutes of Public Health in Serbia to expand the network and consult with the practitioners. At the end of the sessions, all participants were invited to provide feedback through a questionnaire. To assess public trust in various health information sources, a 5-point Likert scale was used.
Results: The questionnaire was completed by 36 public health practitioners. The participants rated television as a source of health information with the highest public trust, scoring 3.8. Internet portals and family members were ranked second with a score of 3.7. Participants rated faith leaders as the least trusted source, with an average score of 2.6.
Conclusion: Our group of public health practitioners reported that television and internet portals are considered trustworthy sources of health information by the public. It is important to leverage the influence of these communication channels for health promotion and infodemic management interventions.

UNMET HEALTHCARE NEEDS OF ELDERLY PEOPLE IN SERBIA

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Objectives: This study aimed to examine unmet healthcare needs and associated factors among elderly people in Serbia.

Materials and methods: The data for this research were obtained from the cross-sectional study National Health Survey Serbia 2019. The analysis included 3,705 respondents aged 65 and over (55.1% females and 44.9% males). Unmet healthcare needs were defined as situations in which a participant needed health care and did not receive it. The multivariable logistic regression was applied to estimate the factors associated with unmet healthcare needs.

Results: Among respondents who had a need for health care in the past 12 months, 19.0% had unmet healthcare needs due to financial reasons, 17.5% due to long waiting times, and 6.5% due to distance or transportation problems. Lower odds of having unmet healthcare needs had the oldest respondents (OR=0.64; 95%CI=0.43-0.94), while the group with depression was 2.2 times more likely to have unmet healthcare needs (OR=2.24; 95%CI=1.56-3.22), as well as people with low social support (OR=1.7; 95%CI=1.30-2.26) and those who assessed their health as poor (OR=2.26; 95%CI=1.77-2.90).

Conclusion: Among the elderly, unmet healthcare needs were concentrated in people with low social support, suffering from depression, and who assess their health as poor.

Key words: unmet healthcare needs, elderly, self-assessed health

POSTER PRESENTATIONS

THE ROLE AND IMPORTANCE OF SOCIAL SUPPORT AND PROVISION OF CARE FOR ADULT RESIDENTS

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Objectives: to show the importance of social support and care provision to the adult population as well as their connection with demographic and socio-economic characteristics.

Methods: The research was conducted as a cross-sectional study. The sample consisted of adult residents of four municipalities in Kosovo and Metohija. The Health Examination Questionnaire was used as a research instrument, according to the recommendations of EHIS. *X2, Mann Witney U* and *Kruskal–Wallis statistical tests* were used, with a statistical significance level of $p<0.05$.

Results: The research included 1067 adults. When they have serious problems, 9% state that they do not have a close person they can count on, the most in the municipality of Štrpce (19.4%), while 17% can count on 6 or more people, the most in the municipality of Zubin Potok (20.4%). About 7.3% believe that other people are not interested in the events in their life. Two-thirds of respondents confirmed that they can easily get help from their neighbors, while 7.1% said it was difficult or very difficult, significantly more often respondents from the municipality of Zubin Potok (8.4%). When necessary, respondents most often provide help to family members (79%). Women, employed, with secondary education, married, most often take care of others when necessary.

Conclusion: The importance of social support and care provision as well as their connection with demographic and socio-economic characteristics has been determined. The obtained data can help in improving health care through informal care and emphasizing the importance of social support through health and educational measures.

Keywords: provision of care; social support; adults;

THE ANALYSIS OF MORTALITY DUE TO TYPE 2 DIABETES (T2D) BY SEX AND AGE IN THE CITY OF BELGRADE, SERBIA 2017-2021

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Objectives: To present and evaluate the death rates due to T2D by sex and age in the City of Belgrade, Serbia 2017-2021.
Materials and methods: The data on mortality due to T2D for the period 2017-2021, were obtained from the mortality database in Belgrade, maintaned by the Institute of Public Health Belgrade. The main method of analysis was descriptive statistics.
Results: The calculated crude mortality rates due to T2D per 100.000 population, in the observed period in Belgrade, for male sex, were 31,4 (2017), 26,2 (2018), 25,6 (2019), 32,8 (2020) and 30,3 (2021), and for female sex, were 30,5 (2017), 23,9 (2018), 26,2 (2019), 32,5 (2020) and 33,1 (2021). The calculated crude mortality rates due to T2D per 100.000 population in the age interval of 20-64 years, were higher for male sex each year in the period 2017-2021. The calculated crude mortality rates due to T2D per 100.000 population, in the age interval of >64 years, were higher for male sex in the period 2017-2020, with the exception of 2021, when higher mortality rate was observed for female sex.
Conclusion: The male population had higher crude death rates due to T2D, for age intervals 20-64 and >64 years.
Key words: type 2 diabetes (T2D), mortality, age, sex

CHANGES IN CAPACITY PROVISION IN GENERAL HOSPITALS IN THE PROVINCE OF VOJVODINA IN THE PERIOD 2013-2022

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Objectives: To analyze changes in workforce provision and use of 9 general hospitals in the Province of Vojvodina in the period 2013-2022.

Methods: We used data from health statistics record

Results: In 2022 adequate supply of bed capacity in hospitals was maintained except in district of Srem where it was low (1.8 beds/1000 inhabitants), but better than 10 years ago. In the period 2013-2022, the overall number of doctors increased by 11.0%, except in hospitals in Subotica, Vršac, and Vrbas, there was no change. Overall, the number of nurses/technicians increased by 4.3 (from 2.9% to 17.4%) except in hospital in Pančevo where was a decrease of 10%. Provision with doctors/100 beds mainly increased but still varies considerably in 2022 between hospitals ranging from 15 to 32, while the number of nurses/technicians varies from 53 to 101. The average length of stay was reduced from 7.2 to 5.7 days and was noted in all hospitals except in hospitals in Pančevo and Sremska Mitrovica. Bed occupancy decreased in all hospitals and in 2022 it was in a range from 28.6% to 45.3%.

Conclusion: The analysis indicates differences in workforce provision and use of general hospitals in 2022 compared to 2013, as well as differences between hospitals.

Key Words: hospital health care, hospital beds, average length of stay

THE OBESITY EPIDEMIC – OLD AND NEW PUBLIC HEALTH CHALLENGES

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The health, economic, and social consequences of obesity require urgent and effective public health actions. Recent studies indicate certain differences in subpopulation groups determined by ethnic, racial, gender, social, and other factors.

Objective: The paper will show the differences between individual subpopulation groups in the development of obesity.

Methodology: In the study, a systematic review of the literature was applied using the global databases PubMed and Medline with the application of keywords and filters.

Results: women are more susceptible to obesity than men (15.7%, 12.2%) globally; the racial/ethnic determinant of obesity is reflected in the high prevalence of obesity in Latin Americans and the non-Hispanic black population in the USA (42-48%; 56.9%) compared to the white population (42.4%); the growth rate of obesity in children is higher than the rate in adults; lower education and income are associated with a higher risk of obesity; generations born in the 1980s had an increased tendency to be obese compared to previous generations.

Conclusion: Differences in the prevalence of obesity within subpopulation groups can be the basis for the development of specific public health programs and policies for the prevention and treatment of obesity.

Keywords: obesity, prevalence, subpopulation groups, public health

SESSION: HEALTH EDUCATION IN YOUTH POPULATION

INVITED LECTURES

SEXUAL HEALTH AND ASSESSMENT OF CERVICAL CANCER SCREENING USE IN WOMEN OF REPRODUCTIVE AGE

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Introduction

The concept of sexual health, is defined as a state of physical, emotional, mental and social well-being related to sexuality; and does not mean only the absence of disease, dysfunction and disability, it already includes a positive approach to sexuality and sexual relations and much more respect, satisfaction and security, free from all violence, coercion and of discrimination (1).

Risky sexual behaviors refer to early sexual intercourse initiation, a greater number of sexual partners and a lack of use of reliable contraceptive methods for efficient STI protection (2).

The prevalence of risky sexual behaviors varies from 5.1% to 50%. What raises some concern is a relatively low rate of the contraceptive use among young women. Even if they use contraceptive means at the beginning of their sexual activity, the majority of such women continue to be using the insufficiently effective pull-out method (coitus interruptus) in the later part of their life (3).

Not using contraceptives can cause sexually transmitted infections (STIs), whereas those infections caused by the human papillomavirus (HPV) may lead to the development of cervical cancer (2).

Cervical cancer occupies a significant place in the overall structure of morbidity and mortality in Serbia. This particular malignancy is the second leading cause of morbidity and the sixth leading cause of mortality among our female population, with more than 1,300 newly diagnosed patients and approximately 500 deaths reported annually (4).

Despite the current efforts that are being invested in order to increase the vaccination rates against human papillomavirus (HPV), early screening for the detection of pre-cancerous cervical lesions remains to be the most significant intervention accomplished by the health system for the purpose of decreasing the morbidities and cervical cancer mortality rates, particularly in the areas with limited resources and poor vaccination coverage (5,6,7).

Materials and method

The research was conducted as a cross-sectional study in three steps, in accordance with the methodology entitled the World Health Organization (WHO) STEPwise Approach to Noncommunicable Disease (NCD) Risk Factor Surveillance (STEPS) (8).

It was accomplished by the teachers and students of the Faculty of Medical Sciences, University of Kragujevac, with the support of the Ministry without portfolio which is in charge of demography and population policy of the Republic of Serbia.

The research presented a part of the teaching process related to the course unit entitled Social Medicine (the sixth year of the studies at the Integrated Academic Studies of Medicine).

In accordance with the research needs, some significant modifications were made within the teaching program (in the curriculum of the course unit entitled Social Medicine). For the purposes of this particular manuscript, the results of the first step-Cervical cancer module and Sexual health module will be presented. An anonymous standardised questionnaire was chosen as a primary research tool. Demographic and socioeconomic indicators were included in the questionnaire, complete with a segment related to the cervical cancer prevention and sexual health characteristics as well. The study population consisted of 1182 female aged 18-49 years, living on the territory of Central Serbia. As regards selecting the appropriate sampling methods, accidental sampling was used in the study which was carried out in the period from June 2019 to December 2022. This population-based study comprised employed women, working for various companies or institutions on the territory of Central Serbia. Our research study obtained ethics approval from the Ethics Committee of the Faculty of Medical Sciences, University of Kragujevac (No. 01-12167).

Results

The average age of female respondents was 33.65±9.25. As regards the use of contraceptives during the first sexual intercourse, 35.1% of the surveyed population reported not having used any of the contraceptives, whereas 74.5% of the female respondents confirmed that they had not used them during their last sexual intercourse. Condoms (71.1%) and contraceptive pills (14.5%) were found to be the most commonly used contraceptives. Out of the total number of female respondents, 26.1% of the respondents reported that they had never had a single Pap smear in their lifetime. Pap test results were not normal in the case of 15.3% of the respondents. As regards every second female respondent who had never undergone a single Pap smear test, she did not indicate a clear reason why she had not been subjected to testing (52.6%).

Three quarters of the female respondents who reported high school completion had never had a Pap smear test in their lifetime (78.2%), whereas 14.6% of the respondents who confirmed getting a higher school degree reported not having done such a Pap testing. Taking into consideration their marital status, 23.0% of the married female respondents reported they had not been screened for cervical cancer so far. The lack of use of contraceptives during the first sexual intercourse on the part of every second female respondent was associated with their not having done a Pap test either (53.5%). Similarly, 54.4% of the respondents who had experienced pregnancy so far did not start having cervical screening tests.

Recommendations for improving of reproductive health and cervical cancer screening use

1. It is possible to improve the state of sexual and reproductive health by intensifying efforts to apply the current legal regulation and strategic commitments in the domains of informing, education and counselling, with a higher level of participation of the healthcare service users complete with making reasonable adjustments in the work practices of healthcare institutions in order to meet the needs of particularly vulnerable population groups.

2. A Health Care Center as an institution of the primary healthcare level represents a major coordinator of activities performed for the purpose of maintenance and improvement of sexual and reproductive health by enhancing the model for family planning programs. These activities are administered by the chosen doctors of medicine (specialists in general medicine, specialists in gynecology and obstetrics and specialists in pediatric medicine) with the assistance of nurses involved in their teams, and the patronage nursing service by informing their patients and providing counseling services on various topics relating to the domain of sexual and reproductive health and laws, along with promoting and providing preventive health checkups. In addition, what imposes by itself is the urgency to intensify the administration of all the relevant activities regarding the performance of organized screening programs, with the Health Care Center being a major coordinator of activities, along with the coordination of the Public Health Institute/Institution.

3. Institutions at the secondary and tertiary healthcare (organizational units in charge of the provision of healthcare services in the domain of sexual and reproductive health) are supposed to provide counselling on family planning and appliance of modern contraception methods especially with vulnerable groups

4. Local self-government units (Health Counsels and the working entities dedicated to gender equality) in coordination with the Institutes of public healts, health care centers, associations and means of informing the public, should take all necessary measures for the purpose of maintenance and enhancement of sexual and reproductive health of adolescents and particularly vulnerable population groups.

5. Children and adolescents should be given complete scientifically based age-appropriate information and education, throughout their entire lives, which is necessary in terms of maintaining and improving their sexual and reproductive health and respect, along with the protection and fulfillment of their own sexual and reproductive rights. In accordance with the abovementioned facts, employee training at educational institutions (the Preschool and Primary Education Department and the Department of Secondary Education) should be oriented towards the relevant sexual and reproductive health-related topics.

6. The integration of reproductive health enhancement support programs into the graduate and postgraduate education of students at the faculty of health studies is found to be of significance, just like this very research was integrated into the teaching process of the Faculty of Medical Sciences, University in Kragujevac (the course unit entitled: Social Medicine). In this manner, at the final stage of their graduate education students would be involved in a serious scientific project and would be able to master the research methodology in the area of public health, whereas they would simultaneously raise awareness as regards the significance of reproductive health and a proper understanding of public health within the health system of our country. By administering such research from one generation of students to the other, it would be possible to follow the trends, that is, the tendencies of indicators' movement which are found to be significant in the field of reproductive health.

7.Important step is to promote the significance of reproductive, sexual health and screening by means of creating national campaigns (The European Cervical Cancer Prevention Week, March – National Cancer Prevention Month, the European Immunization Week, the World and National Breast Cancer Day, the World AIDS Day, the International Youth Day, etc.).

8. Promotion of voluntary confidential counselling and testing (VCCT) for HIV and other sexually transmitted infections (STIs) at the Institution of public helth

9. Prevention of sexually transmitted infections (STIs) should be continually reinforced by promoting the vaccination against the hepatitis B virus (HBV) and human papillomavirus (HPV).

10. The involvement of private sector is necessary in order to enable the effective and equal provision of sexual and reproductive health protection services.

11. Revising existing and creating national guidelines and protocols that would be harmonized with current internationally recognized evidence-based recommendations, which falls within the scope of duties of the working group appointed by the Ministry of Health in charge of public healthcare
12. The Ministry of Health and other competent ministries coordinate all the activities.

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A PARADIGM SHIFT IN PREVENTION: THE CONCEPT OF »EARLY PREVENTION«

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Introduction: In March 2022, the UN Commission on Narcotic Drugs (CND) adopted at its 65th session by consensus and cosponsored by 40+ Member States a resolution on promoting comprehensive and scientific evidence-based early prevention. The resolution (initiated by Slovenia) represents a significant milestone and conceptual shift in prevention as it encourages the governments to provide appropriate resources for and put greater emphasis on scientific evidence-based early prevention, encompassing prenatal care, infancy, and early and middle childhood. The fact is that the focus of most of the prevention work is on adolescence and early adulthood, when some risk behaviour problems already appear at larger extent and are more difficult to prevent or reduce the harm from them, such as substance use, (cyber)bullying, violence, self-harm, suicides, gambling, gaming etc.

Methods: The analysis of situation (e.g., rapid mapping of interventions in different evidence-based intervention (EBI) registries, such as Blueprints Programs, Xchange etc.) and research findings (based on scientific and grey literature review) show that there is a lack of evidence-based early prevention interventions globally.

Results: The authors will present key facts on the new CND resolution and some related information and evidence on the value of early prevention, especially based on the UNODC/WHO international prevention standards. They will present some key characteristics of existing evidence-based early prevention practices based on literature review and analysis of internationally recognized EBI registries, and some future challenges and potential barriers in the process of implementation of the CND resolution.

Conclusions: The main challenge in prevention science, research and practice based on the new CND resolution is therefore to strategically invest more on early developmental stages, where we can more effectively tackle most of cross-cutting risk and protective factors in purpose to achieve better long-term outcomes in child and youth development. The CND resolution represents an important milestone in prevention, which will shape the future of prevention science, research, and practice in the forthcoming decades. Attendees will get a brief insight into the new concept of early prevention in terms of the newly adopted resolution, existing EBIs in this area and some suggestions for overcoming potential challenges and barriers in the process of implementation of the resolution.

Keywords: early prevention, risk and protective factors, prevention standards

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ORAL PRESENTATION

THE PREVALENCE OF CYBERBULLYING AMONG SCHOOL-AGED CHILDREN IN SERBIA

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Objectives: Cyberbullying has become a growing problem among school-age children in Serbia. This study aimed to examine the prevalence and exposure of cyberbullying in a sample of school children aged 11, 13 and 15 years.

Methods: A secondary analysis is performed on the original data of the 2017/18 HBSC study, which was conducted on 3267 students in a nationally representative sample of primary and high schools in Serbia.

Results: The research results show that every tenth pupil was exposed to some type of digital violence. 12% of school children said that their photos that were not suitable for sharing were published on the Internet. Girls in the 7th grade of elementary school were more often exposed to abuse by some form of digital violence, once a week. Girls were exposed to cyber violence twice as much as boys.

Conclusion: The cyberbullying exposure was more prevalent among girls than among boys of school-age. Seventh-grade elementary school-age children were the most frequently abused by some form of cyberbullying. Primary prevention of all forms of violence against children is a priority.

Keywords: cyberbullying, prevalence, exposure, school-aged children, Serbia

DO MOBILE PHONES HAVE A PLACE IN MEDICAL SCHOOLS - WHAT DO STUDENTS SAY?

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Objectives: The education of young health personnel is being adapted to modern technologies, but the use of mobile phones (MPs) in teaching is still controversial. The aim of the study is to examine students' attitudes and practices about the use of MPs during classes.

Materials and methods: A cross-sectional study using the Google Forms electronic survey, based on a convenient sample of students from all grades of the secondary medical school in Zvezdara was performed in 2022.

Results: Out of a total of 152, 114 (75%) are female, mean age of 16.4 (SD=1.1), mostly from urban areas (74%). Every fifth student thinks that MPs could be used in class as a source of information, while 13.2% of them think that MPs cannot be useful. Students who use MPs during class (p=0.03) and for whom MPs serves to overcome boredom in class (p=0.01) had a lower average grade, although agreement with this fact among students is low (2.4/5). Out of the total, 82.9% of students believe that the use of mobile phones during the classes could improve its quality.

Conclusion: As in the community, there are contrary attitudes towards students' use of MPs, additional research is needed on a more representative sample in the community.

Key words: mobile phones, medical school, students, attitudes

SAFE PHARMACOTHERAPY DURING LACTATION – KNOWLEDGE SUPPORT BREASTFEEDING

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Administration of drugs during the period of breastfeeding is very common in clinical practice. The safety of the infant during pharmacotherapy in a nursing mother is determined on the basis of the pharmacokinetic assessment of the transfer of the drug into milk and the exposure of the infant to the drug and on the pharmacodynamic considerations of the safety profile of the drug. Various factors influence the transition of the drug into milk: 1. drug - volume of distribution, lipophilicity, binding to plasma proteins, molecular weight, half-elimination time: 2. milk - composition and quantity; 3. infant - age, time of drug administration; 4. women - stage of lactation, comorbidities. The assessment of exposure to the drug is performed by calculating the relative dose of the drug that reaches the infant through milk (Relative Infant Dose-RID). When the value of RID > 25% (about 3% of all drugs) an effect on the infant is expected, while RID <10% (about 90% of known drugs) is considered acceptable, except in the case of pronounced toxicity of the drug. Even 98% of drugs have RID<3%. Large number of non-steroidal anti-inflammatory drugs (NSAIDs) demonstrate safety, but preference is given to ibuprofen, which is the first recommendation for use (RID up to 0.66). Rational pharmacotherapy can be safe with timely support of breastfeeding, with adequate advice from pharmacists and the use of National Guidelines for safe pharmacotherapy during lactation.

Keywords: breastfeeding, safe pharmacotherapy, relative infant dose

METHODOLOGY OF HEALTH EDUCATION IN SCHOOLS IN THE REPUBLIC OF SERBIA

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Introduction: Health Education in the schools of the Nišava district as well as in the Republic of Serbia has a long history, but the results of the Health Behavior in School-aged Children Survey from 2017/2018 raised the question of whether and to what extent the methodology of implementing the program is in accordance with the true health education needs and challenges to which school children are exposed.

Objectives: Analysis of the methodology of Health Education in the schools of Nišava district.

Methods: Analysis of reports on Health Educational programs in primary schools and in secondary schools that the health facilities of the Nišava district submit to the Center for Health Promotion of the Public Health Institute Nis in the period 2010-2020.

Results and discussion: The organizers of these programs are public health institutes, (Public Health Institute Nis), with all health institutions in the district. The teachers of Health Education in schools are health professionals from different health institutions and teachers and associates in schools. Teachers from schools are the least involved. The topics defined by the programs were dealt with in previous years through lectures, more recently through workshops, and actions and campaigns were organized rarely. There are several shortcomings of the methodology of Health Education in schools: Health Education in schools takes place as an "isolated process", there is no involvement of parents, teachers are not involved enough due to the excessive regular teaching program, there is no involvement of the community, it is rarely supported by the media.

Conclusion: A serious change in the methodology of Health Education in schools in the Nišava district (and in the Republic of Serbia) is needed, where the concept of Health Promoting Schools, based on the experiences already gained in European countries, can offer possible directives.

Keywords: health education, schools, methodology

ASSOCIATION BETWEEN DEPRESSION AND ANXIETY SYMPTOMS OF UNIVERSITY STUDENTS IN SERBIA WITH EXCESSIVE SOCIAL MEDIA USE DURING COVID-19 PANDEMIC

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Objectives: This two-phase study aimed to find out whether the usage of social media during the COVID-19 pandemic showed some significant association with depression and anxiety symptoms.

Methods: The study was based on the survey of 1,476 randomly selected students at the initial phase, and 1,400 students of the same cohort at the follow up phase. Standardized questionnaires - the Bergen Social Media Addiction Scale (BSMAS) was applied to measure the levels of social media addiction, and the Depression Anxiety Stress Scale (DASS 42) was administered to evaluate the symptoms of depression and anxiety.

Results: The six components of online social media addiction, which constitute the BSMAS, between the two phases of the study showed significant difference ($p<0.01$) in favor of the follow up phase in the raised scores of all but one component. The probable severe or extremely severe symptoms of depression and anxiety were notably enhanced during the peak of pandemic, and both of them were positively correlated with all 6 BSMAS components ($p<0.01$).

Conclusion: The comparison between two phases of this follow-up study revealed significant changes in the Internet usage characteristics, which may have had an essential influence on the investigated symptoms of depression and anxiety.

Keywords: social media; BSMAS; DASS42; depression; anxiety.

HEALTH EDUCATION IN YOUTH POPULATIONS: STRATEGIES, CHALLEGES, CHALLEGES AND IMPACTS

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Health education plays a vital role in empowering young individuals to make informed decisions about their health. Adolescence and young adulthood are critical periods for adopting lifelong health behaviors, making targeted interventions essential. Various approaches are employed to engage and educate young people, including school-based curricula, community workshops, peer-led initiatives, and digital platforms. School-based programs provide structured health education, while community initiatives and peer-led campaigns leverage relatable messengers to convey health information. Digital platforms offer convenient and accessible ways to reach tech-savvy youth. Health education to the young people also hides challenges. These include adapting content to cultural and social contexts, addressing varying levels of health literacy, and navigating the rapidly evolving digital landscape. Balancing traditional methods with emerging technologies is essential for holistic education. Effective health education positively influences knowledge acquisition, attitude formation, and behavior change among youth populations. Accurate health information contributes to choosing healthier lifestyles and reducing the prevalence of risky behaviors, resulting in long-term public health benefits. Health education tailored to youth populations is a pivotal investment in building healthier societies. By utilizing a combination of strategies and effectively navigating challenges, health educators can empower the youth to adopt and maintain positive health behaviors, leading to improved individual and community well-being.

POSTER PRESENTATION

ADOLESCENTS' ADDICTION IN THE CITY OF NOVI SAD FROM USING SOCIAL MEDIA AND GAMING

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[1]University of Novi Sad, Medical Faculty
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[3]Oncology Institute of Vojvodina

Objective: Examine whether there is a statistically significant difference in relation to gender in the use of social networks and gaming among adolescents.

Methods: The sample consisted of 877 students aged 15, from 16 high schools in the territory of Novi Sad. The standardized ESPAD questionnaire (*European School Survey Project on Alcohol and Other Drugs*) from 2019 research was used as an instrument. The research was conducted in the period October - December 2022. A unique link was distributed to all schools that participated in the research to share with their students via the "*Google Classroom*" platform.

Results: A total of 86.2% of students use the Internet almost every day for leisure activities. During the last 7 days, on weekdays they mostly spent 2-3 hours on social networks, while on weekends 29.1% of them spent 6 or more hours, in both cases significantly more girls ($p<0.001$). Students who gaming on one of the electronic devices during the week did so for half an hour or less, while on weekends 9.6% of respondents played games for 6 or more hours, significantly more young men ($p<0.001$).

Conclusion: Observing different patterns of internet use concerning gender can improve the adaptation of preventive programs to different target groups in the period of early adolescence.

Key words: adolescent, internet, video games

THE MORTALITY OF BREAST CANCER ON THE TERRITORY OF PIROT MUNICIPALITY- SOCIO-MADICAL ASPECT

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In Central Serbia breast cancer is the leading cause of death in women (18% of all cancers).

Work aim: The observation mortality rate of new breast cancer sufferers in the Pirot municipality and suggestions for prevention of breast cancer as relevant social-medical problem.

The method: Application of descriptive-epidemiologist studies of breast cancer for the female population in Pirot municipality for period between 1999. to 2012.

Analysing: The mortality rate from breast cancer considering regions and the age of group samples for chosen time period in Pirot municipality.

The results of the work and discussion: In Pirot region the rate of mortality from breast cancer is showing a slight growth from 1999. (36,7) to 2012. (39,7/100.000). The average growth rate for breast cancer mortality rate in the Pirot municipality for observed time period is 34,3/100.000 and it is slightly lower than average mortality rate for Central Serbia which was 43,4/1000.000 in the year 2012.

The other municipalities in the Pirot region similarly have slightly lower mortality rate comparing to Central Serbia: Dimitrovgrad municipality (40,76/100.000), Pirot municipality (36,5/100.00), Babusnica municipality (28,67/100.000), Bela Palanka municipality (29,9/100.000).

The average specific-increase in mortality from breast cancer in regions of Pirot municipality shows that the risk of dying from breast cancer is closely link with the aging factor: the highest percent of woman dying in the age over 50 years old is documented in the Pirot municipialtety (88,9%), followed by Dimitrovgrad municipality (78,6%), Babusnica municipality (78,3%), with the lowest mortality rate being registered in Bela Palanka (72,6%).

The highest percent of woman dying under the age of 50 years old is in the municipality of Bela Palanka (13%), followed by Pirot municipality (10,6%), then Babusnica municipality (7,4%) and lastly Dimitrovgrad municipality (7%).

The conclusion: Influence the changing attitude of the community at the national and local level about the values of undertaking preventive actions in promoting healthy lifestyles. Primary prevention measures should be carried out on an individual and population level.

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