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Ladies and Gentlemen, Faculty, Graduates and Students of Universities, Readers and Enthusiasts of *Medical Science Pulse*!

I would like to introduce the last issue of Medical Science Pulse in 2019. I am pleased to announce that Medical Science Pulse has been positively evaluated by experts in a competition by the Minister of Science and Higher Education under the "Support for scientific journals" de minimis programme and has been awarded 20 points. Tasks: "Purchase of digital object identifiers for electronic documents; Purchase of software to manage editorial and publishing works; Purchase of anti-plagiarism programme; Linguistic correction of scientific articles in the journal; Improvement of substantive level of reviews; Dissemination of information about the journal" are financed by the Ministry of Science and Higher Education de minimis programme within the framework of "Support for scientific journals" project – contract number 147/WCN/2019/1. All these actions significantly affect the quality of the papers published in the quarterly, and increase the interest of authors, reviewers or thematic editors to contribute to the journal's success.

The year ends with 46 published articles. 173 authors are affiliated with 65 scientific institutions from Poland, Europe, North America, Asia and Afrika. Compared to last year, the number of reviewers increased from 43 to 55 and the number of foreign papers from 11 to 21. Also, new thematic editors joined our team, including editors from Lithuania and Ukraine. The quarterly's team of language editors includes a native speaker with medical education and a statistical editor with a specialised education.

All the articles published in subsequent issues are available free of charge on the journal's website – medicalsciencepulse.com. – under Creative Commons licenses, which is in line with the currently promoted strategy of open access to publications containing research results. Submissions are made via the editorial office's unified website.

It should be noted that Medical Science Pulse is the only scientific quarterly in the field of medical sciences, health sciences and physical culture sciences in Opole and the Opole Voivodeship.

We would like to thank all the readers for their dynamic and growing interest in the scientific content of the quarterly, for their support and willingness to cooperate with us as well as heart-warming reviews! We also wish to thank the Reviewers, Members of the Scientific Council, Editors and Members of the Editorial Committee for their hard work and constant help in 2019!

We encourage you to send the results of your research projects: https://medicalsciencepulse.com/resources/html/cms/DEPOSITSMANUSCRIPT.

As the year comes to an end, we are also pleased to announce the organisation of the next 7th International Medical Science Pulse Conference, which will take place at Opole Medical School on May 7–8, 2020.

The theme of the 7th International Medical Science Pulse Conference focuses on presenting new scientific findings and gaining knowledge in the field of biomedical, and related, sciences in light of the current issues of open access data management. The conference will also focuses on increasing public awareness in the area of providing data access to the public. The central topic of the scientific debate, based on the presentations, is the current issue of open access and research data management.

The main goal of the conference is to present research in the field of health sciences, medical sciences, and related disciplines, with a particular emphasis on oral presentations given by young scientists in an international environment of eminent researchers, and scientific luminaries. We warmly extend our invitation to researchers from all interdisciplinary teams!

Generational dialogue is understood here as a kind of scientific cooperation of researchers and the use of various methods of research disciplines to gain new knowledge and create new interdisciplinary and multidisciplinary research fields. This step is crucial since interdisciplinarity and teamwork are now becoming fundamental elements of the research paradigm in all fields. The topic of the scientific debate based on research presentations is the current issue of research data management and open access to this data.

Furthermore, the objectives of the conference include providing knowledge about the importance of the role of cooperation between scientists, universities and research centres, disseminating scientific findings with a particular emphasis on the medicine. The conference also aims to draw attention to various professional groups associated with the promotion of science in the social and economic environment. Finally, the conference strives to develop practical skills needed in research work and to improve scientific communication skills in English.

The expected effects include changing the stereotyped way of thinking in the process of solving current research problems and anticipating potential new ones. The conference will also result in strengthening good practices in the field of science, exchanging scientific experiences and disseminating science in the national and international environment. It will help establish professional contacts and international cooperation, increase public awareness in the area of open access to research data and emphasise the importance of collaboration between the scientific, educational and economic environments. Lastly, it will facilitate the promotion of a positive pattern of scientific work as a potential way of building a professional career for university graduates.

The conference programme includes presentations of research projects as part of the Master Class module, a module for young scientists, including students, an e-poster session, as well as specialised workshops in the field of research data management.

Content-related, guests from Europe and the USA, training panels, discussions, and debates – these features distinguish this conference from various other proposals.

Register: https://expandio.pl/7th_MSP_Conference/#registration

In the scientific part of the fourth issue, we present original works on preterm birth and perinatal outcome, co-presence of a family doctor and psychologist in the management of patients with psychosocial and somatic symptom disorders, seroprevalence of Toxoplasma gondii, Varicella zoster virus and Human Parvovirus B19 among women in Biała Podlaska District of Eastern Poland, stopping the hemorrhages from the limbs: raising efficiency through training on human unfixed preparations, occurrence of *Legionella* spp. in Polish hotels in 2009–2013 and 2014–2016 and opolskie voivodeship secondary school students' knowledge about fetal alcohol syndrome and its determinants. We also present case reports: death due to rare rhinocerebral mucormycosis infectionand and the effectiveness of therapeutic massage in treating back pain. We recommend reading interesting review papers: health technologies and smart & integrated care – key action 2 stage of the Regions4Permed (H2020) project, development of cardiovascular complications and their correlation with Lyme disease, and the papers of early stage researchers on clinical practice guidelines, quality indicators, and the true values of primary care

Happy New Year 2020! May you be satisfied in both your personal and professional life. May you feel a constant sense of fulfilment and have memorable times with your loved ones. Finally, we hope that you will find a spare moment to immerse yourself in the scientific world of Medical Science Pulse!

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Original papers

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PRETERM BIRTH AND PERINATAL OUTCOME: AN OBSERVATIONAL COHORT STUDY

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Preterm birth is a common cause for neonatal morbidity and mortality worldwide.

Aim of the study: To compare perinatal outcomes in preterm and term neonates.

Material and methods: The present cohort study was conducted in the Obstetrics and Gynecology Department of MMIMSR, Ambala, a rural tertiary care center of Northern India over a one-year period (January-December 2018). 2,997 antenatal women were recruited at gestation (≥28 weeks) with singleton live pregnancies. All participants were divided into two groups: Group I: Antenatal women delivering at gestation (≥37 weeks) and Group II: Antenatal women delivering at gestation (≥28 to <37-weeks. Onset of labor, mode of delivery, perinatal outcome including birth weight, Apgar scores, Neonatal Intensive Care Unit (NICU) admission, need for intubation, complications, and mortality were compared between groups.

Results: Of 2,997 deliveries, 2,528 (84.4%) were full-term, 469 (15.6%) preterm [48(10.2%) very preterm and 421(89.8%) late preterm] deliveries. The most common mode of delivery in both full-term and preterm participants was spontaneous vaginal delivery (62.8% vs 60.4%) followed by cesarean section (36.6% vs 39.2%). Preterm neonates (especially very preterm) had significantly lower birthweights (p<0.001, OR: 0.898; 95% CI: 0.108-7.48), 1-minute (p=0.018; OR: 7.812; 95% CI: 1.06-57.69) and 5-minutes Apgar scores (p=.000; OR: 3.410; 95% CI: 1.79-6.48) as compared to moderate- to- late preterm neonates. NICU admission rate, need for intubation, neonatal complications, stillbirth and early neonatal deaths were significantly higher in preterm neonates (p=.000). The most common complication in preterm neonates was Respiratory Distress Syndrome 172(55.1%) followed by sepsis 41(54.7%).

Conclusions: Preterm delivery, especially very preterm, was significantly associated with adverse perinatal outcome as compared to full-term delivery.

KEYWORDS: pregnancy, infant, newborn, intensive care units

Background

The World Health Organization (WHO) has defined preterm birth as birth before 37 completed weeks of gestation from the first day of a woman's last menstrual period (LMP). Preterm birth is subdivided into three groups based on the gestational age: extremely preterm (<28 weeks); very preterm (28 to<32 weeks); moderate or late preterm (32 to <37 completed weeks of gestation) [1,2]. An estimated 15 million neonates are born preterm (more than 1 in 10 newborns) worldwide, annually [1], with India alone accounting for the maximum contribution to the world's total prematurity burden. According to the WHO 2013 fact sheet, India accounts for 3,519,100 preterm births which is 23.6% of the total preterm births in the world [3,4]. Preterm birth is one of the leading causes of neonatal mortality, accounting for approximately 1 million deaths of children every year due to its complications [5]. Furthermore, preterm birth is responsible for 70% of neonatal deaths and around 75% of neonatal morbidity, including long-term neurocognitive, ophthalmologic disorders, and pulmonary dysfunction [6].

The exact reason for preterm birth is still unclear; however, it can be due to multiple factors of which preterm premature rupture of membranes (PPROM) is one important cause. Other causes include cervical incompetence, uteroplacental insufficiency, multifetal gestation and polyhydramnios [3,7,8].

Aim of the study

The present study was conducted with the aim to compare the overall perinatal outcome in women with preterm (≥28 weeks to <37 weeks) and full-term (≥37weeks) deliveries in a rural tertiary care center of Northern India.

Material and Methods

Study design, setting and duration

The present Observational cohort study was conducted in the Department of Obstetrics and Gynecology of a rural tertiary care center of Northern India over one year from January 2018 to December 2018.

Study Population

2,997 live singleton pregnancies at gestation ≥28 weeks were divided into two groups: Group I Full-term: 2,528 and Group II Preterm: 469, admitted in the labor ward of Department of Obstetrics and Gynecology.

Inclusion criteria

All admitted antenatal women with a single live fetus at gestation ≥28 weeks with or without spontaneous onset of labor were enrolled as participants.

Exclusion criteria

Antenatal women at gestation <28weeks, multifetal gestation, with intra-uterine dead or anomalous fetus, women with a history of substance or tobacco abuse and those who were not able to give formal consent were excluded from the study.

Study size

Consecutive sampling was done and all the subjects fulfilling the inclusion criteria were enrolled over the period of one year.

Ethical Considerations

The study was conducted after ethical approvals were obtained from the MMIMSR Institutional Ethical Committee (IEC No.: 1120).

Methodology

The present study was conducted according to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) statement. After obtaining ethical approval from the Institutional Ethical Committee and informed written consent from each of the participants in their own language, the socio-demographic parameters including age, gravidity, parity, gestation, were recorded by trained staff members. A thorough medical history of all of the participants and their general and systemic examinations including per-abdominal and vaginal examination were recorded. Based on gestation at the time of delivery, all of the participants were divided into two groups: Group I: antenatal women delivering at term (≥37 weeks) and Group II: women delivering at gestation (≥28-<37 weeks). Group II was further subdivided into very preterm (28–<32 weeks) and moderate-to-late preterm (≥32–<37weeks). The onset of labor, mode of delivery, perinatal outcome including birth weight, Apgar scores at 1-and 5-minutes, NICU admission, need for intubation, neonatal complications, stillbirth and early neonatal deaths were recorded and compared between the groups. The birth weight was measured using a tabletop-beam weighing scale by trained nursing staff. Neonatal Apgar scores, NICU admission and overall outcome was assessed and recorded by a trained pediatrician on duty at the time of delivery.

Statistical Analysis

Statistical analysis was performed using SPSS software version 22.0. For comparison of two continuous variables such as neonatal birthweight and Apgar scores, unpaired t-test/Mann-Whitney U- test was performed. For comparison between more than two groups such as age and gestation, an ANOVA/Kruskal-Wallis test was performed. The qualitative variables such as NICU admission, neonatal complications, and perinatal mortality were correlated using a Chi-Square test A p value of ≤ 0.05 was considered statistically significant.

Results

Of a total 2,997 live births at gestation (≥28 weeks), 2,528 (84.4%) were full-term and 469 (15.6%) were preterm births. The mean age (±SD) for full-term participants was 25.08±3.193 years and for preterm was 25.55±3.653 years with the majority of participants (88.7%) belonging to the 21-30 years of age group. The average gestation in Group I was 38.82±1.121 weeks and for Group II was 34.77±2.001 weeks. The majority of the participants in both groups were multigravida and multiparous. The most common maternal high-risk factors associated with preterm birth were hypertensive disorders of pregnancy, anemia, malpresentations, antepartum hemorrhage and Rhesus factor (Rh) incompatibility. The most common mode of delivery in both of the groups was spontaneous vaginal delivery (62.8% vs 60.4%). The comparison of socio-demographic features between the two groups is described in Tab. 1.

Preterm birth was found to be significantly associated with adverse perinatal outcome including low birth weight (p<0.001; OR:10.369; 95% CI: 8.29-12.96), poor 1-minute (p<0.001; OR: 1.925; 95% CI:1.45-2.56) and 5-minutes Apgar scores (p<0.001; OR: 9.940; 95% CI: 6.91-14.31), increased rate of NICU admission (p<0.001; OR: 8.914; 95% CI: 7.07-11.21), need for intubation (p<0.001; OR:10.880; 95% CI: 7.01-16.87), neonatal complications (p<0.001; OR:5.034; 95% CI: 4.07-6.22), stillbirth (p<0.001; OR:9.561; 95% CI: 2.78-32.79) and neonatal deaths (p<0.001; OR:9.158; 95% CI: 3.312-25.32) as described in Tab. 2. Furthermore, the neonatal outcome was significantly worse in very preterm as compared to moderate-to-late preterm neonates as described in Tab. 3.

Table 1. Socio-demographic features.

Parameters		Term N (%)	Preterm N (%)	Chi-square test	p-value	Odds Ratio	95% Confidence Interval
Age (Years)	≤20	141(5.6%)	25(5.3%)	13.637	0.001	-	-
	21-30	2259(89.4%)	400(85.3%)				
	>30	128(5.1%)	44(9.4%)				
Gravidity	Primigravida	1018(40.3%)	171(36.5%)	2.397	0.122	1.175	0.95-1.44
	Multigravida	1510(59.7%)	298(63.5%)				
Parity	Nulliparous	1180(46.6%)	197(42.0%)	3.478	0.062	1.209	0.99-1.47
	Multiparous	1348(53.4%)	272(58.0%)				
Mode of Delivery	Vaginal	1588(62.8%)	283(60.4%)	4.920	0.085	-	-
	Cesarean Section	925(36.6%)	184(39.2%)				
	Instrumental	15(0.6%)	02(0.4%)				
Perinatal outcome	Live	2518(99.6%)	452(96.4%)	18.630	0.001	9.470	2.63-31.68
	Stillbirth	04(0.2%)	07(1.5%)	19.260	0.001	9.561	2.78-32.79
	Neonatal death	06(0.2%)	10(2.1%)	26.749	0.001	9.158	3.312-25.32

Table 2. Comparison of neonatal outcome between term and preterm neonates.

Neonatal Parameters		Term N (%)	Preterm N (%)	Chi-square test	p-value	Odds Ratio	95% Confidence Interval
Birth weight (Kg)	<2.5	487(19.3%)	334(71.2%)	536.815	0.001	10.369	8.29-12.96
	≥2.5	2041(80.7%)	135(28.8%)				
1-minute Apgar score	<7	1963(77.7%)	408(87.0%)	20.899	0.001	1.925	1.45-2.56
	>7	565(22.3%)	61(13.0%)				
5-minutes Apgar score	<7	52(2.1%)	81(17.3%)	215.918	0.001	9.940	6.91-14.31
	>7	2476(97.9%)	388(82.7%)				
NICU admission	Yes	211(8.3%)	210(44.8%)	434.828	0.001	8.914	7.07-11.21
	No	2317(91.7%)	259(55.2%)				
Need for Intubation	Yes	33(1.3%)	59(12.6%)	169.906	0.001	10.880	7.01-16.87
	No	2495(98.7%)	410(87.4%)				
Neonatal Complications	Yes	372(14.7%)	218(46.5%)	252.495	0.001	5.034	4.07-6.22
	No	2156(85.3%)	251(53.5%)				
Stillbirth	Yes	04(0.2%)	07(1.5%)	19.260	0.001	9.561	2.78-32.79
	No	2524(99.8%)	462(98.5%)				
Neonatal Death	Yes	06(0.2%)	10(2.1%)	26.749	0.001	9.158	3.312-25.32
	No	2522(99.8%)	459(97.9%)				

Table 3. Comparison of neonatal outcome between moderate to late preterm and very preterm neonates.

Neonatal Parameters		Moderate to Late Preterm N (%)	Very Preterm N (%)	Chi-square test	p-value	Odds Ratio	95% Confidence Interval
Birth weight (Kg)	<2.5	286(67.9%)	48(100%)	21.613	0.001	0.898	0.108-7.48
	≥2.5	135(32.1%)	00(0%)				
1-minute Apgar score	<7	361(85.7%)	47(97.9%)	5.639	0.018	7.812	1.06-57.69
	>7	60(14.3%)	01(2.1%)				
5-minutes Apgar score	<7	63(15.0%)	18(37.5%)	15.315	0.001	3.410	1.79-6.48
	>7	358(85.0%)	30(62.5%)				
NICU admission	Yes	166(39.4%)	44(91.7%)	47.548	0.001	16.890	5.96-47.91
	No	255(60.6%)	04(8.3%)				
Need for Intubation	Yes	37(8.8%)	22(45.8%)	53.76	0.001	8.782	4.54-16.99
	No	384(91.2%)	26(54.2%)				
Neonatal Complications	Yes	178(42.3%)	40(83.3%)	29.192	0.001	6.826	3.12-14.94
	No	243(57.7%)	08(16.7%)				
Stillbirth	Yes	06(1.4%)	01(2.1%)	0.127	0.722	1.472	0.173-12.48
	No	415(98.6%)	47(97.9%)				
Neonatal Death	Yes	02(0.5%)	08(16.7%)	54.133	0.001	41.910	8.60-204.05
	No	419(99.5%)	40(83.3%)				

The most common neonatal complication observed in preterm neonates was Respiratory Distress Syndrome 172(55.1%) followed by sepsis 41(54.7%), whereas in full-term neonates, it was jaundice 186(88.2%) followed by hypoglycemia 12(75.0%) as shown in Fig. 1.

Discussion

In the present study of total 2,997 neonates delivered, 2,528(84.4%) were term and 469(15.6%) preterm with 421(89.8%) moderate to late preterm and 48(10.2%) very preterm. The mean (±SD) gestational age in term group was 38.82±1.121 weeks and in preterm group 34.77±2.001 weeks. Similar results were reported by a study conducted in Trinidad and Tobago on 129 preterm neonates with 59.7% moderate to late preterm, 33.3% very preterm and 7.5% extremely preterm neonates and concluded that preterm delivery was associated with increased risk of neonatal morbidity and mortality with 12.4% neonatal deaths before discharge, and 11.6% survived with major disabilities [9]. Another similar study conducted in Greater Paris on 2,172 live births found that 13.6% (95% CI 12.2–15.1) of newborns were preterm. The median gestation for full-term neonates was 39 weeks and for preterm neonates was 35 weeks [10].

In this study, the majority of the women having preterm delivery were multiparous and belonged to the 21-30 years of age group (mean±SD: 25.55±3.65 years) with spontaneous vaginal delivery (60.4%) as the most common mode of delivery. Another similar study conducted on 21,075 women delivering at gestation (≥ 20 weeks) reported that the incidence of preterm delivery was 5.8%, of which 85% belonged to the 32 to36 weeks of gestation group and was least common in women of the 20 to 35 years of age group. The authors observed that preterm birth was more common with male fetuses and in primigravida. They also concluded that preterm neonates were significantly at higher risk of perinatal morbidity and mortality as compared to full- term neonates [11]. Similar to our study, many authors have reported that preterm births were more common in multiparous women [11–14]. Many other studies have reported that preterm birth was more common in young (<20 years) and advanced (≥40 years) age mothers [14,15].

In this study, it was observed that preterm neonates have a significantly adverse outcome with low birth weight (p<0.001; OR:10.369; 95% CI: 8.29-12.96), poor 1 minute (p<0.001; OR:1.925; 95% CI: 1.45-2.56) and 5-minutes (p<0.001; OR:9.940; 95% CI: 6.91-14.31) Apgar scores, increased NICU admission (p<0.001; OR: 8.914; 95% CI: 7.07-11.21), need for ventilator (p<0.001; OR:10.880; 95% CI: 7.01-16.87), neonatal complications (p<0.001; OR:5.034; 95% CI: 4.07-6.22), stillbirth (p<0.001; OR:9.561; 95% CI: 2.78-32.79) and early neonatal deaths (p<0.001; OR:9.158; 95% CI: 3.312-25.32) as compared to term neonates. Furthermore, very preterm neonates were more significantly associated with adverse perinatal outcome as compared to moderate to late preterm neonates (p<0.05). Similar results were reported by a study which concluded that neonates in preterm group were significantly associated with adverse perinatal outcomes, such as low birth weight, poor 1 and 5-minutes Apgar score, compared with term neonates ($P < 0.05$) [16]. Another study reported that the Apgar scores were significantly affected by advancing gestational age ($P< 0.001$), neonatal birthweight ($P< 0.001$), head circumference ($P< 0.001$) and placental weight ($P< 0.001$) [17]. A recent study observed that preterm newborns had a 3.8-fold higher risk of infant mortality than full-term neonates (RR 3.8, 95%CI 2.7–5.2) and 4-fold higher risk of neonatal (RR 4.3, 95% CI 2.9–6.6) and 3-fold higher risk for post-neo-

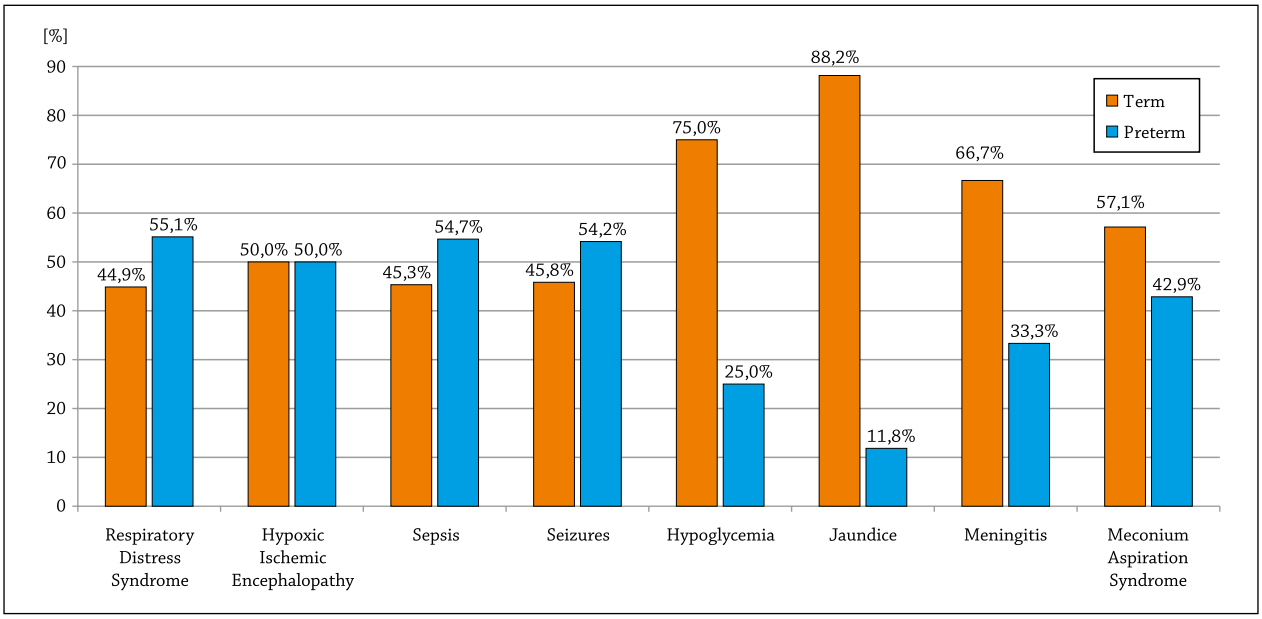

Figure 1. Comparison of neonatal complications in full-term and preterm neonates.

natal deaths (RR 3.0, 95% CI 1.7–5.2) [10]. In this study, 3.6% preterm neonates had perinatal mortality (7 stillbirths and 10 early neonatal deaths) as compared to 0.4% (4 stillbirths and 6 early neonatal deaths) in term neonates (p<0.001), accounting for 63.0% of total perinatal deaths. Similar to this study, another recent study conducted in Bangladesh reported that the preterm neonates were associated with 46% of all neonatal deaths, with 40% in the late preterm group, 20% in moderately preterm and 40% in very preterm neonates. They also concluded that the preterm neonates carry a 3.5 times higher mortality risk as compared to term neonates (RR=3.5, 95% CI=2.9 to 4.3) [18]. Similar results of adverse perinatal outcomes and an increased risk of mortality in preterm neonates as compared to full-term neonates was reported by many other studies [7,19–21].

A recent global survey has shown that India ranks first amongst the top ten countries with the greatest number of preterm births, around 35,019,100 preterm births every year [4]. The table 4 shows the comparison of preterm births in this study with different parts of India, different countries of Asia and global comparison.

Table 4. Comparison of preterm births in india and all over the world.

Comparison amongst states in India	
States	**Estimated Preterm births (N or %)**
Present Study	15.6%
Maharashtra	6.1% [22]
Gujrat	8.9% [23]
South India	23.3% [24]
North India	5.8% [25]
Comparison amongst different countries in Asia [4]	
India	3 519 100
China	1 172 300
Pakistan	748 100
Bangladesh	424 100
Global Comparison [26]	
Asia	7 847 643
Sub-Saharan Africa	4 182 440
Latin America and the Caribbean	1 062 800
Europe	690 931
North America	491 297

The common reasons for preterm births identified in developing countries, especially in India, are maternal anemia, hypertension in pregnancy, diabetes, tobacco use, obesity and domestic violence [27]. By providing appropriate antenatal care to mothers, the risk of preterm births can be significantly reduced.

Limitations of the study

The present study was conducted over a short period and small sample size. In future studies, a larger population size (including preterm deliveries) at centers other than ours in India will be considered. Furthermore, various maternal risk factors will be correlated with preterm births and their complications.

Clinical Implications

Preterm births carry the major burden for perinatal morbidities and mortalities all over the world. Preterm neonates are at an increased risk of birth asphyxia, poor Apgar scores, increased rate of NICU admission, need for ventilators, hypothermia and hypoglycemia [16,17]. They are also prone to developing long-term complications in their childhood and adulthood such as delayed development of milestones, retarded growth, learning disabilities, attention-seeking problems and speech disorders. The risk of preterm births can be prevented to some extent by identifying women at increased risk of preterm births such as those having history of any previous preterm births, ultrasound for cervical length, vaginal infections, particularly Group B Streptococcal infections, and women with multifetal gestation. Women identified as having an increased risk of preterm births can be managed by progesterone supplementation, cerclage operations, and antibiotic therapy [28].

According to the WHO, more than three quarters of premature neonates can be saved easily by using cost-effective methods such as providing essential maternal and neonatal care during childbirth and in the postnatal period to mothers and neonates. Antenatal steroid injections can be given to women at increased risk of preterm births(to hasten fetal lung maturity), kangaroo mother care, thermal care and frequent breast feeding to all preterm neonates, delayed cord clamping (to prevent anemia in these neonates and antibiotic treatment to newborns with infections or sepsis. The described methods have led to a major reduction in the incidence of neonatal morbidities and mortalities associated with preterm births [29].

Conclusions

Preterm birth was associated with adverse overall perinatal outcome with increased risk of neonatal morbidity and mortality as compared to full-term neonates. Very preterm neonates were more adversely affected than moderate-to-late preterm and therefore, carried a higher risk of developing chronic complications in later life including neurocognitive disorders due to poor development of the brain. The majority of the preterm births described in the present study are due to preventable causes and can be avoided by identifying these problems and treating them at an early gestation period, which could reduce the overall burden of preterm births in India.

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CO-PRESENCE OF A FAMILY DOCTOR AND PSYCHOLOGIST IN THE MANAGEMENT OF PATIENTS WITH PSYCHOSOCIAL AND SOMATIC SYMPTOM DISORDERS

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Patients often seek out the help of general practitioners for problems that need a holistic, biopsychosocial approach. Having a psychologist present to support the GP in treatment allows for a more complete response to the patient's distress, which is aided by the integration of the two specialists' areas of expertise.

Aim of the study: The aims of the study were to ensure all patients had direct access to a psychologist during treatment, even if they had not put in a specific request for one, to take care of accidental crises in real time, to reduce spending on inappropriate pharmaceutical prescriptions and diagnostic examinations, and to facilitate health promotion.

Material and methods: The experiment took place between January 2014 and December 2015, in Pordenone, Italy. The psychologist was present in the GP practice every Thursday. The psychologist was present to provide consultation for each person who went to the GP practice for treatment. The study also explored the significance of any request, the psychological framework of the observed situations, and included an additional meeting with the psychologist in the GP practice, for individual interviews.

Results: Of about 1,300 consultations with both the psychologist and GP present, the majority of the patients accepted the psychologist's presence favorably. The most frequent source of discomfort for patients related to the grieving process during separation from people to whom the individual has a strong emotional attachment. 30 patients (6 males, 24 females) took part in individual follow-up meetings, 5 abandoned the project, 21 completed the full series of meetings, and 4 were sent to a mental health facility. Because of this holistic approach, spending on medical investigations was reduced by 6%, and the cost of pharmaceutical expenditure decreased by 10%.

Conclusions: The joint medico-psychological treatment prevented, even at early stages, the appearance of somatic and psychic symptoms. This study has positively promoted health and well-being and shown that this type of treatment can help to limit expenses for pharmaceutical prescriptions and specialist diagnostic examinations.

KEYWORDS: family medicine, psychology, psychosocial distress, functional somatic symptoms, biopsychosocial treatment

Background

Sometimes people go to their family doctor/general practitioner (GP) and complain about non-specific symptoms that need to be correctly interpreted. The GP must assess whether these symptoms need further investigation or should be considered functional disorders that manifest themselves through body language and require a biopsychosocial and holistic type of approach. Numerous studies, beginning with Balint [1], have shown that at least 50% of the requests received by GPs express relational/existential discomfort rather than a somatic problem. Despite enormous progress from a technical point of view, current medicine tends to neglect the doctor-patient relationship. In the last 150 years, there has been a progressive differentiation between general medicine and psychology, that is, between an approach to the body and an approach to the mind. Medicine has moved away from

a global vision of the human being, which was one of its characteristics in the 19th century, focusing on biological and genetic aspects. The way the GP relates to the patient and his or her psycho-social context can be considered a real therapeutic tool, often "at no cost", and sometimes more effective than drugs or surgical interventions.

The GP is, at times, unable to satisfy the patient's complex requirements and therefore tries to provide answers only on a biological level, by prescribing specialized medical examinations and medications. In certain cases, the GP may also recognize that this type of treatment falls short of addressing the patient's holistic needs. This not only fails to adequately and appropriately help the patient, but may also lead to an unnecessary increase in costs.

In 1948, the World Health Organization (WHO) defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity". Clinical practice guidelines recommend cognitive-behavioral therapy as the treatment of choice for affective and mood disorders [2]. There is strong evidence that the efficacy of psychological therapy, in particular, is the same as or greater than pharmacological treatments of the most common affective and anxiety disorders [3-5].

Physical illness is socially considered to be inevitable for all, to the point that, at least in Europe, every citizen is required from birth to have a reference doctor, whose services are offered free of charge. Psychological distress, on the other hand, is considered as something that only concerns certain people, to be treated with specific services. Consultations with a psychologist capable of responding to psychic distress are made extremely difficult by ongoing social prejudice [6], and therefore, even if the patients recognize the signs of their distress, they do not ask for help and do not go to a psychologist, even if they have only to cross the street to do so.

The patients that the GP sends to the Department of Mental Health for a specialist intervention are people who have managed to express their psychic discomfort to a family doctor, regardless of social stigma or prejudice. People who, despite being in situations of particular psychological suffering, cannot express their discomfort except through body language, remain outside the realm of appropriate care. However, this changes if the patient finds the psychologist in front of him or her, sitting next to the family doctor, without having been specifically requested.

It is therefore necessary to provide easy access to psychologists for everyone, and not only for a particular category of people who have sought out specialized treatment. The inclusion of a psychologist alongside the GP allows us to respond more completely to the discomfort of patients, through the integration of complementary skill-sets, and also encourages the exchange of training and information between the two professionals [7-13]. These findings were the foundation for the primary care study carried out here. This study involves the GP and the psychologist in co-presence with the patient in the same room, side by side behind the same desk.

Aim of the study

The primary aim of the study was to ensure the GP's patients had direct access to a psychologist, even without having specifically requested one be present, so the patient could be seen without the risk of being labelled as "psychologically disadvantaged".

The study also aimed to explore the meaning of any request made by a patient, regardless of how it was expressed, and view it in the context of the patient's present and past relationship situation and in the context of his/her life cycle. The study also hoped to take care of accidental crises in real time, including marital or employment difficulties, loss or illness, and to respond to significant life moments (e.g. adolescence, beginning of university, marriage, parenthood, retirement). Finally, the study hoped to reduce spending on inappropriate pharmacological therapy and diagnostic specialist medical examinations and hospital admissions, to the extent that these derive from an attempt to read any type of discomfort within an exclusively biological model, which is inappropriate for functional disorders.

Material and methods

Study design

This initiative falls under the umbrella of work which began years earlier with a group led by Prof. Luigi Solano of the Department of Dynamic and Clinical Psychology of the University "Sapienza" of Rome, where this model of co-presence of a GP and psychologist was developed through the internship experiences of psychologists participating in the Master's program, "The psychologist in primary care". The psychologist carried out the work in the form of an internship related to the Master's course of study.

A notice was displayed on the information board at the GP's office specifying the details of this collaborative project, in order to inform the patients before the beginning of the appointment that a psychologist would be present

The patients were also informed that they could still request to be seen only by the GP. The psychologist would not ask for any compensation from the patients for the collaboration provided within the medical office. As required by the code of professional ethics, the psychologist was obliged to maintain doctor-patient confidentiality.

Verbal informed consent was obtained from all project participants.

The intervention of the psychologist envisaged:

– Psychological listening for each person visiting the GP practice.

– Exploration of the significance of any request.
– Psychological frameworking of the observed situations.
– Exploratory intervention when needed.

The main purpose of the psychologist's intervention was not to replace the Mental Health Service for cases with evident psychic distress, but to try to give a meaning, in any case, to the patient's disorders, both in the psychic and somatic domains, within his or her relationship situation and life span.

Table 1. Intervention modality by the psychologist.

Intervention modality
– Psychological listening for each person visiting the GP practice. – Exploration of the significance of any request. – Psychological frameworking of the observed situations. – Exploratory intervention when needed. – Eventual further meeting in the GP practice for individual interviews. – Sending a proposal for an additional visit, approved by the GP and the patient, if necessary, to the mental health specialist. – Debriefing with the GP at the end of the day.

When necessary, patients were given access to an individual interview of one hour with the psychologist alone, usually by appointment on Mondays, in the family doctor's office.

It was also possible to offer listening and assistance to those patients who expressed their discomfort in somatic form, without explicit psychic discomfort, but through poor contact with their emotions, characterized by low emotional significance, colorless style, and poor expression of their needs (alexithymia).

Setting

The project, "Co-presence of a family doctor and psychologist in primary care" was conducted from January 1, 2014 to December 31, 2015 in Polcenigo in the province of Pordenone. One family doctor and one psychologist participated in this research. The psychologist sat next to the GP in their office every Thursday, for two consecutive years. A sufficiently long period of co-presence and collaboration is fundamental to establish the necessary harmony between the two professionals involved. Participation in this initiative was free and voluntary for both. Data collection was carried out from January 1, 2016 to February 28, 2016.

Participants

On Thursdays, the psychologist listened to all the patients who came to the family doctor›s office, regardless of the reason for their appointment. No patient was, therefore, a priori «excluded» from the project.

Access to individual interviews was provided in situations where the patient expressed psychological distress/suffering. The decision to take this further step was agreed upon by the psychologist, the GP and the patient himself/herself. Diagnostic criteria were used according to the classification of areas of psychosocial distress by Solano [14].

Data sources

We used the Millewin computerized archive's database of Mille Utility software (Millenium s.r.l.) to collect data on co-presence access, individual interviews with the psychologist, cost of hematochemical tests, instrumental tests and specialist visits. No statistical correlations were made.

Results

Participants

During the two years of co-presence, about 1,300 consultations were carried out. Individual interviews with the psychologist alone were proposed to a cohort of 30 patients (6 males and 24 females), who were more or less aware of having a form of psychosocial distress (Tab. 2). In total, 4 of these patients were sent to the Department of Mental Health, 5 abandoned the project after the first interview, and 21 ultimately benefited from the interviews, managing to make themselves more aware of any symptoms or disorders at that particular moment in their lives (Fig. 1). In most cases, psychologists held 4/5 individual interviews (from a minimum of 1 interview to a maximum of 13).

Table 2. Age and gender of patients involved in individual interviews.

Age	0-14	14-24	25-34	35-44	45-54	55-64	65-74	>75
Male	1	0	1	2	1	1	0	0
Female	0	2	3	6	4	4	3	2

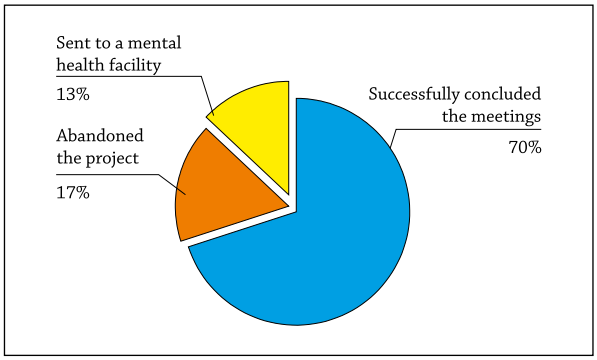

Figure 1. Results after individual interviews.

The age range of the patients who undertook individual interviews was rather wide, with the youngest being 14 to the oldest being 86. The most represented group was made up of patients between 35 and 44 years.

Main results

Most patients willingly accepted the initiative. The patients were accustomed to seeing other young doctors in training working alongside the GP. Given the many years of experience of Tutor for Family Medicine, this has perhaps facilitated the presence of the psychologist, who was well received. It simultaneously showed patients were able to understand perfectly the specific function of the psychologist compared to the GP.

In the space of two years, only one person asked to be received by the GP alone. Most of the work was carried out in co-presence (about 1,300 visits). Although the psychologist did not necessarily intervene in each of the family doctor's interactions with the patients, the lengths of the medical examinations on a co-presence day were inevitably longer, as was expected. The effort to ensure listening for every patient, on some occasions, was hampered by the workload. However, prolonged co-presence was beneficial in these situations as it gave people the opportunity to return to the office to integrate, or resume from where they had been previously interrupted, knowing when they would also find the psychologist at the appointment once again.

In certain situations, patients were given the opportunity to have an individual appointment with the psychologist, in order to deepen what was introduced and to better explore the psychosocial aspects and the relational or life experiences of the patients. The necessity of these types of individual consultations was evaluated by the GP and the patient, along with the psychologist. Despite having a greater or lesser awareness of their discomfort, the majority of the patients welcomed the proposal of having an individual interview, which was supported by both the doctor and psychologist.

The greatest number of interventions arose from patients' concerns about family relations (58%). One issue that emerged several times during the interviews was patients' difficulty in accepting detachment from significant people in their lives (usually parents or children), both living and deceased, necessary to live a sufficiently fulfilled life. In other words, patients experienced difficulty in mourning a separation (Fig. 2).

During the appointments that included the co-presence of the psychologist and GP, there was a 6% decrease in the rate of expenditure for medical investigations (hematochemical examinations, specialist visits, instrumental investigations) compared to the previous period. According to the data provided by the Pharmacy Department of Local Health Authority (ASS5) the daily defined doses (DDD) prescribed by the GP decreased by 7%, with a reduction by 10% in pharmaceutical expenditures, compared to the period prior to the presence of the psychologist (Tab. 3).

Discussion

Prolonged co-presence gave the patients an opportunity to meet the psychologist several times, gradually allowing them to get closer with the professional. Additionally, the psychologist was able to do follow-ups with patients.

The objective is to put the somatic symptom into the context of the patient's life. The disappearance of the symptom will eventually depend on finding, where possible, adequate solutions to the problems

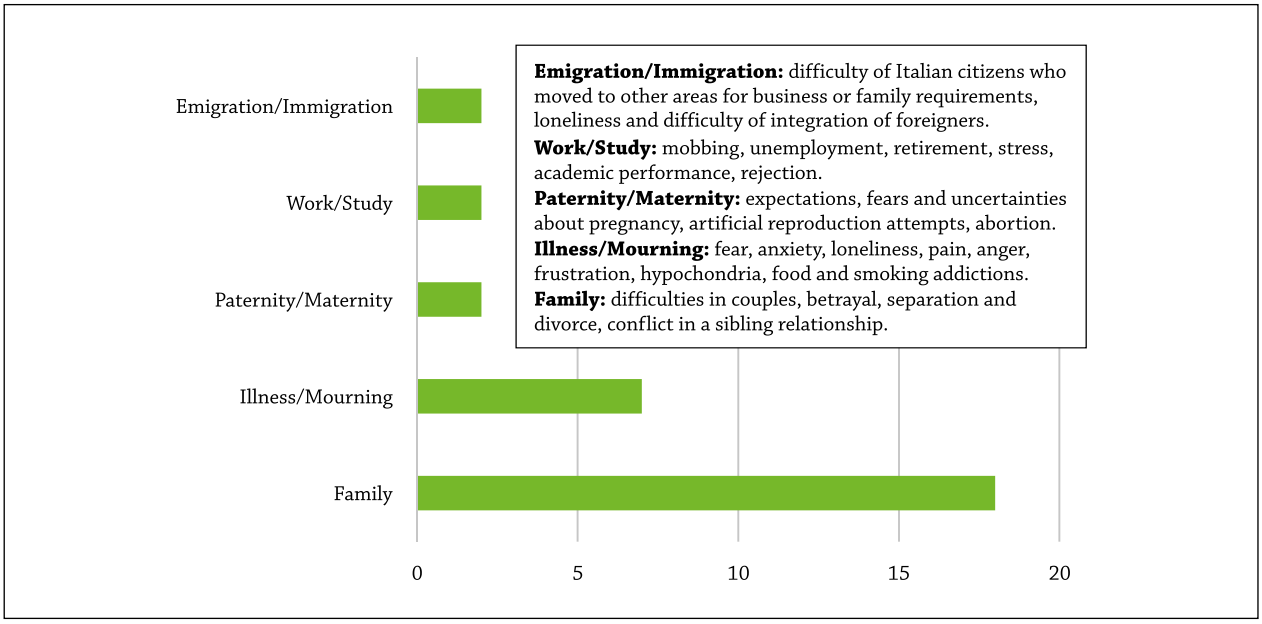

Figure 2. Areas of psychological distress in individual interviews.

Table 3. DDD variation and GP pharmaceutical expenditure (2013-15).

Year	Number of prescription packs	% variation of packs from 2013	Daily Defined Dose (DDD)	% variation DDD from 2013	Net prescription amount	% change in expenditure
2013	24.535		500.562		€ 198.200,67	
2014	22.927	-7%	464.425	-7%	€ 180.587,10	-9%
2015	23.117	-6%	467.241	-7%	€ 178.009,34	-10%

as they relate to the patient's inner and outer wellbeing. Even if the disorder does not disappear, it will not acquire the meaning of a "disease" but rather, a reaction to a problematic or unsatisfactory life situation. Over the course of months, a suitable working relationship formed between the GP and the psychologist, supported by mutual respect and esteem, trust and complicity, both from a personal and professional point of view.

The presence of the psychologist was accepted by patients because of the way it could holistically enhance the medical encounter, and because, of the addition of another medical professional's authority. The GP, likewise, found it beneficial to have support from the psychologist in dealing with those patients for whom a repetition of exclusively medical solutions could lead, over time, to a chronicity of the problems.

Mental disorders are one of the top public health challenges in the WHO European Region, affecting about 25% of the population every year. The European Mental Health Action Plan 2013-2020 proposes effective actions to strengthen mental health and wellbeing. Investing in mental health is essential for the sustainability of health and socio-economic policies in the European Region and recommends improving access to mental health services.

A Primary Care Psychologist (PCP) can reduce the gap between the need of psychological treatment and its provision. In the Netherlands, there has been a strong increase in consultations of a Primary Care Psychologist during the last years [7]. In England, there have been efforts to initiate an integration between health and psychology services [15]. In Italy, our experience with the co-presence model with the GP and the psychologist in the same room has an added value in comparison with the Dutch and the English models and their coordinated (remote team collaboration) or co-located services (where GP and psychologists operate in the same setting, but in different rooms).

In addition to effectiveness studies, economic impact assessments have also been carried out for some years. Various studies have suggested that the introduction of psychological interventions in primary care may significantly reduce health care costs related to mental disorders [16-18].

An analysis conducted by the Centre of Mental Health (UK) shows that early interventions in children in various situations of psychological distress provide an enormous economic benefit [19].

Also, a study involving adults with psychological distress carried out by the London School of Economics arrived at the same conclusions. Spending on evidence-based mental health services is an investment that will pay in quality of life and economic dividends across much of society, over many years [20].

In Italy, in the Lazio region, in an experiment similar to ours, after two years of co-presence of the psychologist in the office of a family doctor, there was a reduction of about 15% in pharmaceutical expenditures [10]. Our findings demonstrate a clear need to find a more human approach to understand the ways in which people suffer. Sometimes, it helps to understand their (and our) holistic life experiences.

Limitations

The limitations of this study included its small sample size. No statistical correlations were made. There was no parallel group for a randomized controlled trial. The data was collected in 2016.

Conclusions

This joint medical-psychological action, intervening even in the initial stages of a patient's concern, has developed as a prevention and health promotion mechanism, which can, in the most critical situations, prevent the worsening of psychic or somatic symptoms. During the visit, all of the physical and mental elements of the patients' lives were taken into consideration. Equal dignity was afforded for both and this allowed the patients to return to a more integrated vision of themselves. Thus, this encouraged them to feel free to talk more openly about themselves and their emotional experiences, without the fear of being labelled.

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SEROPREVALENCE OF TOXOPLASMA GONDII, VARICELLA ZOSTER VIRUS AND HUMAN PARVOVIRUS B19 AMONG WOMEN IN THE BIAŁA PODLASKA DISTRICT OF EASTERN POLAND

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ABSTRACT

Background: Infections in pregnant women or women planning pregnancy caused by the protozoan *Toxoplasma gondii* and the viruses *varicella zoster virus* (VZV) and human parvovirus B19 can be a danger to the fetus.

Aim of the study: The aim of the study was to determine the serological status of women of childbearing age in relation to *T. gondii,* VZV and human parvovirus B19 in a region of Eastern Poland (Biała Podlaska District).

Material and methods: The study group consisted of 174 women aged 19 to 35 (average 23, SD 3.68) from the Biała Podlaska District. Anti-*T. gondii* IgM/IgG antibodies, anti-VZV IgG and anti-human parvovirus B19 IgG were detected by ELISA.

Results: Serological screening revealed that the most common antibodies were anti-VZV and anti-parvovirus B19 (in 96% and 60.9% of women, respectively). Anti-*T. gondii* antibodies were found in 28.6%. No correlation was found between the presence of anti-*T. gondii*, human parvovirus B19, and VZV antibodies and the age of the examined women, their place of residence, and their education.

Conclusions: About 4%, 39% and 71.2% of women participating in this study were still susceptible to infection with VZV, human parvovirus B19, and *T. gondii,* respectively. It is therefore important to address health education primarily in women of childbearing age in order to help them undertake relevant measures for prevention of *T. gondii*, human parvovirus B19 and VZV infection.

KEYWORDS: human parvovirus B19, toxoplasma, herpesvirus 3, human, Poland, women

Background

Infections in pregnant women or women planning pregnancy caused by the protozoan *Toxoplasma gondii* and the viruses *varicella zoster virus* (VZV) and human parvovirus B19 can be a danger to the fetus. *Toxoplasma gondii* infections are mainly dangerous to pregnant women due to the potential transmission of the maternal infection through the placenta to the fetus, which leads to development of congenital toxoplasmosis in the fetus [1]. In rare cases, the fetus can be infected from a mother who was seropositive before pregnancy due to reinfection with a more virulent protozoan strain or recurrence of chronic infection, which can occur in immunosuppressed pregnant women [2]. In the case of primary infection, *T. gondii* exhibits affinity mainly to the central nervous system, eye, skeletal muscle, cardiac muscle, and placenta [3].

Varicella zoster virus (VZV), in accordance with the applicable nomenclature *Human alphaherpesvirus 3*, belongs of the *Herpesviridae* family and cause infections usually acquired during childhood. VZV is the etiological factor of chickenpox. However, the primary infection

of VZV in pregnant women can cause congenital varicella syndrome (CVS) [4], maternal varicella pneumonia, and neonatal varicella [5]. The symptoms of CVS in newborns are low birth weight, limb hypoplasia, eye disorders, neurological abnormality, and backwardness [6].

Human parvovirus B19 (*Parvoviridae* family) infects through the respiratory system, blood transfusion, and blood products, and vertical transmission from mother to fetus [7,8]. The percentage of people with anti-human parvovirus B19 antibodies increases with age but a lot of people become infected during their childhood and adolescence [7,9]. Most human parvovirus B19 infections are asymptomatic. However, in 3% of infected pregnant women it can cause severe congenital anomalies to the fetus, fetal anemia, non-immune hydrops fetalis, intrauterine fetal death and spontaneous abortion [8,10]. Virus infection can occur any time during the pregnancy period. However, the highest risk of fetal loss is during the second trimester [10].

In 2015, 41 cases of congenital toxoplasmosis were reported in total in the European Union: in the Czech Republic, Germany, Hungary, Ireland, Lithuania, Poland, Slovenia, and the United Kingdom. France reported data with a 2-year delay and there were 216 confirmed congenital toxoplasmosis cases in 2014 [11]. As shown by the data from the National Institute of Public Health – National Institute of Hygiene, 19 cases of congenital toxoplasmosis were recorded in 2016 in Poland (incidence: 4.97 per 100 000 live births), which is 4 cases more than in 2015. Chickenpox was reported in 3419 women between the ages of 20 and 39 who were not vaccinated, and 1 case of congenital varicella was recorded in 2016 in Poland (incidence: 0.26 per 100 000 live births) [12]. As shown by data from the National Institute of Public Health, 69,357 vaccinations against varicella were made in 2016 in Poland, 1206 of which were performed on people over 20 years of age. Vaccination against VZV is recommended for women planning pregnancy who have not had chickenpox [13]. Regular recording of infections caused by human parvovirus B19 is not carried out.

Aim of the study

The aim of the study was to determine the serological status of women of childbearing age in relation to *Toxoplasma gondii*, VZV and human parvovirus B19 in a selected region of Eastern Poland.

Material and methods

Study design

The National Institute of Public Health – National Institute of Hygiene, Department of Epidemiology and Surveillance of Infectious Diseases registered cases of toxoplasmosis and congenital toxoplasmosis until 2008. In 2008, 19 cases of toxoplasmosis (incidence of 0.88 / 100,000) and 93 cases (incidence of 7.8 / 100,000) were found in the Lubelskie Voivodeship in the Podlaskie Voivodeship, respectively. It was a significant number of cases in the country. Since 2009, only cases of congenital toxoplasmosis have been recorded [14]. The exposure of women, especially of childbearing age, to *T. gondii* infections has not changed.

Setting

The Biała Podlaska region of Eastern Poland was selected as the research area due to its location on the border of the two mentioned provinces. Blood samples were collected in May 2015 by venipuncture. Sera were separated by centrifugation and stored at -20° C until analysis. Whole collected samples were tested by enzyme-linked immunosorbent assay (ELISA). The study was approved by the Bioethical Committee of the Medical University of Lublin, permission No. KE-0254/183/2014.

Participants

The study group consisted of 174 women aged 19 to 35 (average 23, SD 3.56) in the selected region of Eastern Poland (Lublin province, Biała Podlaska District): 95 women aged 19 to 34 (average 22, SD 2.93) lived in the countryside and 79 women aged 19 to 35 (average 23, SD 4.12) lived in the city of Biała Podlaska.

Variables

Anti-*T. gondii* IgM antibodies were detected by ELISA (Euroimmun, Germany). Results above or equal to 1.1 (ratio) were considered as positive, below 0.8 (ratio) as negative, whereas borderline results were ≥0.8 and <1.1 (ratio). The presence of anti-*T. gondii* IgG was detected by ELISA (Euroimmun, Germany). Results above or equal to 11 international units/ml (IU/ml) were considered as positive, below 8 IU/ml as negative, whereas borderline results were ≥8 and <11 IU/ml.

The presence of anti-VZV IgG was detected by ELISA (Euroimmun, Germany). Results above or equal to 110 IU/ml were considered as positive, below 80 IU/ml as negative, whereas borderline results were ≥80 and <110 IU/ml.

The presence of anti-parvovirus B19 IgG was detected by ELISA (Euroimmun, Germany). Results above or equal to 5.5 IU/ml were considered as positive, below 4 IU/ml as negative, whereas borderline results were ≥4 and <5.5 IU/ml. The tests were carried out and the results were interpreted according to the manufacturer's instructions.

Statistical methods

The data obtained were analyzed statistically using Statistica v.10 software (Chi-square test, Kruskal-Wallis test). The assumed level of significance was p=0.05.

Results

Outcome data

Among the participants of the investigations, 45.4% (79/174) lived in the city of Biała Podlaska and 54.6% (95/174) lived in the countryside.

Secondary school education was declared by 70.5% (67/95) of participants who lived in the countryside and 64.5% (51/79) of participants who lived in the city. Higher education was declared by 29.5% (28/95) who lived in the countryside and 35.4% (28/79) who lived in the city of Biała Podlaska.

Serological screening revealed that antibodies against VZV and human parvovirus B19 were the most common, being observed in 96% (167/174) and 60.9% (106/174) of participants, respectively. Positive results for anti-*T. gondii* antibodies only in the IgM or IgG class were found in 1.1% (2/174) and 23.5% (41/174) of the examined women, respectively. Simultaneous presence of anti-*T. gondii* IgM and IgG was reported in 4% (7/174) of participants.

Of participants who were positive for VZV antibodies, 27.6% (484/174) were positive for VZV only and 68.3% (119/174) were positive for human parvovirus B19 and/or *T gondii* as well. Human parvovirus B19 and VZV antibodies were detected in the same participants most frequently (39.1%, 68/174), whereas *T. gondii* and VZV antibodies were detected together less frequently (9.8%, 17/174). There were some samples (12.6%, 22/174) with concomitant *T. gondii,* human parvovirus B19, and VZV antibodies. Detailed results are shown in Table 1.

Table 1. Results of serological tests for *T. gondii*, VZV, and human parvovirus B19 – general screening.

anti-*T. gondii*	anti-*T. gondii*	anti-human parvovirus B19	anti-VZV	N(%) 174(100)
IgM	IgG			
-	-	+	+	68(39.1)
-	-	-	+	48(27.6)
-	+	+	+	22(12.6)
-	+	-	+	17(9.8)
-	-	+	-	6(3.4)
+/-	+	+	+	3(1.7)
-	-	+	+/-	2(1.1)
+	+	-	+	2(1.1)
+	+	+	+	2(1.1)
-	+	+	-	1(0.6)
-	+/-	+	+	1(0.6)
+	-	-	+	1(0.6)
+	-	+/-	+	1(0.6)
9(5.2)	48(27.6)	106(60.9)	167(96.0)	

+ positive result, +/- borderline result, - negative result

Main results

Results of serological tests in women living in the rural areas

Anti-*T. gondii* IgM antibodies were detected in 2.1% of IgG-free samples (2/95) whereas anti-*T. gondii* IgG antibodies found in 26.3% samples: 25.3% (24/95) were positive and 1.05% (1/95) were borderline. The simultaneous presence of anti-*T. gondii* IgM and IgG was reported in 2.1% of samples (2/95).

56.8% (54/95) of study subjects tested positive for human parvovirus B19 antibodies, 1.05% (1/95) were borderline and 42.1% (40/95) were seronegative.

VZV antibodies were detected in 98.9% of women: 97.9 % (93/95) were positive and 1.05% (1/95) were borderline. Detailed results are shown in Table 2.

Table 2. Results of serological tests for *T. gondii*, VZV, and human parvovirus B19 in women living in rural areas.

anti-*T. gondii*	anti-*T. gondii*	anti-human parvovirus B19	anti-VZV	N(%) 95(100)
IgM	IgG			
-	-	+	+	37(38.9)
-	-	-	+	27(28.4)
-	+	+	+	14(14.7)
-	+	-	+	10(10.5)
+	+	-	+	2(2.1)
-	+/-	+	+	1(1.05)
-	-	+	+/-	1(1.05)
-	-	+	-	1(1.05)
+	-	+/-	+	1(1.05)
+	-	-	+	1(1.05)
4(4.2)	27(28.4)	55(57.9)	94(98.9)	

+ positive result, +/- borderline result, - negative result

Results of serological tests in women living in the city

Positive results for anti-*T. gondii* antibodies only in the IgG class were found in 20.2% (16/79) of the examined women. Simultaneous presence of anti-*T. gondii* IgM and IgG was reported in 6.3% (5/79). Detailed results are shown in Table 3.

Table 3. Results of serological tests for T. gondii, VZV, and human parvovirus B19 in women living in the city.

anti-*T. gondii*	anti-*T. gondii*	anti-human parvovirus B19	anti-VZV	N(%) 79(100)
IgM	IgG			
-	-	+	+	31(39.2)
-	-	-	+	21(26.6)
-	+	+	+	8(10.1)
-	+	-	+	7(8.8)
-	-	+	-	5(6.3)
+/-	+	+	+	3(3.8)
+	+	+	+	2(2.5)
-	-	+	+/-	1(1.3)
-	+	+	-	1(1.3)
5(6.3)	21(26.6)	51(64.5)	72(91.1)	

+ positive result, +/- borderline result, - negative result

VZV antibodies were detected in 91.1% of women: 89.9% (71/79) were positive and 1.3% (1/79) were borderline. Anti-human parvovirus B19 IgG antibodies were found in 64.5% of samples (51/79).

Other analyses

No correlation was found between the presence of anti-*T. gondii*, human parvovirus B19, and VZV antibodies and the age of the examined women, their place of residence, or their education.

Discussion

Key results

The percentage of subjects seropositive for *T. gondii* varies within countries, regions, and communities within regions. The seroprevalence of *T. gondii* in the human population is low in North America and northern Europe (10–30%) and moderate in the countries of central and southern Europe (30–50%) [15]. In Poland, the seroprevalence of *T. gondii* is estimated at 36–66.9%, depending on the place and region of residence [1, 2, 16]. In accordance with the guidelines adopted in Poland, detection of specific antibodies is recommended in the case of native parasitic diseases, including toxoplasmosis. The basic tests include determination of the concentration of IgM, IgG, and IgA as well as IgG avidity assays. The recommendations define cases of primary *T. gondii* invasion. Confirmed cases are associated with seroconversion between two consecutive tests performed at a 2–3-week interval. In pregnant women, the infection is confirmed when both serum samples have been examined during pregnancy and probable when one of the samples was analyzed before pregnancy. Determination of the avidity of IgG antibodies is also recommended, as it reveals the character of the anti- *T. gondii* response and the time of infection acquisition [2,17,18]. This type of serological testing is particularly important in pregnant women or those planning pregnancy due to the potential of transmission of the infection to the fetus [19].

Zajkowska et al. reported that the *T. gondii* IgG antibodies were detected in 51% of pregnant women or women planning pregnancy; 32.7% were positive for IgG and IgM [7]. In this study, anti-T. *gondii* IgM/IgG antibodies were detected in 28.6% of women of childbearing age working or studying in Biała Podlaska (Lublin Province). 1.1% of these were anti-*T. gondii* IgM antibodies, indicating an early immune response. There was no correlation between the presence of anti-*T. gondii* IgM/IgG antibodies and the place of residence of the women. Similarly, the investigations conducted by Lewicka et al. did not demonstrate a statistically significant correlation between the place of residence of the analyzed pregnant women and the serological groups related to their immune status towards *T. gondii* [20].

The study showed that 71.2% of women had no contact with this protozoan. Since seronegative women are at a high risk of acquisition of *T. gondii* infection, education in prophylaxis is essential [1]. As shown by investigations, *T. gondii* was diagnosed in pregnant women who were seronegative before pregnancy, and the level of the infection was higher in patients living in rural areas (1.1%) than in cities (0.27%) [2]. Results of a study conducted among young people studying in Poland and Slovakia showed insufficient knowledge of the routes of *T. gondii* transmission. More than half of respondents were unaware of the routes of human *T. gondii* infection (56.5%) and the route of fetus infection with this protozoan (57.5%) [21].

Parvovirus B19 in adults and children causes mild infections; however, fetal infection may have serious consequences. Infection spreads through the droplet route and most pregnant women get infected from young children. Laboratory diagnostics of parvovirus B19 infection in pregnant women is performed in suspected B19V infection in case of exposure to the infection; suspected symptomatic B19V infection in pregnancy (clinical symptoms in the pregnant or fetus); or miscarriage of unknown cause. Specific laboratory diagnostics for parvovirus B19 infection are based on the identification of anti-B19V IgM/IgG antibodies in ELISA and Western blot tests. In diagnostic tests using molecular biology methods, viral DNA is detected [22]. Chickenpox is diagnosed on the basis of clinical features and epidemiological history; however, in doubtful cases laboratory methods are used: serological or PCR. Anti-VZV antibodies are determined using fluorescence test for antibodies against membrane antigen, latex agglutination and ELISA [23]. In the course of chickenpox, the diagnostic tests show the production of IgA, IgM (to 2 days after the onset of the rash) and the IgG antibody that can survive to the end of life of the patient [24]. The highest concentration of anti-VZV antibodies occurs 4–8 weeks after infection. VZV infection can be confirmed by at least a 4-fold increase in antibody titers in serum samples taken during the acute period of the disease and during the recovery period. Persistence of anti-VZV antibodies in infants over 8 months old suggests intrauterine chickenpox infection. Skin scraping, alveolar fluid, airway secretions, and cerebrospinal fluid by PCR are also useful in diagnosing VZV infection [23]. Chickenpox vaccination is recommended for those who have not had chickenpox and have not been vaccinated, and women who have not had chickenpox and are planning to become pregnant [25]. It is estimated that after contact with VZV, 90% of adult Americans and Europeans have protective antibodies [26]. Similarly, anti-parvovirus B19 IgG antibodies indicate previous infection, which leads to lifelong immunity [8]. In the research conducted by Pembrey et al. the differences were shown in the seroprevalence of VZV among pregnant women according to ethnic group and country of birth (women born in the United Kingdom: white British 94.8% and South Asian 95; women born in South Asia 89.6%) [4]. Talukder et al. estimated seropositivity for VZV among white

British women at 93.1% [27]. A study conducted by van Rijckevorsel et al. showed a high seroprevalence of VZV IgG antibodies in the Amsterdam population by age categories: 18–34 years 92%, 35–44 years 95%, 45–54 years 93% [28]. Our investigation showed a very similar level of seroprevalence for VZV among women (96%). There was no correlation between the presence of anti-VZV IgG antibodies and the place of residence of the examined women and their age and education. Studies published by Cieślik-Tarkota et al. showed that seroprevalence for anti-VZV IgG in pregnant women from Śląskie Voivodeship (Poland) in the years 2011–2015 was 69.2% [24].

Serological screening revealed that the IgG antibodies were recorded against parvovirus B19 in 60.9% of participants. These results are similar to the results of Siennicka's research conducted on a similar age group (prevalence of 50–80%) [29]. Similar results were reported by others: 69.1% [8] and 52.6% [7].

Limitations

We did not analyze the issues related to having children and the contact of women with pets, especially cats. Analysis of these data in connection with knowledge of toxoplasmosis may be relevant. This issue will be considered in future studies.

Interpretation

About 4%, 39% and 71.2% of women participating in the study are still susceptible to infection with VZV, human parvovirus B19, and *T. gondii,* respectively.

Generalizability

It is therefore important to address health education primarily in women of childbearing age in order to help them undertake relevant measures for prevention of *T. gondii*, human parvovirus B19 and VZV infection.

Conclusions

About 4%, 39% and 71.2% of women participating in the study are still susceptible to infection with VZV, human parvovirus B19, and *T. gondii,* respectively. It is therefore important to address health education primarily in women of childbearing age in order to help them undertake relevant measures for prevention of *T. gondii*, human parvovirus B19 and VZV infection.

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STOPPING HEMORRHAGES FROM THE LIMBS: RAISING EFFICIENCY THROUGH TRAINING ON UNFIXED HUMAN PREPARATIONS

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Hemorrhages from the limbs are one of the most frequent injuries endangering human life. Immediate help from witnesses and the emergency services is necessary in such cases. Developing the skill of stopping the bleeding manually requires adequate training. One of the modern methods for such training is the use of cadavers, which accurately imitate real patients.

Aim of the study: The aim of this research is to evaluate the effectiveness of learning to stop the bleeding manually on freshly frozen cadavers.

Material and methods: Thirty-one people who had already trained on medical phantoms took part in the study. The participants stopped the hemorrhage on the cadavers twice and the time taken was recorded. The second attempt was performed after a short briefing from a teacher. After the training, the participants assessed their satisfaction with the course on a scale of 1 to 5.

Results: On the first attempt, the average time of stopping the bleeding was 2.06 seconds (SD ± 1.61); the longest time was 10 seconds and the shortest was 0.7 seconds. On the second attempt, the average time was 1.52 seconds (SD ± 0.59); the longest time was 4.1 seconds and the shortest was 0.8 seconds. The average rating of course satisfaction among the respondents was 4.48 points (SD ± 0.88).

Conclusions: This research showed that training on cadavers increased the quickness of reaction while stopping a hemorrhaging. Moreover, it indicated that training on medical phantoms does not assure optimal ability to perform rescue procedures.

KEYWORDS: cadavers, bleeding, hemorrhage, paramedic, learning, education

Background

Medical emergency teams come across many different patient injuries, and the most common are hemorrhages from the limbs [1]. Hemorrhages pose a serious threat to human health and life, because inadequate or delayed medical aid can lead to hypovolemic shock and even death of the victim. The first and most basic procedure is applying manual local pressure to the place of hemorrhage, then putting on a pressure dressing and, if necessary, applying a tourniquet. In this case, quick help of both eyewitnesses as well as the emergency services is necessary. This condition requires the implementation of numerous medical interventions that can be performed, among others, by medical rescuers who

constitute the main composition of emergency medical teams [2]. However, all actions must be taken as soon as possible, and performed accurately and correctly, and this requires adequate training [3].

Unfortunately, paramedics' training varies depending on the availability and advancement of equipment in the form of training phantoms or other medical equipment. Learning during internships in medical emergency teams is not always possible. Conditions that prevail at the scene of the incident often make it impossible to conduct the same education for all paramedics due to the necessity of immediate execution of appropriate rescue procedures on the patient, and the lack of ability to practice them multiple times. In addition, it is often unrealistic for several people to repeat the medical procedures on one injured patient for training purposes.

Nowadays, more and more professional and advanced simulators reflecting the human body are available, but they are not able to replicate the structures of the human body. To ensure the best results, education should aim to create maximum realism. One contemporary teaching method is to provide training on cadavers, i.e. unfixed human preparations that faithfully replicate the structures of a real patient. They provide the opportunity to train on many medical procedures, including iniections of arterial and venous vessels, establishment of intraosseous approach, endotracheal intubation, cricothyroidotomy, defibrillation and rapid trauma examination. Available studies indicate a high level of satisfaction, and better mastery of the ability to perform various medical procedures, by training on human cadavers [4–7].

Aim of the study

The aim of the study is to evaluate the effectiveness of learning to manually stop limb hemorrhage on freshly frozen cadavers that have been thawed and appropriately prepared 24 hours prior to the start of the study.

Material and methods

Study group

The study was attended by 31 students who were studying Emergency Medical Services at the University of Natural Sciences and Humanities in Siedlce, Poland, who previously been trained in stopping hemorrhages at the simulation laboratory.

Materials

The research tools were cadavers, i.e. unfixed human preparations that came from the USA. These preparations were previously tested for the presence of HBV, HCV, HIV and syphilis and found to be negative, so they were safe for participants of the study. During transport, the preparations were frozen and the day before the examinations they were thawed in the dissecting room. They therefore preserved the natural appearance and structure of the tissues.

Methods

Before examination, the upper limb was appropriately prepared. The upper limb was amputated evenly at the level of the forearm. Radial and ulnar arteries were dissected. The vessels were rinsed with water to remove the remaining blood, so that the clots would not create embolic material that could affect the results of the study. Radial and ulnar arteries were ligated in such a way that they would not move during several dozen attempts to manually stop the hemorrhage. Additionally, to allow the simulated blood to flow through the limb, a drain was inserted into the subclavian artery through which the fluid was introduced.

The study was divided into two parts. The first was the manual stopping of the hemorrhage. The time of examination was measured from the beginning of the task until the bleeding was effectively stopped. Then, the study group took a short class, during which the operation on the cadavers was demonstrated. After that, a second attempt to stop the hemorrhage with time measurement was performed. The results were subjected to statistical analysis (Wilcoxon's test for related variables). At the end of the study, the participants were asked to assess their satisfaction of with the training on a scale of 1 to 5 (with 5 indicating high satisfaction).

Results

Characteristics of the study group

The study was conducted on 31 students in the field of emergency medical services, including 10 women (32.26%) and 21 men (67.74%). The average age of participants in the study was 21.58 years (SD ± 3.23). Before the examination, the students took part in classes on the manual stopping of hemorrhages.

The first attempt

In the dissecting room, on a stand with the upper limb preparation, the students attempted to manually stop of the hemorrhage. The average time to successfully stop the hemorrhage in this trial was 2.06 seconds (SD ± 1.61). The longest time was 10 seconds and the shortest was 0.7 seconds.

The second attempt

Before the second attempt, a short (20-minute) lecture was carried out, addressing the correct method of manually stopping the hemorrhage along with the site of pressure. Limb structures such as arteries, veins, and muscles were also discussed. Then a second attempt to stop the hemorrhage was made, giving an average time of 1.52 seconds (SD ± 0.59). In this trial, the longest time to stop the hemorrhage was 4.1 seconds while the shortest was 0.8 seconds.

Satisfaction rating

After finishing the measurements, 31 students were asked to assess their satisfaction with the study on a scale from 1 to 5 (with 5 indicating high satisfaction). The average satisfaction score was 4.48 points (SD ± 0.88).

Statistical analysis

A lack of normality of distribution was found in both measurements using the Shapiro–Wilk test ($p < 0.05$). For this reason, a statistical analysis for dependent variables (Wilcoxon test) was used, which demonstrated a statistically significant difference between the first and second attempts ($p = 0.02$).

Discussion

In many countries, medical emergency teams consist mainly of paramedics [8,9]. It depends on their skills and knowledge whether they will be able to implement the appropriate treatment for a patient who is in a state of sudden threat to health or life. One of the injuries that poses a serious threat to human life is hemorrhage [10]. A procedure for treating the victim in the event of an external hemorrhage from the limb is to apply manual pressure to the arteries as soon as possible, and then to put on a tourniquet [11]. However, medical staff need adequate training to be able to effectively stop the bleeding at the site of the incident.

At medical universities, students exercise mainly in simulation laboratories using training phantoms, which gives more and more opportunities to perform medical procedures such as placing intravenous, intraosseous or endotracheal intubation, and direct laryngoscopy. However, along with the advancement of the phantom, its purchase price has increased. An alternative way of learning is to conduct exercises on animal preparations [12]; however, this creates a lot of ethical controversies [13,14]. These days, human cadavers are the most desirable teaching tool. They are models of the natural human tissues, which allows training on many medical procedures. In the literature, there is evidence that supports the use of cadavers over phantoms because they reflect a higher level of realism in performing medical activities and lead to greater satisfaction for people taking part in classes [15–17].

This study attempted to evaluate the effectiveness of teaching the manual stopping of a hemorrhage from the amputated upper limb. For this purpose, a human limb preparation was used, which was amputated at the proximal end of the radial and ulnar bones. The technique of stopping the hemorrhage was based on manual pressure on the brachial artery.

Despite the students' preparations for the study by conducting classes in the simulation laboratory, the results were quite varied. Their average time was 2.06 seconds (SD ± 1.61) on the first attempt. Before the second attempt, the participants took part in a short lecture, during which the technique of performing pressure on the brachial artery was discussed and presented. This resulted in a reduction of the time to stop the hemorrhage, with an average time of 1.52 seconds (SD ± 0.59). Between the measurements, statistically significant differences were found (Wilcoxon test: $p = 0.02$). In addition, students were highly satisfied with participation in the study, with an average rating of 4.48 points (SD ± 0.88) on a scale of 1 to 5. The authors point to the need for further research on cadavers to determine the effectiveness of teaching other medical procedures. The acquired skills can improve the quality of help provided by medical personnel as well as by police and fire brigade [18].

Conclusions

This study shows that conducting training on the manual stopping of hemorrhages using cadavers reduces the time taken to stop the hemorrhage. It also shows that exercises on phantoms do not ensure the achievement of an optimal level of ability to perform medical procedures. Students who took part in the study declared a high level of satisfaction with the classes. In order to improve the quality of medical interventions, more opportunities to conduct exercises on cadavers should be established, which may be crucial in life-threatening situations.

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OCCURRENCE OF *LEGIONELLA* SPP. IN POLISH HOTELS BETWEEN 2009-2013 AND 2014–2016: A COMPARATIVE STUDY

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: *Legionella* spp. have been found in both natural and manmade water systems, coastal waters, thermal waters, moist soils, clays, and near wastewater discharge sites.

Aim of the study: This study aims to report a comparative, retrospective epidemiological analysis of water testing study results indicating the presence of *Legionella* spp. in Poland between 2009-2013 and 2014-2016. This study is a comparative retrospective epidemiological analysis of individual tests for the presence of *Legionella* spp. in hotels between two different time periods. The two time periods being compared in this study are between 2009-2013 (n=369 hotels) and 2014-2016 (n=174 hotels). Reporting has been performed in accordance with the STROBE checklist.

Material and methods: Hot water samples were collected by employees of the Sanitary and Epidemiological Station in Poland as part of routine water quality monitoring. Samples were taken from the water supply systems of 369 hotels, representing 19.59% of total hotels in Poland, from January 2009 until December 2013. Samples were taken from the water supply systems of 174 hotels, representing 7.51% of total hotels in Poland, from January 2014 until December 2016.

Results: The percentage of facilities classified as Group I remained comparable for the period between 2009 and 2013 compared to the period between 2014 and 2016. The percentage of facilities classified as Group II, however, showed a clear upward trend between 2014 and 2016 compared to the time period between 2009 and 2013. The percentage of facilities classified as Group III showed a clear downward trend between 2014 and 2016 compared to the time period between 2009 and 2013.

Conclusions: The colonization rates observed in this comparative study indicate that the aquatic environment in these facilities requires constant monitoring to lower the risk of legionellosis. The increased colonization of hotel water networks with *Legionella* spp. is a serious health problem that requires constant monitoring.

KEYWORDS: Legionnaires' disease, *Legionella pneumophila*, water

Background

Legionella species are naturally found in aquatic environments and these environments serve as the reservoir from which the bacteria spread. *Legionella* spp. inhabit manmade utility systems that carry both hot and cold water. *Legionella* spp. are found in natural and artificial water systems, groundwater, coastal seawaters, thermal waters, moist soils and clays, and near wastewater discharge sites. The optimal temperature range for bacterial growth is between 32°C and 42°C. This temperature range likely affects the bacteria's ability to multiply within protozoan cells. The presence of

protozoa in natural aquatic environments promotes *Legionella* growth and persistence by providing a host [1,2]. *Legionella* spp. enter water supplies and distribution systems through water treatment plants. Once inside, bacteria can rapidly multiply inside water supply and distribution systems. Artificial reservoirs for *Legionella* spp. also include water massage equipment like pearl pools, water heating and cooling circuits associated with air conditioning equipment, refrigeration towers, steam condensers, and medical apparatuses like respiratory devices, nebulizers, inhalers, dialysis equipment, and dental turbines. *Legionella* spp. can inhabit moisturizing equipment, fountains, sprinklers, car washes, moisturizing systems and other equipment with the ability to produce aerosols less than 5 μm in diameter [3].

Legionella spp. can also be transmitted through the oil-water mist generated by installation of compressed air. Modern swimming pools that are part of recreational complexes are a great threat to public health if they contain *Legionella* spp. Many recreational complexes create additional implements to attract consumers, and these can harbor *Legionella* spp. Geysers, water whips, underwater massage systems, cascades, artificial rivers, slides, whirlpool baths, and saunas are all potential reservoirs for *Legionella* spp. Currently, most hotels have a recreation area equipped with such facilities [4–6].

The implementing act for the Law on collective water supply and collective wastewater disposal of 7 June 2001 is a Regulation of the Minister of Health regulating the quality of water intended for human consumption. This act implements Directive 98/83 EC of 3 November 1998 (OJ L 330 of 5.12.1998) concerning the quality of water intended for human consumption. The act requires the Member States of the European Union to report every three years on the quality of water intended for human consumption. The Regulation also specified that hot water meet a series of requirements concerning the presence of microbiological organisms. Due to the epidemiological threat of Legionnaires' disease and the increase in cases of the disease, the Regulation requires that hot water be tested for the presence of *Legionella* spp. Aerosol water-air droplets between 2.0 to 5.0 μm in diameter are the main sources of transmitted *Legionella* infection for humans. Droplets containing invasive forms of *Legionella* bacteria are aspirated into the human respiratory system, causing infection [7,8].

Aim of the study

The aim of this study was a comparative retrospective epidemiological analysis of water testing results wherein water samples from hotels were tested for the presence of *Legionella* spp. between two different time periods in Poland. The samples were collected and testing as part of routine hotel water monitoring, and collected and tested between 2009 and 2013 and between 2014 and 2016. The testing was performed in by Poland's State Sanitary Inspectorate. The study findings were reported according to the STROBE checklist.

Material and methods

Study design and sampling

Hot water samples were collected by employees of the local competent Sanitary and Epidemiological Station in Poland as part of routine water quality monitoring. The authors of this paper thank the State Sanitary Inspectorate for making the results of this research available. Arbitrary distribution of the research results was adopted according to the following guidelines. The examined hotels were arbitrarily divided into three groups:

- group I - where a negative result was obtained from each of the hot water samples taken (samples with <100 CFU/100 ml);
- group II - where from the hot water samples taken results were obtained once positive and negative (in which values >100 CFU/100 ml as well as <100 CFU/100 ml were found);
- group III - where a positive result was obtained each time from hot water samples (containing an abnormal number of Legionella spp. in which >100 CFU/100ml was found).

Date collection

Samples were collected from the water supply systems of 369 hotels, representing 19.59% of total hotels in Poland, between January 2009 and December 2013. During the second time period assessed in this study, samples were collected from the water supply systems of 174 hotels, representing 7.51% of hotels in Poland, between January 2014 and December 2016 [9,10]. The number of objects surveyed is a representative sample for objects of this type in Poland.

Standards

All testing was performed by the Sanitary Inspection laboratories. In the Sanitary Inspection laboratories, samples were tested in accordance with the applicable standards and legal acts enforced at the time of the study. Specifically, samples were tested in accordance with: 1) PN-EN ISO 11731-2:2008 Water quality. Detection and enumeration of legionella – Part 2: Part Direct membrane filtration for waters with low bacterial counts 2) PN-ISO11731 December 2002 Water quality. Detection and enumeration of the genus *Legionella* 3) PN-EN ISO19458:2007 Water quality. Sampling for microbiological analyses 4) Regulation of the Minister of Health of 29 March 2007 on the quality of water intended for human consumption (OJ No 61, item 417 as amended) 5) Regulation of the Minister of Health of 13 November 2015 on the quality of water intended for human consumption (OJ 2015, item 1989) 6) Regulation of the Minister of Health of 7 December 2017

on the quality of water intended for human consumption (OJ 2017, item 2294).

Statistical analysis

The results of water testing for the occurrence of *Legionella* spp. was compared between the two different time periods when testing was performed, between 2014 and 2016 and 2009 and 2013. The results were compared and the statistical differences were analyzed. Statistical analysis was carried out using STATISTICA 7.1. The Pearson's Chi square independence test was applied using $p < 0.05$ as the level of significance.

Results

Legionella spp. risk assessment in the studied objects

The sample results were categorized into groups indicated whether they were positive, negative or positive and negative for the presence of *Legionella* spp., as illustrated in Fig. 1. When the tested samples collected between 2014-2016 were compared to the samples collected between 2009-2013, the percentage of samples classified as Group I (negative) were the same, or comparable [11]. The percentage of samples in Group II (negative and positive) showed a clear upward trend. In contrast, the percentage of samples in Group III (positive) showed a clear downward trend. These data show that it is unclear whether the applied methods in place to eradicate *Legionella* spp. from hotel drinking water are sufficient.

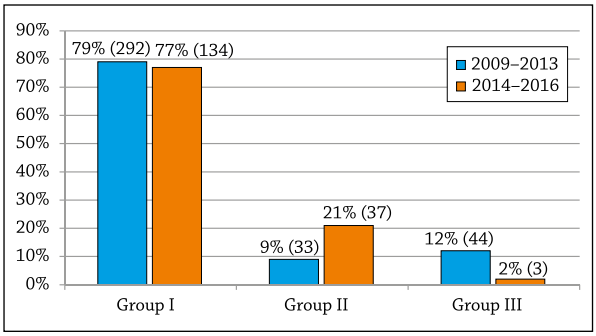

Figure 1. *Legionella* spp. risk assessment in hotels between 2009 and 2013 compared to 2014 and 2016.

The average number of *Legionella* spp. colonies in water samples collected between 2014 and 2016 was significantly higher than water samples collected between 2009 and 2013 (Tab. 1).

Discussion

Factors most likely to affect the occurrence and persistence of *Legionella* spp. in hot water systems include the physiochemical qualities of the water and the maintenance and operation of the colonized object. For example, colonization can be impacted if an artificial water system is used seasonally, if sediment is allowed to accumulate within the system, and if water is stagnant inside the system. Colonization can also be affected by failure of the system to meet temperature requirements that minimize colonization.

Hotels are facilities where travelers stay on a temporary basis. Stress incurred by travelers throughout their journey can result in compromised immune systems in travelers, resulting in increased susceptibility to infections like those caused by *Legionella* spp. [12]. The results of this study indicate that Polish hotels are facilities in which upward trends in *Legionella* occurrence have been observed. This may main that the methods in place to eradicate bacteria from the hotel water system is not functioning properly, or is insufficient. Other studies have indicated that hotel water systems may be reservoirs for *Legionella* spp.

Szczepanek et al. conducted a study testing hot water installation systems in 228 facilities that provide hotel services in Świętokrzyskie voivodeship. A large amount of *Legionella* spp. was found in 19.2% of the total number of samples taken, indicating that bacteria were present in the water sampled from 44 hotels [13]. Hotels outside Poland have also been implicated as reservoirs for *Legionella* spp. Research conducted by Kyritsi et al. in 51 Greek hotels showed the presence of *Legionella* spp. in 38 hotels (75% total samples) [14]. Özen et al. conducted research in 56 hotels located in the tourist region of Antalya, Turkey, and found *Legionella* spp. in 10% of the samples analyzed, indicating the presence of bacteria in the water of 6 hotels [15]. Fragoua et al. investigated 9 hotels in Patras, Greece. The hotels selected for the study had between 50 and 100 rooms. The colonization of the water network with *Legionella* spp. was detected in 5 hotels (55.5% of samples) [16]. Studies by other Greek authors, conducted in 67 hotels with a total of 518 hot water samples taken, showed colonization of the water networks in 43 hotels (64.1% of samples), representing 35.8% (181) of the analyzed hot water samples [17]. De Filippis et al. analyzed 160 water samples from 36 recreational facilities with swimming pools. 10 hotels (57.1% of samples) and 7 sports centers (41.2% of samples) were the most contaminated with *L. pneumophila* [18].

Table 1. Comparing the amount of *Legionella* spp. detected in hotel water samples collected between 2009 and 2013 to samples collected between 2014 and 2016.

Research period	Number of hotels	Average number of colonies	Standard deviation (SD)	Standard error (SE)
2009-2013[1]	369 (19.56% hotels in Poland)	576.39[1]	3899.05	180.04
2014-2016[1]	174 (7.51% hotels in Poland)	932.60[1]	3043.61	207.09

[1] Z=2.12; p=0.0337*

Studies carried out by Napoli et al. in 305 Italian hotels detected bacteria in as many as 66.9% (204) of hotels. A total of 5009 water samples were taken and *Legionella* spp. were detected at 36.5% (1828 samples). Among the positive samples containing *Legionella* spp., bacteria within the range of 100-1000 CFU/L were detected in 30.6% of samples, or 1533 total samples. Bacteria within the ranges of 1000-10,000 CFU/L were detected in 44.6% of samples, or 2234 total samples. Bacteria present at over 10,000 CFU/L were detected in 24.8% of samples, or 1242 total samples [19]. Rakić et al. analyzed 304 hot water samples from 3 hotels in southern Croatia. This study showed the presence of *Legionella* spp. in 20.3% of hotels, representing 62 hotels. The *Legionella* bacteria were present in the range of 500-13,000 CFU/L in these samples [20].

The choice of an appropriate *Legionella* spp. eradication method should be adopted by those maintaining hotel water networks. Future maintenance and the subsequent consequences of wear over time should be anticipating by those maintaining the hotel water networks. These future considerations include increased corrosion and sediment precipitation. There are two main methods of water disinfection. Water disinfection can refer to disinfection during installation and disinfection of the installed equipment. In addition, there is chemical disinfection and physical disinfection. The chemical methods most commonly used in routine disinfection include the use of chlorine and chlorinated compounds. According to *Wanot and Krzypkowska,* chlorination should be used when other methods have failed. The effectiveness of this method depends on pH, temperature, the amount of organic compounds in the water, and the thickness of bacterial biofilms [21]. During the application of this method, halogen compounds may be formed, which pose a threat to human health [22, 23]. One of the procedures based on this method is shock hyperchlorination. Shock hyperchlorination consists of using chlorine compounds in concentrations that result in a concentration of free chlorine that is 10 mg/L. Disinfection time should consist of a two hour period at 30°C. Higher temperatures cause evaporation of chlorine. Finally, the system should be rinsed until free chlorine levels are between 0.1-0.3 mg/L at a pH of between 7.6-8.3.

Limitations of this study

This study is a comparative retrospective epidemiological analysis. This study does not account for physiochemical properties of the water sampled.

Conclusions

The major conclusion of this study were that the observed colonization rates indicate that constant monitoring of the aquatic environment is necessary to prevent the potential risk of legionellosis. The colonization of hotel water networks with *Legionella* spp. is becoming more and more common. This is a serious health problem that requires constant monitoring.

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OPOLSKIE VOIVODESHIP SECONDARY SCHOOL STUDENTS' KNOWLEDGE ABOUT FETAL ALCOHOL SYNDROME AND ITS DETERMINANTS

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ABSTRACT

Background: Alcohol consumption during pregnancy may result in a wide range of morphological and neurodevelopmental abnormalities, most notably fetal alcohol syndrome (FAS).

Aim of the study: To evaluate: (1) Opolskie Voivodeship high school students' level of knowledge on the subject of FAS (2) the factors contributing to this level of knowledge (3) sources of information about FAS which are accessible and preferred by secondary school students.

Material and methods: The study was conducted in 2018 among 228 adult students of Opole secondary schools. The authors used a diagnostic survey based on original questions they developed for the study. The students' knowledge was assessed using a four-level scale (very good, good, sufficient, and insufficient).

Results: Only 37.28% (85) of students surveyed had ever heard of FAS. A total of 135 people (59.21%) had sufficient knowledge, 57 respondents (25.00%) had a good level of knowledge, 28 respondents (12.28%) had insufficient knowledge, and 8 respondents (3.51%) had very good knowledge. The level of women's knowledge was higher than that of men (p=0.001). The majority claimed that there was a need to raise awareness of FAS (77.19%; 176). Respondents indicated they believe teachers (51.75%; 118) and family members (50.88%; 116), followed by health care workers (42.11%; 96) should be primarily responsible for this education.

Conclusions: A definitive minority of those surveyed had a good or very good level of knowledge about FAS, which indicates the necessity of increasing the education level of this group on this specific topic. Taking into account students' expectations that teachers aid in such education, FAS educational programs should be implemented at schools.

KEYWORDS: fetal alcohol spectrum disorders, adolescents, knowledge, fetus

Background

Alcohol is one of the most popular psychoactive substances worldwide and the most common teratogen. Alcohol consumption during pregnancy may result in a wide range of morphological and neurodevelopmental abnormalities, most notably fetal alcohol syndrome (FAS) [1,2]. A new study from the Centre for Addiction and Mental Health (CAMH) shows that the global prevalence of alcohol use during pregnancy was estimated to be 9.8%, and the estimated prevalence of FAS in the general population was 14.6 per 10,000 people. Every year, there are about 119,000 children born with FAS worldwide. That means that every 67 women who consumed alcohol during pregnancy would deliver a child with FAS. In Europe, FAS prevalence is 2.6 times higher than the global mean. The five countries with the highest prevalence of FAS per 10,000 people were Belarus (69.1), Italy (82.1), and Ireland (89.7) [3]. It is estimated that approximately 900 children with full-blown FAS are born in Poland every year [4].

According to data from the Centers for Disease Control and Prevention, one in 10 (10.2%) pregnant women in the United States between the ages of 18 and 44 years reports drinking alcohol in the past 30 days [5]. In other research conducted in the US, it was found that 55% of the 5,036 women who participated reported

using alcohol in their first trimester, with 6% continuing use at the time of the first trimester interview [6]. Popova et al. states that Russia, the United Kingdom, Denmark, Belarus and Ireland are the five European countries with the highest alcohol use during pregnancy [3]. Other studies showed that the prevalence of maternal alcohol consumption during pregnancy is 5.5 % in Sweden, 13.6 % in Germany, between 19% and 22% in the Netherlands, and between 12 % and 63 % in France [1,7–9]. Surveys conducted in 2017 by order of the Central Sanitary Inspectorate to diagnose the level of risky health behaviors of pregnant women in Poland showed that three months before pregnancy, 23.04% of respondents drank alcohol once a month or less, 10.81% drank alcohol 2 to 4 times a month, 2.72% drank alcohol 2 to 3 times a week, and 0.61% drank 4 to 5 times a week. 4.84% of the respondents said they consumed alcohol during pregnancy [10]. However, in another Polish study, it was found that every third woman who participated tested positive for the presence of alcohol breakdown indicators (found through examining urine samples) while pregnant [4].

As we mentioned above, FAS is defined by congenital malformations caused by alcohol use during pregnancy. The term FAS was first used by Jones and Smith in 1973 [11]. A diagnosis of full FAS is made if there is documentation of the characteristic facial abnormalities, such as smooth philtrum, thin vermillion border, and short palpebral fissures, documentation of prenatal and postnatal growth deficits and documentation of central nervous system abnormalities [12]. FAS is the most serious and complex complication caused by the effects of alcohol on the fetus [13]. People with FAS typically have low birth weight, small body size, delayed speaking ability, hearing difficulties, difficulty interpreting visual stimuli, developmental anomalies in the heart, liver, kidney and genitals. Individuals with FAS may have communication and linguistic problems, attention, learning and memory problems, as well as difficulties coping with social situations and the need for spontaneous problem solving. Moreover, they typically experience a delay in social, emotional and cognitive functioning [14]. All of these factors contribute to the child's eventual ability to function in society as an adult.

The consumption of alcohol by pregnant women is particularly dangerous during the first trimester. During this period of time, serious brain damage, cell development disorders, facial deformations, heart, kidney or liver damage, or even miscarriages can occur. It has been found through many years of research on the harmful effects of alcohol during pregnancy that there is no minimum dose that can be considered safe for the fetus [15]. Women who plan to become pregnant and those who are already pregnant should avoid drinking alcohol. That is because 40–60 minutes after drinking alcohol, the concentration of the substance in the fetal blood is similar to that in the mother's [13]. The only way to prevent FAS is to avoid alcohol consumption entirely during pregnancy and in the pre-conception period by both mothers and fathers [16].

According to studies conducted in Poland in 2008 and 2009, young people have little knowledge about FAS and its risks, and they admit to frequent consumption of alcoholic beverages [17,18]. Having considered the importance of the subject and the lack of up-to-date data concerning students' level of knowledge on FAS in Poland, the authors decided to study it and look into any determining factors.

Aim of the study

The aim of the study was to establish: (1) the level of Opolskie Voivodeship high school students' knowledge on the subject of FAS (2) the factors contributing to this level of knowledge (3) sources of knowledge about FAS which are appropriate and accessible for secondary school students.

Material and methods

Study population

The study was conducted with a group of 228 students from 5 secondary schools located in the city of Opole (Opolskie Voivodeship, Poland). The inclusion criteria were: age of majority (age ≥ 18 years), secondary school attendance, and consent to participate in the study. Minors, non-secondary students, and those who did not agree to participate in the survey were excluded from it. The majority of the respondents were people aged 18 (56.11%; 128), male (61.84%; 141), self-identified as financially and materially secure (61.40%; 140) and living in large cities (35.53%; 81) or villages (38.60%; 88) (Tab. 1).

Data collection

The study was conducted in December 2018 after obtaining permission from the Institutional Review Board at the Opole Medical School, No. KB -5/PI/2019. Before the study, the students were informed about its purpose and methodology as well as the possibility for them to withdraw from it at any stage. The respondents were also assured of full anonymity and voluntary participation in the survey. The students understood that returning a completed questionnaire was tantamount to agreeing to participate.

Questionnaires

The authors used a diagnostic survey based on original questions they developed for the purpose of the study. It consisted of 6 demographic category questions regarding sociodemographic data and 20 questions concerning the students' knowledge about FAS. All of the survey questions were closed single-choice or multiple-choice questions. 1 point was given for each correct answer to a single-choice question, and 0 points for an incorrect answer. In the case of mul-

Table 1. Sociodemographic variables of the surveyed students.

Variable	n	%
Age		
18 years	128	56.14%
19 years	81	35.53%
20 years	18	7.89%
21 years	1	0.44%
Sex		
Women	87	38.16%
Men	141	61.84%
Number of persons living together in the household		
0–2	14	6.14%
3–4	148	64.91%
5–6	59	25.88%
7–8	3	1.32%
9–10	1	0.44%
No answer	3	1.32%
Material status and financial security of the family		
Very poor	0	0.00%
Poor	4	1.75%
Medium	30	13.16%
Good	140	61.40%
Very good	50	21.93%
No answer	4	1.75%
Place of residence		
Large city	81	35.53%
Medium-sized town	15	6.58%
Small town	43	18.86%
Countryside	88	38.60%
No answer	1	0.44%
Grade point average obtained in the previous school year		
6.0–5.1	26	11.40%
5.0–4.1	128	56.14%
4.0–3.1	63	27.63%
3.0–2.1	11	4.82%

tiple-choice questions, where multiple answers could be correct, points were awarded for each of the correct answers selected. Question 10 of the survey comprised 9 different true and false statements (marked from "a" to "i"), and the respondent's task was to answer these statements using a 5-point Likert scale (a, c, d, e, g). They were awarded 1 point for the reply "I completely agree", 0.75 points for the reply "I agree", 0.5 points for the reply "Neither agree nor disagree", 0.25 points for the reply "I disagree", and 0 points for the reply "I completely disagree". On the other hand, for points b, f, h and i, the scores were reversed. This way, each question was weighted equally. In each question, students could potentially obtain a score of 0 to 1 point. The questionnaire included, among other things, the following questions: Is there a safe amount of alcohol that can be consumed by a pregnant woman (if so, how much)? What health problems can children of mothers who drink alcohol during pregnancy have? In which trimester of pregnancy is drinking alcohol the most harmful?

In total, a maximum of 20 points could be obtained (this was the total number of questions). A five-level scale was used to assess the students' knowledge. Scoring from 0–10 (0–50% of possible points) meant the student had an insufficient level of knowledge; scoring from 10.1–15 (50–75% of possible points) indicated a sufficient level of knowledge; scoring from 15.1–18 (75–90% of possible points) indicated a good level; scoring from 18.1–20 (90–100% of possible points) indicated a very good level.

Statistical analysis

A comparison of qualitative variables in groups was performed using a chi-square test (with a Yates correction for tables 2x2) or Fisher's exact test, where low expected numbers appeared in the tables. A comparison of quantitative variables in two groups was performed using a Student's t-test (when the variable had a normal distribution in these groups) or a Mann-Whitney U test, otherwise. The values of quantitative variables in three or more groups were compared using ANOVA (Analysis of Variance) when the variable had a normal distribution in these groups, or a Kruskal-Wallis test, if not. After the detection of any statistically significant differences, *post-hoc* analysis with Fisher's LSD test, in cases of distribution normality, or Dunn's test, in cases where there was a lack of normality, was performed in order to identify the statistically significantly different groups. The normality of the distribution of variables was studied using the Shapiro-Wilk test. The analysis assumed a significance level of 0.05. Thus, all p-values below 0.05 were interpreted as indicating significant dependencies. The analysis was performed in R software, version 3.5.3 [19].

Results

The majority of the students who participated (94.30%; 215) said they had consumed alcohol in the past. The respondents said they had consciously used alcohol for the first time between the ages of 17–18 years (42.33%; 91), 15–16 years (34.42%; 74), 13–14 years (14.42%; 31), 11–12 years (3.26%; 7), 9–10 years (1.40%; 3). Others did not reply.

Students' level of knowledge about FAS

Only 37.28% (85) of respondents had ever heard of FAS. Most correctly stated that FAS occurs in the child (67.98%; 155), but there were also those who claimed that FAS occurs in the mother (24.12%; 55), in the father of the child (4.39%; 10) or did not know about it at all (3.51%; 8). Most of the respondents did not doubt that FAS could trigger health problems (86.84%; 198), mental problems (76.32%l; 174), emotional problems (53.07%; 121) and social problems (50.00%; 5). When asked how much alcohol a pregnant woman can safely

consume, 74.56% (170) correctly answered that a pregnant woman cannot safely consume any alcohol at all, 10.09% (23) stated that a pregnant woman can safely consume one glass of wine, 10.96% (25) did not know anything about the safety of drinking alcohol during pregnancy. Other respondents claimed that a safe consumption level could be one beer (0.88%; 2), several beers (0.88%; 2), one weak drink (0.88%; 2), or several drinks (0.44%; 1). Just 1.32% (3) of the group did not answer this question. Answers to some of the survey questions are presented in Tab. 2.

Tab. 3 shows how the survey participants responded to true and false statements about FAS.

When self-assessing their level of knowledge about FAS, young people most often had the opinion that their level of knowledge was very bad (39.04%; 89), average (29.39%; 67), bad (28.95%; 66), good (2.19%; 5) or very good (0.44%; 1). In actuality, 135 respondents (59.21%) had sufficient knowledge, 57 respondents (25.00%) had good knowledge, 28 respondents (12.28%) had insufficient knowledge, and 8 respondents (3.51%) had very good knowledge.

Factors determining the level of knowledge about FAS

Knowledge about FAS was significantly higher in 18-year-olds, than in 19-year-olds (p=0.046). Women's knowledge was greater than men's (p=0.001). Their material status/security, place of residence, number of people living together in a household and average academic grades did not affect the level of students' knowledge about the study subject (Tab. 4).

Most of the young people surveyed had the opinion that spreading knowledge about FAS was necessary (77.19%; 176). Respondents also indicated that they believed teachers (51.75%; 118) and family members (50.88%; 116), followed by health care workers (42.11%; 96), should be primarily responsible for education. 21.49% of the students said it was the youth themselves who should be educated on the harmfulness of alcohol consumption both before and during pregnancy.

Table 2. Answers of the surveyed youth to questions concerning FAS.

Content of the question	n	%
Do you think that there is a safe amount of alcohol that can be consumed during pregnancy that will not affect the development of the child?		
Definitely yes	3	1.32%
Yes	20	8.77%
It's hard to say	41	17.98%
No	70	30.70%
Definitely no	92	40.35%
No answer	2	0.88%
Can a pregnant woman:		
Consume foods with added wine	59	25.88%
Use alcohol-based herbal liqueurs	11	4.82%
Take medications with (little) alcohol added	52	22.81%
Any quantity of alcohol is prohibited	128	56.14%
The consumption of alcohol by a pregnant woman in the first weeks may cause:		
Fetal brain damage	176	77.19%
Fetal face deformity	82	35.96%
Fetal heart damage	142	62.28%
Fetal liver damage	129	56.58%
Miscarriage	170	74.56%
Fetal weight gain retardation	114	50.00%
Preterm birth	103	45.18%
None of the above	7	3.07%
In infancy, children whose mothers drank alcohol during pregnancy may suffer from:		
Convulsions	108	47.37%
Sleep disturbances	116	50.88%
Weak or high muscle tension	129	56.58%
Problems with sucking and eating food	113	49.56%
Hypersensitivity to light and sound	103	45.18%
Abstinence syndrome	82	35.96%
None of the above	13	5.70%
People with FAS may have problems with:		
Learning	167	73.25%
Memory	158	69.30%
Focusing attention	179	78.51%
Communication	130	57.02%
Vision	96	42.11%
Hearing	87	38.16%
None of the above	10	4.39%

Table 3. Distribution of participants' responses concerning FAS.

Scale of responses	A		B		C		D		E		F		G		I		J	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
I completely agree	205	89.91%	3	1.32%	12	5.26%	21	9.21%	67	29.39%	6	2.63%	34	14.91%	4	1.75%	1	0.44%
I agree	16	7.02%	0	0.00%	10	4.39%	38	16.67%	74	32.46%	9	3.95%	41	17.98%	13	5.70%	0	0.00%
Neither agree nor disagree	1	0.44%	8	3.51%	68	29.82%	113	49.56%	65	28.51%	63	27.63%	134	58.77%	87	38.16%	15	6.58%
I disagree	2	0.88%	40	17.54%	51	22.37%	33	14.47%	10	4.39%	65	28.51%	13	5.70%	67	29.39%	36	15.79%
I completely disagree	2	0.88%	174	76.32%	83	36.40%	16	7.02%	9	3.95%	82	35.96%	2	0.88%	54	23.68%	172	75.44%
No answer	2	0.88%	3	1.32%	4	1.75%	7	3.07%	3	1.32%	3	1.32%	4	1.75%	3	1.32%	4	1.75%

Legend: A - Drinking alcohol during pregnancy may affect the development of a fetus in the womb, B - Drinking alcohol during pregnancy does not affect the development of a baby after birth, C- Alcohol is a substance, the characteristic of which is the difficulty of transmission through the placenta to a fetus, D - Alcohol consumption may lead to a failure of contraceptives, E - Exposing a fetus to alcohol may lead to disturbances in the child's bond with parents and peers later in life, F - A pregnant woman should regularly consume small amounts of red wine for her health, G - FAS is an incurable disease, I - FAS does not apply to children of mothers who drink occasionally(i.e., women who are pregnant, women who have been pregnant or who have been pregnant for a long time and who drink once in a while), J - Alcohol consumed by a pregnant woman has no effect on the fetus (i.e. it only affects the woman, not the child).

Table 4. Analysis the level of knowledge of the respondents and selected variables.

Age				
Level of knowledge (score)	18 years (N=128) - A	19 years (N=81) - B	20–21 years (N=19) - C	p *
mean±SD	13.82±2.81	12.95±2.68	13.09±2.35	0.046
Median	13.94	13.33	13.24	
Quartiles	12.41–15.76	11.09–14.9	11.75–14.71	A>B
Sex				
Level of knowledge (score)	Women (N=87)	Men (N=141)	p **	
mean±SD	14.26±2.34	12.95±2.87	0.001	
Median	14.1	13.39		
Quartiles	12.77–15.95	11.29–14.9		
Number of persons living together in the household				
Level of knowledge (score)	Up to 4 persons (N=162)	More than 4 persons (N=63)	p **	
mean±SD	13.5±2.57	13.22±3.19	0.948	
Median	13.64	13.74		
Quartiles	11.82–15.13	11.72–15.18		
Material status				
Level of knowledge (score)	Bad, Medium (N=34)	Good (N=140)	Very good (N=50)	p *
mean±SD	12.67±3.28	13.53±2.51	13.8±3.04	0.175
Median	13.27	13.61	14.01	
Quartiles	10.14–15.04	11.77–15.12	12.86–15.75	
Place of residence				
Level of knowledge (score)	Large city (N=81)	Medium-sized or small town (N=58)	Countryside (N=88)	p *
mean±SD	13.33±2.87	13.34±2.83	13.59±2.59	0.74
Median	13.57	13.41	13.8	
Quartiles	11.48–15.23	11.8–14.96	12.29–15.23	
Mean scores				
Level of knowledge (score)	6.0–5.1 (N=26)	5.0–4.1 (N=128)	4.0 or less (N=74)	p *
mean±SD	14.11±2.75	13.45±2.79	13.21±2.67	0.248
Median	14.2	13.77	13.46	
Quartiles	13.24–15.77	11.77–15.1	11.33–15.13	

* No normality of distribution in groups, Kruskal-Wallis test + results of post-hoc analysis (Dunn's test).
** No normality of distribution in groups, Mann-Whitney U test.

Discussion

Key results

In our study, we showed that a small group of surveyed students (28.51%) possess a very good or good level of knowledge about FAS. The age and gender of the respondents were the two factors that significantly contributed to their level of knowledge. Most young people pointed to the need for more FAS education and said the best source for this is teachers and family.

Interpretation

When asked about the amount of alcohol that a pregnant woman can safely consume, the majority (74.56%) correctly answered that a pregnant woman cannot safely consume alcohol at all, and 10.96% (25) said they had no knowledge about it. However, among students in the graduating classes at secondary school in Poznań, 53% correctly answered that no amount of alcohol is safe during pregnancy, and 57% believed that no type of alcohol is safe for a pregnant woman and her child. In a study in Poznań, 9% of women and 28% of men described wine as a safe alcohol for pregnant women and their children [20]. Our respondents also claimed (10.09%) that a pregnant woman can consume one glass of wine. It turns out that myths about the beneficial effects of red wine on the development of the fetus still exist. This is likewise shown in a study that was carried out in Australia. In the Crawford-Williams et al. (2015) study, some participants claimed that certain midwives had, in fact, endorsed drinking during pregnancy, suggesting wine was safe to drink if a pregnant woman was craving it [21]. The results of the aforementioned studies clearly show that these beliefs need further examination. As young people are shown to be using alcohol and beginning sexual intercourse earlier and earlier, it would be reasonable for this topic to be discussed as early as primary school.

The decreasing age at which youth begin to use alcohol is explored by Hołyst, who used data from police

statistics. The data collected by the author show that the age limit for alcohol initiation is 11 years [22]. Our study confirms this fact. We showed that the vast majority of respondents said they started drinking alcohol before reaching the age of majority (18), and 3 people said they were first exposed to alcohol before the age of 10. The latest HBSC report shows that in 2018, the percentage of people who tried drinking alcohol increased, compared to 2014. Scientists claim that 11-, 13- and 15-year-olds who have already consumed alcohol constitute 11.4%, 28.0% and 63.4% of the studied population, respectively. While it was mainly boys in the group of 11–13-year-olds who tried to drink, in the group of 15-year-olds, as many as 63.3% were girls. The report states that the percentage of respondents who attempt to drink increases with age. The authors of the report indicate that the model of alcohol substance use by boys and girls is changing, to the disadvantage of girls [23].

Previous studies have shown that there is a need for public health initiatives providing information on the relationship between alcohol consumption and reproductive health [24]. In the authors' own study, almost all of the respondents were aware that drinking alcohol during pregnancy may affect the development of the fetus in the mother's womb. Similarly, in the study of Beretta et al., 89.5 % of students were aware that drinking alcohol during pregnancy can cause health problems in the fetus [25]. Despite the fact that young people notice the harmful effects of alcohol on the fetus, they do not know much about the FAS itself, as our results showed. It should be noted that in our study, only 37.28% (85) of the respondents had ever heard of FAS. Other authors have also confirmed this. For example, in the Traverso et al. study conducted among 1,321 students in Italy, only 17.5% confirmed knowing about fetal alcohol spectrum disorders. The authors indicated that 76.4% of the students knew that drinking alcohol during pregnancy damages the fetus, but only 23.5% knew that this damage is permanent, and only 43.5% knew that this damage is preventable [26]. In a Swedish study of women of fertile age (15–35 years) who were neither pregnant nor mothers, most women agreed that abstaining from drinking alcohol during pregnancy was beneficial, although their knowledge on the specific consequences of alcohol use during pregnancy was scant and they expressed a desire for more information [24]. In a qualitative study of pregnant women, mothers who just gave birth, and their partners, the majority of participants were aware that alcohol could cause harm to their developing baby. Nevertheless, several participants declared that they had access to limited information [21]. The Polish study conducted by Kayak and Olejniczak affirms the results of our own study. In the study, 51% of respondents said they had heard about FAS, but the authors, like us, demonstrated that young people's knowledge of FAS is insufficient. The sources of information on FAS most frequently indicated by youth in that study included: school (34%), the Internet (32%), and the media (29%). In this study, only 5% of students indicated that a gynecologist or other physician could be a source of information on FAS. The authors showed that as many as 77% of girls who had previously had gynecological examinations did not receive information about the harmful effects of alcohol on the fetus during pregnancy [20]. In the Brems et al. (2014) study of 1,035 college students at a northwestern university in America, the authors achieved different results. In this study, their overall findings showed adequate FASD knowledge among students. The authors claimed that minor differences emerged when comparing students' and professionals' responses, but most respondent groups answered with an 85% accuracy rate or higher [27]. The study by Brems et al. is one of the few studies showing results different from our own.

Generalizability

It is necessary to provide clear and consistent information to the public, and in particular, to people of reproductive age, on the effects of alcohol use on fetal development, as well as on FAS. The results of our own research also showed that gender was a factor that significantly determined the level of knowledge about FAS; women's knowledge was greater than men's. Exactly the same result was obtained by Berretta [25]. This indicates a greater need to supplement the knowledge about FAS among men. 51.75% of our research group indicated that teachers should provide FAS information and education and that educational programs concerning FAS should be implemented in schools. Because of that, further studies should focus on the level of teacher preparation to act as educators on the topic.

Limitations of the study

The survey was limited by a small study sample group, as well as the fact that participants were limited to 18- and 19-year-olds from the Opolskie Voivodeship only. Ultimately, it would be worthwhile to conduct a similar survey on a larger sample of young people living in different regions of the country. It would also be worth including participants older than those in our study, of reproductive age, and to develop or adapt a standardized tool based on Polish cultural conditions for studying the level of knowledge about FAS.

Conclusions

1. Due to the fact that a definitive minority of the surveyed young people had a good or very good level of knowledge about FAS, this indicates the need to educate this group on the topic.
2. Young male adults, more so than young women, need to supplement their knowledge about FAS, and should therefore be a separate target group for education.
3. Most young people pointed to the need for more FAS education and specifically, FAS educational programs in schools.

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Case reports

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DEATH DUE TO RARE RHINOCEREBRAL MUCORMYCOSIS INFECTION: A CASE REPORT

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Rhinocerebral mucormycosis is the most common form of mucormycosis in patients with diabetes mellitus; it is linked to poor prognosis, presenting most commonly in an acute setting, mimicking symptoms of sinusitis or periorbital cellulitis. The general survival rate in chronic cases is 83%, compared to 10–35% in acute.

Aim of the study: To report a death due to rhinocerebral mucormycosis in a 45-year-old male patient.

Case report: In this case report a 45-year-old male presented with acute rhinocerebral mucormycosis and was admitted in a state of unconsciousness with complaints of sudden onset weakness of right upper and lower limb, motor aphasia, right facial swelling, orbital swelling, and diminished distant vision. Upon primary diagnosis of stroke, treatment started immediately. However, past medical history from patient's attendants revealed that the patient underwent a tooth extraction procedure 20 days prior, and had since developed redness of the right eye, diminished distant vision, and swelling of the right side of the face. Pus was drained, and reports revealed orbital cellulitis with an intracranial spread. By the time of admission to hospital, the patient had abnormal lab profiles (WBC, ESR, serum creatinine), acute kidney injury, with MRI revealing rhinocerebral mucormycosis. The patient developed septic shock and died during treatment.

Conclusions: Acute mucormycosis carries a high mortality rate. Pleiotropic manifestations and organ dysfunction add to the further risk of mortality. Timely diagnosis and management may increase the chances of the survival rate of the patient.

KEYWORDS: Mucormycosis, Diabetes mellitus, Orbital cellulitis, amphotericin B

Background

Mucormycosis is a rare fungal infection caused by fungi in the family Mucoraceae which mainly develops in immunocompromised hosts [1]. *Rhizopus* species are the most common causative organisms [2]. Patients with impaired immune function, such as those suffering from diabetes mellitus, hematologic malignancy, HIV, and immune suppression after organ transplantation are predisposed to this infection [3–5]. This infection develops after inhalation of fungal spores into the paranasal sinuses, providing access to the central nervous system; CNS disease is the most prevalent manifestation of mucormycosis [5]. Among all the types of mucormycosis, rhinocerebral mucormycosis is the most common form occurring in patients with diabetes mellitus [2] and is associated with poor prognosis [6]. This most commonly presents in an acute setting, mimicking symptoms of sinusitis or periorbital cellulitis [7]. However, 25% mortality was reported in patients without any underlying disease process, 40% for patients with metabolic abnormalities and 80% for immunocompromised patients [8]. Timely diagnosis and intervention are important for successful management. The treatment of choice is surgical debridement of necrotic tissue and systemic antifungal therapy, including amphotericin B [2].

Aim of the study

This report aimed to present a rare case of rhinocerebral mucormycosis, associated septic shock, renal failure, and death in a 45-year-old male patient.

Case report

A 45-year-old male patient was admitted to the general medicine department in a state of unconsciousness. Symptoms reported were sudden onset of weakness of right upper and lower limb, motor aphasia, right facial swelling, orbital swelling, and diminished distant vision. Medical history revealed hypertension for two years and type 2 diabetes mellitus for six months. The patient was an alcoholic and occasional smoker, and was not on antidiabetic therapy. 20 days prior to presentation, the patient underwent a tooth extraction procedure for dental caries. In the days following, he complained about right eye redness, diminished distant vision, and swelling of the right side of the face. A minor procedure was used to drain the pus. The provisional diagnosis was a stroke on day 1, with treatment initiated accordingly (Tab. 1). An MRI scan and laboratory tests were ordered to rule out the correct diagnosis on day 1.

Table 1. Treatment for Stroke.

Drug	Dose	Frequency	Indication
Tab. Citicholine	500mg	BD	CNS protectant
Tab. Atorvastatin	40mg	OD	Preventing Secondary Stroke
Tab. Aspirin	150mg	OD	Preventing Secondary Stroke
Tab. Clopidogrel	75mg	OD	Preventing Secondary Stroke
Tab. Pantoprazole	40mg	OD	Preventing Acidity
Inj. Ceftriaxone (IV)	1g	BD	Prevention of nosocomial Infections

His complete blood count test revealed abnormal WBC, ESR, and serum creatinine. His glycemic control was poor (Table 2). Coupled with this, there was increased heart rate, respiratory rate, and body temperature, the levels of which met SIRS criteria. MRI scan reports revealed rhinocerebral ocular mucormycosis along with ischemic changes of blood vessels (Fig. 1, Fig. 2, and Fig. 3). The patient developed septic shock on day 2. Intubation was performed to facilitate ventilation. He was admitted to the intensive care unit immediately. Blood was drawn for culture sensitivity tests. Meanwhile, the patient was administered with stroke treatment protocol (Tab. 1), intravenous infusions, and empiric antibiotic treatment. Additionally, to treatment specified in Tab. 1, tab. Metronidazole 500mg, BD, for suspected anaerobic infections was also added. An insulin drip was administered for normalizing blood glucose levels.

Table 2. Abnormal laboratory blood test results.

Test	Value	Reference
White Blood Cells	30800 cells/cumm	4000–10000 cells/cumm
Erythrocyte Sedimentation Rate	19mm in 1 hour	10mm or less in 1 hour
Serum Creatinine	2.64mg/dl	0.7–1.3mg/dl
Random Blood Sugar	260mg/dl	80–140mg/dl

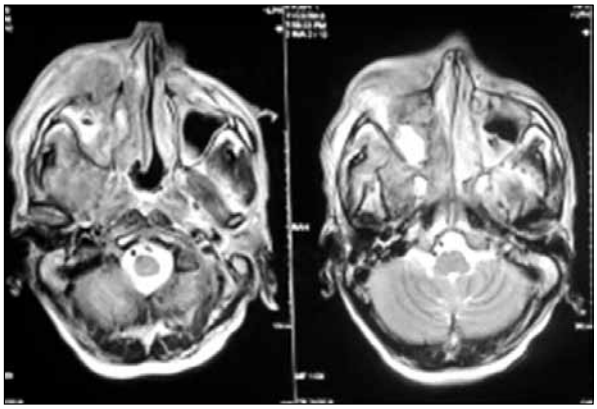

Figure 1. MRI scan report showing right maxillary sinus problem: The ill-defined disease is involving the right pre-septal space, extending posteriorly to the right maxillary ethmoid, sinus and orbital apex. The disease is infiltrative in nature with ill-defined borders.

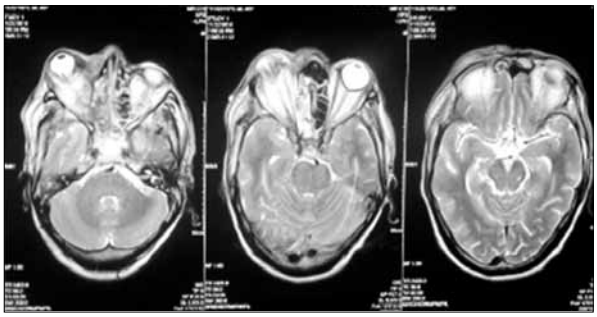

Figure 2. MRI scan report showing eye orbit involvement in the fungal infection: Entire volume of the disease is hypointense on both T2W & T1W images posterior, the disease extending up to the cavernous sinus with possible infiltration of the internal carotid artery.

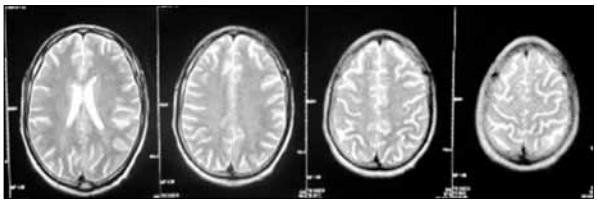

Figure 3. MRI scan report showing the ischemic changes of small vessels, non-hemorrhagic infarcts.

On the day 3, patient became hypovolemic due to septic shock. Noradrenaline, 3mcg/kg/min and Dopamine, 5mcg/kg/min were infused immediately, however, despite appropriate management, the patient died on the day 4 due to cardiac arrest.

Discussion

The initial symptoms of rhinocerebral mucormycosis are consistent with those of sinusitis and periorbital cellulitis; these include eye and/or facial pain, and facial numbness followed by blurry vision. Signs and symptoms that suggest mucormycosis in susceptible individuals include unilateral periorbital facial pain, facial cellulitis, orbital inflammation, eyelid edema, proptosis, acute ocular motility changes, nasal discharge, nasal stuffiness headache, and acute vision loss [9, 10]. Intracranial extension occurs in 80% of cases and

causes encephalopathy, cerebritis, and angioinvasion, leading to cavernous sinus thrombosis and cerebrovascular accidents [11]. In our case, the patient presented with an ischemic stroke which could have been due to the intracranial extension and comorbid conditions. There is no exact definition of chronicity in the case of mucormycosis, which can vary from weeks to months. Classically, it is defined by symptoms that last for more than 4 weeks. In the reported chronic cases, the average duration was seven months. [12]

Sepsis is a systemic inflammatory response to a confirmed or suspected infection. Clinically, the Systemic Inflammatory Response Syndrome (SIRS) is the occurrence of at least two of the following criteria: fever >38.0°C or hypothermia <36.0°C, tachycardia >90 beats/minute, tachypnea >20 breaths/minute, leukocytosis >12*109/l or leucopenia <4*109/l [13]. In this case, SIRS criteria were necessary to rule out confirmed infection and administrate the empirical antibiotics while waiting for the blood culture reports.

Amphotericin B deoxycholate (AmB) is the only licensed antifungal agent for the treatment of mucormycosis, but nephrotoxicity and poor CNS penetration limit its place in therapy. Lipid formulations of AmB (LFABs) exist, however, which are significantly less nephrotoxic, and can be safely administered at higher doses for longer periods, but are more expensive than AmB. [14] Starting dosages of 1 mg/kg/day for AmB and 5–7.5 mg/kg/day for LFAB are commonly used for adults and children. [15] Among the second-generation triazoles, only posaconazole and isavuconazole display appreciable activity against the Mucorales. De-escalation to posaconazole or isavuconazole remains a viable strategy once the pathogen and susceptibility to these agents are identified. Refractory or intolerance to amphotericin B can be managed effectively using triazoles as salvage therapy. [16]

The mainstay of therapy is extensive debridement of all infected and necrotic tissue, with drainage of all sinus and abscess fluid collections. Immediately obtain a consultation with a surgeon. Conservative attempts to spare tissue may result in the retention of the organism and subsequent treatment failure. A delay in surgery may decrease the likelihood of survival in all forms of invasive mucormycosis. Multiple debridements are sometimes required. Due to the vaso-occlusive effect of mucormycosis, the involved tissue rarely bleeds, so debridement until normal, well-perfused, bleeding tissue is encountered, is ideal. Intraorbital irrigation of amphotericin B may be considered as an adjunct treatment. Orbital exenteration along with the removal of the sinuses may be necessary. No standard exists to guide physicians on the best timing of exenteration. [17]

In our case, the patient was treated for ischemic stroke, followed by empirical treatment with broad-spectrum antibiotics. Indeed, empirical treatment with broad-spectrum antibiotics is advisable, as amphotericin B is contraindicated in severe renal impairment. However, despite efforts to improve renal function in order to initiate amphotericin B treatment, the patient died.

Conclusions

Acute rhinocerebral mucormycosis is a rare presentation that requires a high index of suspicion due to atypical presentations. It is important to rule out mucormycosis in diabetic patients, as early diagnosis and treatment can reduce morbidity and mortality. Delay in management often leads to a fatal outcome.

Ethical approval

The study was approved by institutional ethics committee (VIPT/IEC/CR/16). The patient care giver was clearly explained the purpose of case report and obtained patient consent form from the care giver.

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Case reports

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THE EFFECTIVENESS OF THERAPEUTIC MASSAGE IN TREATING BACK PAIN: A CASE REPORT

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A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Spinal pain is a common problem in developed societies. In recent years, more and more people have been found to complain about spinal pain. Therefore, it would seem that back pain remains a major problem, a burden for the patient, the family, and the economy. If the pain is severe, it can cause difficulties with performing even the most basic activities of everyday life. The quest for methods to reduce this complaint may contribute to improving the quality of life for many people. One of the more commonly chosen forms of therapy for back pain is therapeutic massage. Massage therapy has a long history with back pain treatment and has been found to produce various beneficial effects that are associated with endorphin release. It can also enhance local blood flow which could increase the efficacy of local pain mediators.

Aim of the study: The aim of the study was to evaluate the effectiveness of therapeutic massage in the treatment of back pain in a 69-year-old woman.

Case report: The subject was a 69-year-old woman reporting pain in the cervical and lumbar segments of the spine, BH = 154.2 cm, BM = 90.0 kg, BMI = 37.85 k/m^2 (obesity), waist circumference = 114.1, hip circumference = 118.2 cm, WHR = 0.96 (android obesity). The 11-point VAS scale was used in the assessment of her pain, where 0 means no pain, and 10 unbearable pain. The Laitinen Pain Scale (LPS) is a questionnaire which examines the nature of pain in four areas: the intensity of the pain, how frequently the pain occurs, the application of painkillers, and limiting motor activity. Before starting the therapy and immediately after the end of the therapy, researchers conducted a physical examination which included taking measurements of spinal mobility using the SFTR method. Before the first treatment, researchers conducted an interview was conducted about the need for the massage. 10 massages were performed after 60 minutes each, and were done every other day. Researchers performed a pain assessment with the VAS scale both before and after the procedures, which ultimately showed a reduction of the symptoms in the cervical and lumbar sections. The LPS scale showed a reduction of symptoms in three areas. The mobility of the spine had likewise increased.

Conclusions: After a series of therapeutic massage treatments, there was a reduction in pain and improved spinal mobility.

KEYWORDS: back pain, therapeutic massage

Background

Spinal pain is one of the most frequently reported diseases worldwide [1]. Between 75 and 85% of the population experience it at least once throughout their lives [2]. According to research conducted by the Central Statistical Office (GUS) in 2014, every fifth adult person in Poland complains of lower back pain, and every eight adult person reports neck pain [3].

Back pain may be associated with degenerative changes. Symptoms may increase with repetitive movements of flexion and extension of the torso and physical exertion. In many patients, degenerative changes are the only visible cause of pain [4,5].

From a clinical point of view, the severity of pain during exercise is the main symptom. A characteristic beginning of such a state is the extensive, moderate,

and constant sensation of pain. This is accompanied by stiffness and limited mobility of the spine, especially during the extension movement. Muscle weakness and fasciitis are also observed, as well as gentle bending of the lumbar spine [2].

Correct treatment of spinal pain should be comprehensive, and should seek to address not only the cause of the disorder, but also its effects. The ideal treatment would include individualized kinesitherapy complemented by physical therapy. Often, a massage is used as a supplement to the therapy [6].

Massage owes its popularity to the beneficial effects on the whole body. It causes many local and general changes. Local effect is characterized by dilatation of blood and lymph vessels, thusly improving tissue metabolism. The general action consists of acting on the whole organism through the nervous and endocrine systems [7].

The main purpose of the massage is the normalization of muscle tone, which increases the painless range of motion in the joint [7–10]. The result of the massage is also the improvement of blood supply to the tissues. This allows for quicker disposal of accumulated metabolic products and faster regeneration. The reduction of pain sensation is also possible due to the stimulation of receptors located in the skin and skeletal muscles [11]. Thanks to its effectiveness, massage is widely used in the treatment of spinal pain [12,13].

The aim of the study

The aim of the study was to evaluate the effectiveness of therapeutic massage on the reported back pain of a 69-year-old woman.

Case report

Patient: a woman, AGE= 69 years old, BH = 154.2 cm, BM = 90.0 kg, BMI = 37.85 k/m^2 (obesity), waist circumference = 114.1, hip circumference = 118.2 cm, WHR = 0.96 (android obesity).

Through an interview the patient was shown to be complaining of spinal pain in the cervical and lumbar sections. The cervical pain is caused by a prolonged working time in a position with raised upper limbs, carrying heavy objects. Pain in the lumbar region is caused by prolonged working time in a forward sloping position, during prolonged walking and sitting. Moreover, the pain is connected with staying in one position longer and with the trunk in a bent position. The patient is currently retired and she is independent. She lives alone in an apartment block on the third floor without a lift. She practices moderate physical activity in the form of gardening and recreational cycling.

The X-ray image of her cervical segment showed the appearance of initial degenerative changes at the C4-C7 levels. An X-ray image of the lumbar region showed the onset of degenerative deformity and common signs of osteoporosis.

Lumbar densitometry showed a change in bone density that qualified the patient as being on the borderline of osteopenia and osteoporosis.

On the basis of blood test, it was found that there was no acute inflammation in the patient's body that would be a contraindication to therapeutic massage treatments.

Prior to the study, the participant was informed about the principles and purpose of the study and expressed her written consent to participate in the study. For conducting the research, the team obtained the approval of the Bioethical Commission at the Opole Medical School in Opole (Nr 15/2017).

Therapy

10 therapeutic massage treatments were performed every other day. Each treatment lasted 60 minutes, and included a massage of the back and the neck.

The therapeutic massage was performed with techniques such as stroking with the hair and under the hair, superficial stroking, deep stroking, friction, spiral friction, longitudinal kneading, transverse kneading, rolling, and vibration.

The massage included the superficial muscles of the back, the latissimus dorsi muscle and trapezius muscle, the rhomboid major muscle, the rhomboid minor muscle and deep muscles of the back, including the splenius capitis muscle, splenius cervicis muscle, sacrospinalis muscle, transversospinalis muscle, interspinales muscle, intertransverse muscle, levatores costarum muscle, and lumbar fascia. The massage also included the muscles of the shoulder girdle, including the supraspinatus muscle, infraspinatus muscle, teres minor muscle, teres major muscle, and subscapularis muscle.

Researchers interviewed the subject about her need for a massage before the first treatment took place. Researchers also assessed her spinal pain both before starting therapy and immediately after the end of therapy. The mobility of her spine was also assessed using the SFTR method. In the assessment of her pain, the 11-point VAS scale was used, where 0 means no pain, and 10 unbearable pain. The Laitinen Pain Scale is a questionnaire which evaluates the nature of pain in four areas, including the intensity of pain, the frequency of the pain's occurrence, the application of painkillers, limiting motor activity. The patient assesses each of these factors on a 5-degree scale in the range from 0 to 4, where:

- 0 means: without pain, does not occur, no help ,
- 1 means: mild, periodical, does not occur, without medicine, no help,
- 2 means: strong, frequent, big doses, demanding partial help,
- 3 means: very strong, very frequent, permanent, big doses, demanding partial help
- 4 means: not sustainable, continuous pain, permanently very big doses, demanding full help.

Results

After a series of therapeutic massage treatments, it was found, using the VAS scale, to have reduced pain in the cervical and lumbar segments of the spine (Tab. 1).

Table 1. Comparison of the test results with the VAS pain scale before and after therapy.

The sections of the spine (vertebral column)	The VAS pain	
	Before therapy	After therapy
Cervical spine	4	2
Lumbar spine	6	4,5

After performing the massage treatments, it was found that the symptoms were reduced in three of the four areas of the LPS scale (Tab. 2).

Table 2. Comparison of the results of the Laitinen Pain Scale before and after therapy.

LPS scale component	The severity of pain	
	Before therapy	After therapy
Intensity of pain	2,5	2
Frequency of pain occurrence	2	2
Application of painkillers	1	1
Limiting motor activity	2	1

These measurements showed an improvement in the mobility of individual sections of the spine. The exceptions are the mobility of the cervical spine during the extension movement in the frontal plane, lateral flexion in the left direction, and the rotation of the right and left (Tab. 3).

Table 3. Comparison of the results of the spinal mobility measurement using the SFTR method before and after the therapy.

The sections of the spine (vertebral column)	Plane	Before therapy	After therapy
Cervical spine	S (Sagittal)	4-0-1,5	4-0-1,7
	F (Frontal)	1-0-0,4	1-0-0,7
	R (Rotation)	4-0-3,5	4-0-3,5
Thoracic spine	S (Sagittal)	0-1	0-1,2
Lumbar spine	S (Sagittal)	1,5-0-2	1,6-0-2,3
Thoracic-lumbar spine	F (Frontal)	4-0-3,8	4,5-0-4
	R (Rotation)	1,7-0-1,9	2-0-2,2
Whole spine	S (Sagittal)	0-5	0-5,4

Discussion

Lower back pain is one of the most frequently reported illnesses worldwide. According to Milanowa, it affects between 75% and 85% of the population at least once throughout their lives [14].

In the treatment of back pain, improvement treatment, i.e. physiotherapy, which consists of kinesitherapy, physiotherapy and massage, plays a key role. Educating the patient can also help prevent a worsening of the symptoms and minimize the risk of their occurrence [15].

The purpose of the study was to evaluate the effects of therapeutic massage on pain reduction. Based on our own research, after using a series of therapeutic massage treatments, it was demonstrated using the VAS scale that the patient's sensation of pain was reduced. We also conducted a pain assessment using the Laitinen Pain Scale, and found the symptoms there were likewise reduced. The patient noticed improvements in three of the four areas of the above scale. These areas are the intensity of ailments, which decreased by half a point, the frequency of occurrence of the ailments and limitation of mobility, in which the patient noticed improvement by one point in each. Only the use of painkillers has not changed. After the therapy, researchers also observed a marked improvement in the mobility of the spine.

In the Ćwirlej et al. studies, after applying the massage, all patients were less likely to suffer from pain, and in half of them the pain was completely eliminated. Movement was also improved [7].

In other studies, Ćwirlej et al. found that pain had gone down (from 5.21 to 1.1 on the VAS scale) and mobility of the spine had improved among 53 patients after therapeutic massage [11].

In Wilk's studies, after a series of therapeutic massages in the cervical and lumbar sections of the spine, pain was likewise reduced [10].

The Swedish Massage and Acupressure in Rehabilitation of Patients with Low Back Pain study confirmed that both methods demonstrated a significant decrease in the pain's intensity, an improvement in the patient's quality of life and an increase in physical activity. Increased segmental mobility of the spine was also observed in all patients [16].

Allen's research confirms that massage is non-invasive, generally available, can produce results at the right time, and is more cost-effective than most other treatments for chronic lower back pain. Patients usually got good results from just a few therapeutic massage sessions. There are studies demonstrating that only a single massage or two produced positive results. Different patients experience different results because there are many factors contributing to each individual case, including the cause of the dysfunction, its duration, the degree of pain and disability, and any psychological effects [17].

Conclusions

After completing a series of therapeutic massage treatments, there was a reduction in pain and an increased mobility of the spine. Further study is encouraged to determine the efficacy of massage therapy as a readily accessible, lower-cost alternative to more invasive therapies.

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HEALTH TECHNOLOGIES AND SMART & INTEGRATED CARE – KEY ACTION 2 STAGE OF THE REGIONS4PERMED (H2020) PROJECT

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ABSTRACT

Consumer and system-wide gains remain limited by an outmoded policy regime. With scientific innovation running far ahead of public policy, physicians, researchers and patients are not receiving full advantage of the latest developments. European health systems require a seamless and rapid flow of digital information, including genomic, clinical outcome, and claims data. Research derived from clinical care must feed back into assessment, in order to advance care quality for consumers. National health systems are heterogeneous; the solutions and required fundamental approaches differ between the European member states and are not entirely portable and scalable. To date, this applies not only to general systemic aspects but particularly to cross-border reimbursement issues and the exchange of treatment and patient data.

To answer those needs, an international consortium was established to implement the project "Interregional coordination for a fast and deep uptake of personalised health": Regions4PerMed. A cycle of international events, such as conferences, in situ visits and workshops, has been planned. Interdisciplinary groups of experts will exchange thoughts and experiences to design solutions that could be implemented in the various healthcare systems. Regions4PerMed aims to coordinate regional policies and innovation programmes in personalised medicine and personalised health to accelerate the deployment of personalised health for patients. Key Action 2 is dedicated to health technologies and smart and integrated care.

KEYWORDS: health technology, e-health, m-health, integrated healthcare, personalised medicine, personalized health

Background

With many initiatives launched worldwide for the personal human genome map (Personalised Medicine Initiative in the USA, 100,000 Genomes Initiative in the UK, and the Human Genome Declaration at EU level), it is possible to envision a future where treatments are tailored to individuals' genetic structures [1] – a future where Personalised Medicine is fully integrated into real life setting.

In healthcare, newly emergent scientific and technological innovations are either not yet used or are underused because of slow adoption, data analytics is failing to reach its full potential, and interdisciplinary barriers in medical science need to be overcome.

To accelerate the adoption of personalised medicine approaches and enable early interception of diseases, and deliver new precision and personalised care while balancing and optimising healthcare expenditures based on medical and economic value, health technologies and smart and integrated care must become a key priority for policy makers. Healthcare organisations need to be transformed in order to absorb innovative technologies and deliver more personalised services to patients and citizens. In this respect, worldwide, the

healthcare environment is already changing, and it is becoming increasingly obvious that affordable high-quality healthcare cannot be delivered without harnessing new ways of delivering care [2]. New technology is a promising solution to help cope with current challenges and to improve healthcare and pharmacy practice [3].

Health technology

Health technology is defined WHO as "the application of organised knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem, improve the quality of lives". Health technologies equip healthcare providers with tools that are indispensable for effective and efficient prevention, diagnosis, treatment and rehabilitation [4]. These technologies and, in particular, connected and integrated care solutions, can offer users (citizens/patients and health professionals) enormous benefits and amplify system-wide gains that are currently limited. Connected health or technology-enabled care (TEC) is the collective term for telecare, tele-Health, telemedicine, m-Health, digital health and e-Health services. Within the health industry, TECs are often referred to as smart technologies.

Health technologies can advance diagnosis, prediction and therapies for diseases, and TEC tools, in particular, can provide specific information from autonomous data analysis. This can help both the physician and the patient to predict the patient's future health, and foresee management issues and possible modifications to the therapy regime and/or health management activities, as well as interventions targeted to improving the patient's wellbeing (such as improving relaxation and positive emotions or promoting engagement in self-actualising experiences) [5]. This will also help healthcare systems reduce costs for the management of chronic diseases.

Health technologies hold huge potential for the utilisation of health data in transforming healthcare. The application of analytics, machine learning and artificial intelligence over big data enables identification of patterns and correlations and hence provides actionable insights for improving the delivery of healthcare [6].

Smart solutions

Telecare: a new health service that involves the use of technology within patients' homes, such as home monitoring, safety monitoring, and information service technologies [7].

Tele-health: services allowing patients to access health education and support for self-management through the Internet, via their home computers or wireless devices. Patients can obtain personalized education materials and coaching and may participate in online discussions and support groups as an additional means of managing their health [3].

Telemedicine: delivery of healthcare services where distance is a critical factor. All relevant healthcare professionals will use information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation. This also aids the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities [8].

m-Health: tools providing specific information from autonomous data analysis. These will help both the physician and the patient to foresee the patient's future health, management issues and make modifications to their therapy regime and/or health management activities, as well as interventions targeted to different aspects of the patient's wellbeing (such as improving relaxation and positive emotions or promoting engagement in self-actualising experiences) [5].

Digital health: rapidly expanding medical field premised on the availability of ever-increasing amounts of data about people's lifestyles, habits, clinical histories and pathophysiological characteristics [9]. Digital health includes the following technology: i) all devices that have an effect on health even if they are not designed only for health (e.g. smart watches); ii) digital devices that are designed to provide evidence in terms of better health; iii) digital devices that have a therapeutic effect, such as deprexis in UK and Sleepio in USA, and others that influence behaviour and control rehabilitation activities.

e-Health services: use of digital technology to treat patients, diagnose diseases, conduct research, support health education, inform and communicate with patients or other healthcare providers, and gain an overview of public health in society [10].

Medical decision-support systems (MDSS): computer systems designed to assist physicians or other healthcare professionals in making clinical decisions. MDSS can help physicians to organise, store, and apply the exploding amount of medical knowledge. These are expected to improve the quality of care by providing a more accurate, effective, and reliable diagnoses and treatments, and by avoiding errors due to gaps in physicians' knowledge [11].

Semantic interoperability: the ability of computer systems to exchange data with unambiguous, shared meaning. Semantic interoperability is a requirement to enable machine computable logic, inferencing, knowledge discovery, and data federation between information systems.

Medical communication standards: a set of international standards for the transfer of clinical and administrative data between software applications used by various healthcare providers. These standards focus on the upper layers in the OSI model. The standards are maintained by several international standard organisations and are adopted by other standards issuing bodies.

Healthcare services

Smart health should also have the following characteristics:

– Help patients strengthen their resilience towards health-negative events.
– Strengthen flexibility and adaptation of health delivery organisations when innovation occurs, to generate an impact both for individual and public health.

The exponential rise in TEC requires healthcare providers to redefine staff roles and responsibilities and support them to work differently. Currently, healthcare is largely defined by "place" of work and is based on providing hands-on care to patients. As TEC services are adopted more widely, staff can undertake e-visits, write e-prescriptions and track, diagnose and deliver treatment via remote digital monitoring – delivering benefits for providers and offering savings in direct costs and staff time (Figure 1) [12].

As a repercussion of the implementation of TEC, the organisation of providers, management of services and performance improvement processes has begun adapting and responding to new models of care, such as integrated health services.

The WHO Regional Office for Europe defined integrated health services delivery as follows [13]: an approach to strengthen people-centred health systems through the promotion of the comprehensive delivery of quality services across the life-course, designed according to the multidimensional needs of the population and the individual and delivered by a coordinated multidisciplinary team of providers working across settings and levels of care. It should be effectively managed to ensure optimal outcomes and the appropriate use of resources based on the best available evidence, with feedback loops to continuously improve performance and to tackle upstream causes of ill health and to promote well-being through intersectoral and multisectoral actions.

In order to boost the growth of health innovation for the uptake of personalised medicine innovations, we have identified some initial challenges that can be addressed at regional level.

Challenges

Identified crucial challenges for the sector are the following:

– **Data generation along the whole R&D value chain**: generating high-quality, harmonised, reliable, annotated, interoperable data that can be shared, for example for larger integration, interoperability and/or where economies of scale are needed. For instance, a shift in focus to preven-

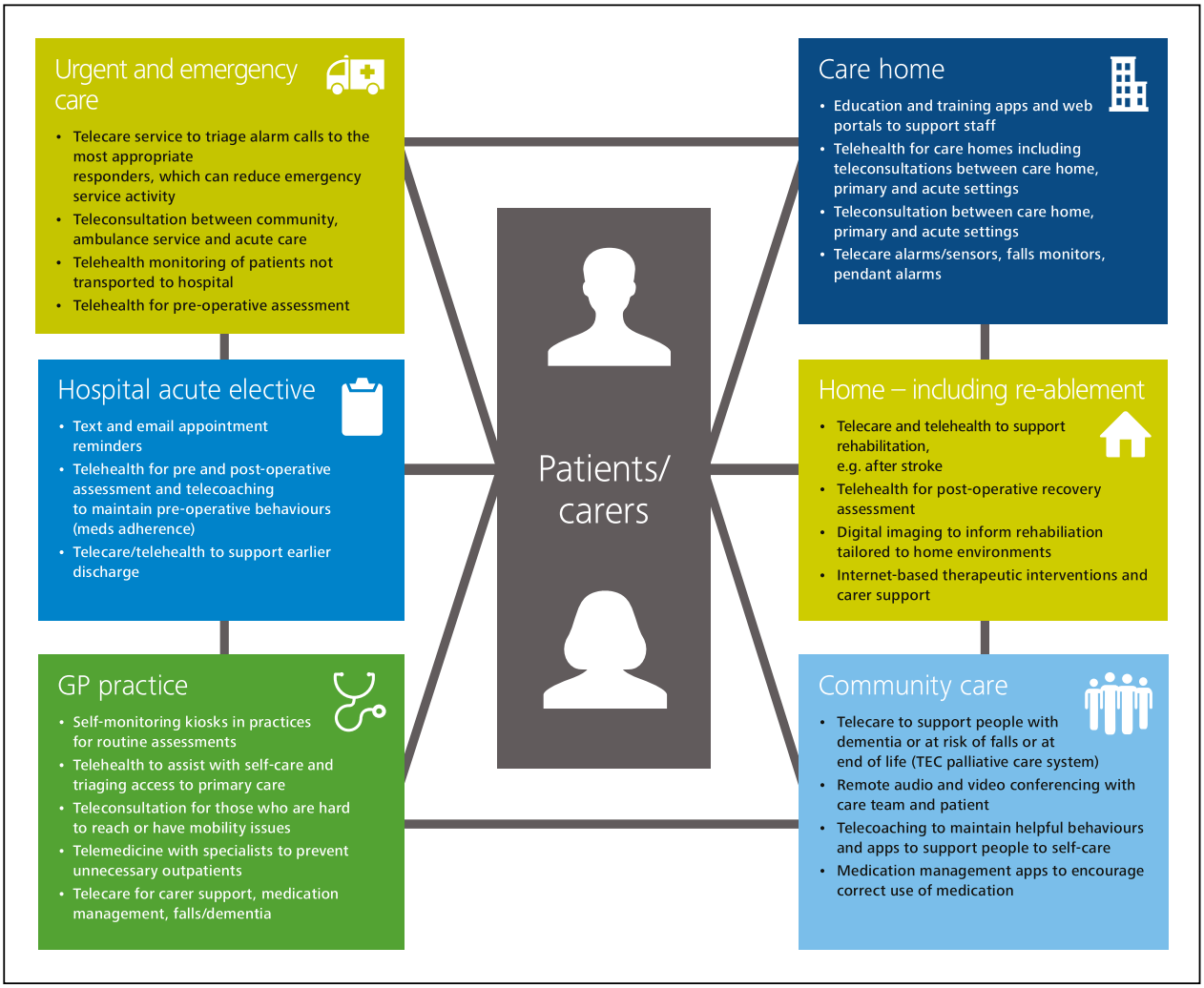

Figure 1: Example of how mobile technology could be used to connect staff with patients and support staff to work differently [12].

tion of disease and diagnosis of pre-disease states will require data on very large cohorts of healthy people that are not identified as high-risk.
- **Integration of technologies for better and safer products and services**: The health industry would leverage new knowledge and technologies, such as artificial intelligence, connected health systems, as well as "omics" and nanotechnologies, for the enhanced understanding of the biology of diseases to develop new products and services for disease prevention, prediction, interception, intervention and management. This integration also includes activities to optimise the innovation pathways both within and across the sectors in terms of common standards, models, platforms, methodologies, etc..
- **Integration of these products and ancillary services to create innovative healthcare solutions**: companies would combine the existing and/or new innovations across the sectors to create solutions and enable their integration within the patient care pathways.
- **Integration of clinical, community, social and informal care workflows**: development of solutions to support improved operational care workflows in clinical or community settings.

Barriers

These ground challenges also present barriers that Key Action 2 (KA2) will address:
- **Quality of data**: accessibility, integrability, relevance, timeliness and rectifiability of data are essential to develop solutions that can be integrated in health systems. In this context, European regions (intended as local and regional authorities), as seen in the context of Key Area 1 (big data, electronic health records and health governance) have a major role to play. Within KA2 we will focus on key enabling investments that regions can promote the wealth of health technology.
- **Regulatory aspects**: health technologies make an essential contribution to healthcare in the EU for the benefit of European citizens. Medical devices, for example, are crucial in diagnosing, preventing, monitoring and treating illness, and overcoming disabilities. They are also important to the economy, providing €110 billion in sales and 675,000 jobs in Europe.

The European Commission has adopted two new regulations which, in order to guarantee a higher degree of safety for the best interests of European citizens, pose a burden on health technologies. This might have consequences, both for the industry and, in general, in slowing the pace of implementation of personalised medicine. These new regulations are as follows:
- Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC.
- Regulation (EU) 2017/746 of the European Parliament and of the Council of 5 April 2017 on in vitro diagnostic medical devices and repealing Directive 98/79/EC and Commission Decision 2010/227/EU.

Within the conference we would like to examine the potential impacts of the new regulations and the role regions can play in reducing these.
- **Trainings for healthcare professionals:** health technologies are often advantageous for the patient, but health professionals often encounter difficulties in using devices associated with these technologies, which can increase the risk of accidents [14].
- **Patient engagement:** there is increasing evidence that having more-informed patients is starting to improve self-care and adherence to medication, and boost health and wellbeing [12]. Health technologies are essential to enable personalised patient engagement approaches by analysing and providing solutions to the patients' needs. In particular, health technologies can be used to for the following:
  - Increase health literacy, promoting patients' knowledge on their specific health problems through dialogue, guidance on trustworthy sources of information and use of ICT tools.
  - Increase self-awareness (SA): SA level will be assessed using validated tools and improvement will be driven by screening and monitoring variables using ICT tools.
  - Improve risk perception (RP): patients' estimated vs. perceived risk will be assessed by validated tools and RP will be computed by comparing these scores, to enable precision empowerment.
  - More accurate prognosis, which will be estimated by systematic use of updated risk scores.
  - Guaranty of receiving state-of-the-art care. PM programmes will make use of updated algorithms to implement the best individualised diagnostic and therapeutic strategies.
- **Economic impact of health technology:** The key point for health technology to access the market and help implement the personalised medicine promise is health technology assessment, which needs to be discussed to assess market barriers and identify potential solutions.

Conference and Workshop concept – KA2 planning

Within this key action, there are plans for a set of meetings and events aimed at exploring health technologies and integrated care. The conference and workshop will explore, amongst others, the following themes:

- Improve data for better personalised health technologies
- Connecting the regulatory aspect with personalised health technologies
- Patient engagement: Engage citizens and patients with tools to better manage their health
- Training programmes for healthcare professionals
- HTA for health innovations

Main goals of KA2

The main objectives of KA2 are as follows:

1. Set the scene around health technology, identifying potential solutions to the identified barriers.
2. Engage regional authorities and stakeholders to understand how the regions can implement the solutions identified and elaborate key recommendations.

Main events connected to KA2

- **Conference**: The conference will gather experts, with the aim to define and highlight the main technical challenges connected to KA2 (we expect at least 30 participants).
- **In situ visit**: In order to study innovative models and programmes that are having a high impact on implementing personalised health tools, we will organise two field visits per each key thematic area. The in situ visits, as implemented in the framework of Interreg Projects, have demonstrated high value for active learning by regions and regional authorities. In order to stage high-quality technical conferences and interregional workshops, the proactive collaboration of all members of the consortium will be fundamental, also taking advantage of the expertise from the Advisory Board.
- **Interregional workshop**: The workshop will survey the interest of regional authorities and stakeholders to identify appropriate policy instruments and assess the feasibility of actions that can be carried out both at regional level as well as at multiregional level. The workshop will encompass the aspects of e-Health and m-Health.
- **Capacity-building**: In order to improve the skills and knowledge of regional authorities' to exploit the knowledge created within Regions4PerMed, at the end of the interregional workshop we will dedicate half a day to the regional authority for a **capacity-building workshop**. In this context, representatives of more experienced regions will share their expertise with other regions and common knowledge will be created.

Co-Creation and WS 2 programme

The involvement of policy makers, representatives of universities and research hospitals from different regions is fundamental to acquiring an overview of the current state of implementation of health technologies in the smart and integrated healthcare system, as well as identifying areas of improvement and where investments are needed. Thus, the workshop will comprise plenary sessions as well as parallel working sessions.

To this aim, while the first day will be dedicated to the overall introduction of the topic and working sessions, the second day will be focused on collecting all outcomes of the discussions and defining regional path(s) towards personalised health. This will include outstanding "best practice" examples, as well as capacity-building activities and policy co-creation with all the regional authorities and stakeholders involved.

Policy intervention/area 1: m-/e-health technologies for continuous monitoring and self-empowerment

Rationale: The combined intellectual power of the leading European experts in the field of e-health and m-health is required to identify possible future approaches to e-health/m-health that are capable of redefining our future interactions within the healthcare system. Development of m-/e-health technologies allows for continuous patient monitoring and – perhaps even more important – building the patient's self-empowerment.

Policy intervention/area 2: m-/e-health technologies for data integration

Rationale: All connecting systematic approaches and platforms require consented, open and interoperable connections that follow international standards. This does not only apply to existing aspects, e.g. IHE profiling, but also to defining new standards on topics such as cross-platform authentication and data exchange. Standardisation in healthcare services is a major requirement for improving patient treatment by way of modern technology.

Policy intervention/area 3: Artificial intelligence for predictive models

Rationale: European health systems require a seamless and rapid flow of digital information, including genomic, clinical outcome, and claims data. Research derived from clinical care must feed back into assessment in order to advance care quality for consumers. Currently, there is discrete data on diagnosis, treatment, medical claims, and health outcomes in parts of the system, but it is hard to determine what works and how treatments differ across subgroups. As more information on treatment, lab tests, genomics, and financial costs is integrated into healthcare, it is hard to incorporate data from medical history, vital signs, genetic background, and lab testing into diagnosis and treatment. Predictive modelling represents a way for physicians to move towards systematic and evidence-based decision-making. While the first step toward enabling personalised

medicine is to ensure clinicians have access to what is known about patient gene variants, computer models can go beyond this approach and predict which treatments are likely to be most effective given observed symptoms. Public policy should incorporate rapid learning and predictive modelling to gain the full benefits of PM.

With the emergence of artificial intelligence (AI), it is necessary to deal with the effects this will have on the transformation of the market in an appropriate and contemporary way. An environment of trust and accountability, including new legal and ethical questions, is the basis of the full profit from the opportunities of AI.

Policy intervention/area 4: Personal data management

Rationale: Collecting data via e/m technologies involves ethical aspects and policies regarding personal data management. Personal data has an increasingly significant social, economic and practical value. Individuals must be at the heart of their own data control and their digital human rights must be strengthened while companies are able to develop innovative services based on mutual trust.

Policy intervention/area 4: Remote monitoring and tele assistance

Rationale: Personalized medicine is based on personalised medical data. To improve the quality of care for a patient with many chronic diseases, it is important to track their vital signs remotely. Remote cardiological care is also about enabling continuous monitoring of the heart, thanks to a portable ECG signal and breathing movement recorder. The recorder detects the patient's heart rhythm using built-in detection algorithms. The relevant fragments of the ECG signal recording are transmitted to the remote medical care centre and subjected to detailed analysis. Collecting a detailed medical history, in the case of confirmation an anomaly, the paramedic follows the appropriate pattern of personalised action. They can then refer the patient to a remote medical consultation or discuss a specific case with the doctor on duty. In situations that threaten life or health, the paramedic can call an ambulance. Such remote monitoring systems enable tele care and tele assistance and have resulted in a more serious focus on home care. This is also due to the ageing of the population and the increase in the number of chronically ill patients. If the patient feels unwell, they can also initiate the transmission of their data to the monitoring system.

Capacity-building

The capacity-building session aims to increase the awareness, competences and skills of regional authorities and stakeholders about the development and implementation of projects or initiatives on personalised health. Personalised health and medicine, specifically for what concerns the valorisation of patients' and citizens' health data, is characterised by common challenges to be addressed by regional policies and investments.

We believe that the participation of regional stakeholders in the parallel sessions contributes to the development of a shared knowledge of the best practices in the EU in the field of big data in health. The learning outcomes of the sessions could provide input to the S3 strategy of the next programming period.

During the capacity-building session, selected best practices will be showcased and the main aspects of each will be illustrated and discussed. The best practice will be selected from those that emerge from the main projects, initiatives and networks in the field of personalised medicine, for example IC Permed Best Practices. The International Consortium for Personalised Medicine, as part of its work plan, collect, evaluates and provides recognition to the best practices on each topic. We will ask the IC Permed coordinator to get access to these best practices, review and choose the most interesting ones for the Regions4PerMed purposes.

Co-creation meeting

At the proposal stage, a co-creation meeting was planned to fine-tune the overall workshop organisation, by liaising with other European project coordinators (the "PerMed Hub"). However, after the award of the project, the EC requested the coordinator to establish an Advisory Board (AB).

Throughout the duration of the project, the AB is delivering a constant and unique expertise. For this reason, during the planning of KA1, the project partners have agreed to assign the co-creation meeting a new role and responsibilities. This meeting is now designed to gather the members of the Interregional Committee and representatives of the PerMed Hub (we will ask each project listed in the PerMed Hub to send a representative). It is hoped that this will reach consensus on the main points of the Key Strategic Area and to maximise the expected project impact in the following key actions.

Stakeholders and participants

We expect a variety of participants at the workshop. Starting from the partners, we will invite regional authorities, stakeholders and policy makers. In addition, the representatives of the European initiatives on personalised medicine and personalised Health, the PerMed Hub, will be invited and are expected to support the activities of Regions4PerMed, providing input, encouraging networks and exchanges, and maximising the visibility of our activities.

Expected outcomes

The results of the conference and workshop will be summarised in a report that will provide an overview of all the challenges, opportunities and issues

related to the topic of health technologies with smart and integrated care.

The workshop will represent an occasion of exchange of regional experiences and best practices, and most of all an important opportunity for a first meeting of the interregional committee.

The report will also outline a series of recommendations aimed at identifying a "regional way" towards personalised health, with a focus on the implementation of the big data technologies in the healthcare system.

Thanks to the co-creation meeting we will launch a "position paper" that calls upon the responsibility of regional authorities to invest on the valorisation of health-related data. In addition, a commonly agreed definition of personalised health will be sought.

Lastly, with the capacity-building activities, we will share best practices and showcase how common challenges related to the use of health data are being tackled all around the EU.

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DEVELOPMENT OF CARDIOVASCULAR COMPLICATIONS AND THEIR CORRELATION WITH LYME DISEASE

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ABSTRACT

Cardiovascular disease is at the forefront of global health issues and contributes to myocardial infarction, stroke, and even death. Lyme disease (LD), spread by ticks of the genus *Ixodes*, is a contributing factor to the potential development of abnormalities in the heart. The bacterial agents *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, and *Borrelia burgdorferi* are known to cause a variety of infections and we speculate that infection with *Borrelia* is a contributing factor to cardiac abnormalities, especially Lyme carditis (LC). Patients who demonstrate undiagnosed cardiac abnormalities should be monitored for potential infection with Lyme disease and, consequently LC. Lyme carditis affects up to 10% of patients that have been diagnosed with LD and additionally, it indiscriminately manifests across a range of ages, from the pediatric populace to the elderly. Given the grave cardiac abnormalities that can arise from LC and the propensity for misdiagnosis, it is critical that medical professionals be aware of the cardiovascular signs and symptoms of Atrioventricular Heart Block (AHB). AHB can lead to third degree heart block in patients and potentially lead to death if left not properly diagnosed and treated. Essential treatments are readily available for Lyme carditis, which include a range of antibiotics and surgical procedures. In this review, we highlight not only the true nature of Lyme disease, but more importantly, the positive correlation between LD and a variety of undiagnosed heart complications.

KEYWORDS: cardiovascular disease, Lyme carditis, *Borrelia burgdorferi*, civilization disease

Background

Cardiovascular disease (CVD) is a constellation of acute, subacute and chronic conditions that affect the heart and the peripheral vasculature and include such conditions as atherosclerosis, hypertension, angina pectoris, and similar ailments. It is by far the leading cause of disability and death worldwide, especially in more industrialized nations. The three main recognized physiological risk factors for cardiovascular disease are dyslipidemia, hypertension and diabetes mellitus, which may also result from hereditary, rather than solely lifestyle, factors. There are other behavioral risk factors that play an important role in the development of CVD, such as dietary habits, a sedentary lifestyle, smoking, a high level of alcohol consumption, and obesity, especially abdominal body fat accumulation. It has been suggested that these lifestyle risk factors for CVD are the most critical to modify as early as possible to avoid later possible complications due to cardiovascular illness [1–3].

Aside from risk factors such as hypertension, diabetes, dyslipidemia, and lifestyle, there is an important link between inflammatory pathways activated within the heart and peripheral vasculature and later manifestations of cardiovascular impairment. Such pathways can be initiated by endothelial cell injury in the vasculature, increased oxidative stress, or by infections induced by exogenous agents. Scientists have

determined that these infective agents include *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, and *Borrelia burgdorferi* [1].

Mycoplasma pneumonia is a bacterium that causes atypical pneumonia and in rare cases, it can affect the central nervous system and heart, inducing pericarditis. *Chlamydia pneumonia* is another bacterium that induces pneumonia in addition to a range of sequelae such as atherosclerosis and coronary heart disease. Additionally, members of the *Borrelia burgdorferi* sensu lato (s.l.) complex are known to potentially cause complications of the cardiovascular system, namely Lyme carditis (LC), which occurs in up to 10% of patients with LD [1,2,4,5].

Understanding the role of *Borrelia burgdorferi* s.l. infection in CVD development may lead to better diagnosis and prevention and may influence decision-making regarding treatment options. The aim of the following review is to examine an array of scholarly articles to provide a resource on severe acute cardiac complications that may follow infection.

Infection with Borrelia

Lyme disease (LD) is caused by gram-negative spirochetes of the *Borrelia burgdorferi* sensu lato (s.l.) complex, which is a diverse group of bacteria that includes various genospecies. The major genospecies that comprise this group are *B. burgdorferi* sensu stricto (s.s.), *B. garinii* and *B. afzelii*. *B. bissettii* has also been known to cause Lyme disease and to be involved in subsequent cardiac dysfunction [6,7]. Even though all are carried by ticks of the genus *Ixodes* and are distributed worldwide, the aforementioned species are the main causative agents of LD, precipitating the wide spectrum of clinical manifestations observed in humans. Recent investigations have shown that they also present high pathogenic potential, as seen in the case of *Borrelia mayonii*, a new genospecies which could also be a cause of LD and Lyme arthritis, especially in the upper midwestern United States [8].

Considering *Borrelia* spirochetes are able pass through the skin, spread to the blood vessels, cross the blood-brain barrier, and infect heart tissue, *Borrelia burgdorferi* is suspected to be one of the most invasive mammalian bacteria. Complications from LD infection range from neurologic symptoms, such as neuroborreliosis, to serious effects on the skin, joints, and heart. However, cardiac complications due to Lyme disease are often misdiagnosed and potentially progress to life-threatening conditions. Lyme disease can lead to Lyme carditis, which statistically occurs in 0.3–4% of untreated adults diagnosed with Lyme disease in Europe and in 1.5–10% of untreated adult patients in the United States [4,9,10]. Lyme carditis symptoms include palpitations, syncope or pre-syncope, dyspnea, chest pain, and most importantly, atrioventricular block that may rapidly progress to third degree block. Other heart abnormalities, including conduction and rhythm disturbances as well as dilated cardiomyopathy, may also manifest [6,7].

Nevertheless, with proper diagnostic procedures and appropriate use of antibiotics, most individuals affected with Lyme disease revert to pre-disease conditions. Some, however, remain affected with residual symptoms. Lyme disease diagnosis and treatment decisions are made through the prevalence of symptoms and through a medical interview where tick exposure is noted and is confirmed by serological tests such as enzyme-linked immunosorbent assay (ELISA) and Western-blot, which measure for the presence of antibody. To date, there are still questions regarding the progression of the illness, the mechanisms behind some of the complications, and whether a chronic disease state exists. Lyme disease has been viewed as a great imitator because it can mimic other nonspecific diseases and lead to misdiagnosis. This compilation of data gleaned from different sources is assembled in hopes of generating interest in further research into the true nature of Lyme disease, and most importantly, its positive correlation with a variety of heart complications [6,11,12].

Lyme borreliosis is the most common tick-borne infection in Europe. Specific areas are more majorly affected, especially centrally located countries in Eastern Europe. Although the true prevalence of Lyme carditis is unknown due to asymptomatic carrier states, its symptoms include acute chest pain, elevated level of cardiac enzymes such as troponin I, and diffuse ST-T segment changes. Cardiac symptoms appear within days to months after infection; it has specifically been estimated to develop between the 4th day and the 7th month of infection. Taken together, the body of LD research has uncovered that Lyme carditis is the main cause of mortality in LD patients. Additionally, it was found that males living in regions with endemic Lyme disease are three times more prone to Lyme carditis than their female counterparts [9,10,13,14]. According to the research gathered by *Kwit* et al., LC is prominent in males in their 60s as well as in younger patients, especially the 20-24-year-olds [15].

Clinical Manifestations

As rare and unusual as Lyme carditis may be, it is a clinical manifestation that can initially be overlooked and misdiagnosed multiple times before it is appropriately identified and treated. From atrioventricular blocks of varying extremes to rhythm abnormalities, the overall effects of such complications, if not treated in an appropriate fashion, could lead to serious damage, and in some cases, death [10]. A recent study led by the Centers for Disease Control and Prevention (CDC) concerning the morbidity and mortality of three deceased Lyme disease patients found that they died of sudden cardiac death, which is a rare complication [16]. All three patients resided in states in the Northeastern quadrant of the United States, namely New York,

Massachusetts, and Connecticut, which are endemic regions for Lyme disease.

As seen in Table 1, there are important, unifying characteristics from these three cases e.g., the similarities in health status, patient complaints, and postmortem findings. Additionally, the geographical locations in the United States where each patient died were similar. Each patient suffered extensive pancarditis due to spirochete infection by *Borrelia* and the various complaints were non-specific or suggestive of other health conditions. Therefore, it is crucial for physicians, health professionals, and even next-of-kin to be aware of non-specific LD signs and symptoms that can easily be mistaken for minor illnesses. Moreover, physicians and health professionals must be cognizant of the endemic regions of Lyme disease and question patients accordingly [7,16].

In a study by *Palecek* et al., Lyme disease was strongly correlated as an underlying cause of dilated cardiomyopathy, which is the third most common cause of heart failure and the most frequent cause of heart transplantation. *B. burgdorferi,* the agent of Lyme disease, may be an underlying cause of unexplained dilated cardiomyopathy, which was especially high in areas of Europe with endemic LD such as the Czech Republic. The team of researchers completed 39 endomyocardial biopsies in individuals exhibiting symptomatic, unexplained left ventricular systolic dysfunction. They concluded that 8 patients, or 21% of the 39 biopsies collected, were infected with *B. burgdorferi*. The pathogen was detected by polymerase chain reaction (PCR) analysis as well as electron microscopy, where one-fifth of the specimens collected indicated dilated cardiomyopathy. Therefore, it is crucial to screen for the presence of *B. burgdorferi* infection in endemic areas of Europe, especially in patients reporting unexplained heart abnormalities [17].

Other Lyme disease research has discovered that Lyme carditis is a common complication and can manifest as partial heart block due to the inflammation of the conducting nodes in the heart. For example, a case report in the *Michalski* and *Umpierrez De Reguero* found that a 45-year-old male was admitted to the hospital reporting non-radiating chest pressure and tightness. The patient hunted 3 weeks prior to the complaint and was possibly exposed to a tick bite, which was later confirmed by an erythematous lesion presented on his arm only after some time. This paper demonstrates not only the necessity of detailed patient history note taking, but also the strong correlation of LD with heart abnormalities. The patient was reported to have an abnormal ECG with ST-segment elevation as well as chest pain and abnormal biomarkers. Therefore, the patient with these collective symptoms was diagnosed with Lyme carditis [14]. This case report illustrates that patients with symptoms of heart abnormalities should be further examined by electrocardiogram in order to assess ST segment discrepancies [7,14].

When heart tissue is attacked by spirochetes and when symptoms of LD, which change rapidly and unpredictably, are left untreated, the disease course can be fatal. A case report by *Yoon* et al. revealed an unprecedented finding concerning a 17-year-old male whose Lyme carditis proved deadly. This diagnosis was determined postmortem, as the patient suffered from various medical issues that overshadowed the Lyme carditis. Various methods were used to identify this finding, such as immunohistochemistry, ELISA, and PCR. This study contributed to the finding that age is not a factor in Lyme carditis, and that LC must always be weighed as a potential diagnosis of cardiac abnormality due to its severity [10].

Many other studies also illustrate the involvement of Lyme carditis in the pediatric population. For example, twelve male patients living in endemic regions with a mean age of 15.9 years old and who stated that they were bitten by a tick upon arrival at an emergency room were monitored for cardiac symptoms. They experienced chest pain, dyspnea, syncope, dizziness or lightheadedness, fatigue, and palpitations. The electrocardiogram findings for 5 out of the 12 patients showed advanced second-degree heart block. Additionally, these findings revealed that 7 patients had complete heart block, with an average escape rate of 40 beats per minute and within

Table 1. Summary of three patient cases of sudden death due to Lyme carditis.

Patient ID	Location of Death	Conditions Prior to Death	Postmortem Findings
Patient # 1	Massachusetts (resident of Massachusetts)	Found on roadside and pronounced dead at nearby hospital; Previous complaints of malaise, symptoms of generalized muscle and joint pain.	Extensive myocarditis with mixed perivascular lymphoplasmacytic inflammation (microscopy); Abundant spirochetes found in cardiac tissue (histopathology)
Patient # 2	New York (resident of New York)	Acute chest pain, sudden collapse at home, pronounced dead at local hospital; Previous history of Wolff-Parkinson-White syndrome	Evidence of hypertensive and atherosclerotic cardiovascular disease noted at autopsy; Examination of cardiac tissue showed moderate diffuse, perivascular lymphoplasmacytic pancarditis
Patient # 3	New Hampshire (resident of Connecticut)	Sudden collapse, pronounced dead at hospital; Previous complaints of episodic shortness of breath 7-10 days prior to death.	Autopsy revealed myocarditis; Examination of heart tissues at CDC demonstrated diffuse mixed perivascular lymphoplasmacytic pancarditis; spirochetes found in myocardium

Each patient, confirmed to have suffered from complications of Lyme disease, was found to have extensive myocarditis resulting from spirochete infection of the cardiac muscle cells. Histopathology and serologic testing confirmed the identity of the bacterial agent, which was *Borrelia burgdorferi*. For more information, refer to the Center for Disease Control and Prevention Morbidity and Mortality Weekly Report [16].

those 7 patients, 2 had a ventricular escape rhythm and 4 had a junctional escape rhythm [18].

Lyme carditis is most commonly reported to cause high-degree atrioventricular block (AVB) in approximately 80-90% of patients. Usually this complication presents with palpitations, breathlessness, dizziness, and syncope and resolves with antibiotic use [5,19]. Given the fluctuating nature of conduction disturbances, the rapid advancement from first-degree to third-degree AVB could be problematic. This rapid advancement result from alternating tachycardias and bradycardias. In some cases, patients may reach second-degree AVB, which can result in a 2:1 conduction rate. It is vital to thoroughly assess patients in the beginning stages of Lyme disease for abnormalities in the cardiac region to potentially stop the progression of Lyme to fatal symptoms such as myocardial infarction [5,10,14,19–21].

Treatment

Lyme carditis is usually a transient illness with an excellent prognosis after a short course of antibiotics. With timely and appropriate therapy, patients should achieve full recovery within 1–6 weeks [10,20]. Although there are various courses of action that can be taken, the therapeutic treatment of choice is antibiotics. Considering that there is an invasive change that takes place in the human body after a bite by an infected tick, β-lactam antibiotics, specifically third generation cephalosporins (ceftriaxone or cefotaxime), are very commonly used. Ceftriaxone is the current drug of choice in first line therapy to treat acute Lyme carditis [19,22]. Taken over a span of two weeks, this antibiotic works by eradicating the *Borrelia* spirochetes before they have a chance to spread and bring about other clinical manifestations. In the case of patients experiencing a much harsher form of LC, one characterized by syncopal episodes or even second or third-degree atrioventricular blocks, antibiotic therapy alone may not be enough. This form of Lyme disease must be accompanied with hospitalization and observation of the individual's heart rhythm. Furthermore, in very unstable patients, a temporary pacemaker is required to monitor and establish normal heart rhythms. In exceptional cases, a permanent pacemaker may have to be implanted to maintain normal rhythms [22–24].

All these methods of treatment have not only proven to be quite effective, but also have shown that Lyme carditis and its various manifestations can be properly treated and have a good prognosis. However, thorough evaluations of each patient's complications and proper diagnoses must be made in order to establish effective therapeutic plans [22,23].

There are some individuals with LD that may follow an appropriate treatment plan, potentially recuperate from LD if diagnosed early on, and yet months or even years later, they will develop a syndrome that consists of fatigue, joint pain, and cognitive dysfunction. This is referred to in a study by *Kanjwal* et al. as postural orthostatic tachycardia syndrome (POTS) [25]. A parallel case report by *Novak* et al. also focused on persistent LD symptoms in a patient earlier treated because of LC with cardiac complications such as bradycardia, tachycardia, and AVB. Even after a course of antibiotics, some individuals later observe a reduction in the ability to function e.g., fatigue and musculoskeletal pain, which is referred to as posttreatment Lyme disease syndrome (PTLDS). This apparently chronic LD relates to disseminated infection during LC, which is often recognized after a delay [26].

Taken together, Lyme carditis is a treatable disease with generally positive responses to medications. However, some patients can have persistent symptoms that are different from those connected to LC. Timely recognition of symptoms and early treatment are key factors in reducing patients' recovery time and maintaining a relatively active lifestyle [25,26].

Conclusions

Lyme carditis is a dynamic, yet rare complication of Lyme disease that is often misdiagnosed. Cardiac complications associated with LD are most often the last to manifest, which explains why spirochete infection can covertly paved the way to life-threatening conditions. While *Borrelia* infection is not the only risk factor for cardiovascular disease, it can potentiate other risk factors. All symptoms and complications associated with Lyme disease, especially those caused by *B. burgdorferi*, can be treated if properly diagnosed. The medical interview, medical history, and efficient patient-physician communication are the keys to a patient's successful diagnosis and ultimate recovery.

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CLINICAL PRACTICE GUIDELINES, QUALITY INDICATORS, AND THE TRUE VALUES OF PRIMARY CARE

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ABSTRACT

Despite the increasing popularity of the concepts known as person-centered care and the holistic approach, their implementation in real life is far from optimal. Patients' priorities, preferences, and values are still too often neglected. The tendency to measure the outcomes of primary care just in terms of avoiding hospital admissions, reducing health care costs, and increasing adherence to treatment can cause problems and create distortion.

Guidelines are too focused on single diseases and not patient-focused. Most guidelines have a "one-size-fits-all" mentality and do not build flexibility or contextualization into their recommendations.

Quality indicators should be used with caution and wisdom, especially in primary care, as they are mainly related to a few common chronic diseases and this is not conducive to recognizing the vast range of health problems of our patients. Quality indicators can be useful as a starting point for discussions about quality in primary care but not all the data that we have in our electronic clinical records can be used to derive good quality indicators and they cannot reflect the broad scope of primary care. Some core values are difficult to measure because doctors and nurses are pushed to spend too much time on the registration and administration of the required data rather than dedicate this time to the actual care of the patient.

Person-centered health care is certainly one the visions of primary care and primary care doctors need to step up and lead the change. Rural primary care doctors, who traditionally adopt a less biomedical and more holistic approach than their urban counterparts, could become the pioneers in the implementation of this process.

KEYWORDS: clinical practice guidelines, quality indicators, core values, primary care, rural primary care

Getting impatient about person-centered care

Primary care is person-centered, not disease-focused care, over time. According to Klikmann & van Weel [1], *"Primary care doctors are those who help persons with problems over time"*: GPs deal with peoples not patients; they give advice, not orders; they cope with problems not with diagnoses, and many times, not just one at the time. Finally they are concerned with the entire episode of care and not only a single visit.

Despite the number of articles published in the last decades on the concept of person- centered care and the need fora more focused holistic approach, the situation in real life is far from optimal [2]. The elicitation of priorities, preferences and values are essential for a person-centered approach and it is a prerequisite for assessing the needs of the patients and identifying their goals [3]. The outcomes of health services need to be measured in terms of their ultimate product: health.

This is not trivial as Valderas states "considering the tendency to measure the outcomes of primary care just in terms of avoiding hospital admissions, reducing health care costs, increasing adherence to treatment or achieving some degree of control of physiological measurements" [2].

The WONCA International Classification Committee (WICC), in designing its classification for primary care (ICPC), gave significant importance to the social and personal factors which affect care, dedicating them to Chapter Z of the classification [4] and the person-related information is still an active line of research in the WICC [5, 6].

The theme of the VII European Rural and Isolated Practitioners Association (EURIPA) forum

The theme of the VII Euripa Forum which took place in November 2017 in Crete (Greece) was "Rural Renaissance". This title attempts to correspond to the demands of a challenging world that has already recognized the health inequalities among and within rural regions. Holistic health care needs assessment along with the essential four dimensions of the quality in Primary Health Care (PHC) (continuity, accessibility, comprehensiveness and coordination). The renaissance of rural health can help to rediscover the true values of our discipline. Why rural health? Because it is less biomedical and more holistic than the urban counterpart and rural doctors usually have an increased social standing [7]. The local doctor is the one who has to deal with very personal issues, and be a reliable friend who patients can count on if there is a problem [8]. PHC and General Practitioners (GPs) could become the agents for "Rural Renaissance", and rural doctors, the pioneers of this old/new approach.

Clinical practice guidelines (CPG)

In the view of many researchers, controlling risk factors in many chronic conditions is unsatisfactory and doctors need to be more proactive [9, 10]. Family doctors are the ones who are blamed the most, often accused of not following the guidelines, and being affected by some sort of clinical inertia. Is this the key issue [11]? CPG should have a role in guiding how we care for patients, but they have been largely developed for and emphasize only the single disease perspective.

Two out of three patients in primary care, over age of 50, have more than one chronic disease, yet most studies apply strict criteria to exclude those with diseases other than the condition under study, to reduce confounding variables [12]. Excluding patients with multiple, chronic diseases from studies may improve the precision but diminishes the relevance of the findings.

Besides, many current guidelines have become marketing and opinion-based pieces, delivering directive rather than assistive statements [13]. Guidelines are often too focused on single diseases and not patient-focused. Most guidelines have a "one-size-fits-all" mentality and do not build flexibility or contextualization into the recommendations. CPG are supposed to be guides, not rules, and one size certainly does not fit all patients. Recommendations should vary based on patient's comorbidities, the health care setting, and patient's values and preferences [14, 15]

Quality indicators

The most popular quality indicators are those included in the pay-for-performance scheme called Quality and Outcome Framework (QoF) [16], which was introduced in the UK National Health Service (NHS) in 2004 as part of the General Medical Services (GMS) contract for UK general practice. As Barbara Starfield argued in her article "Is patient-centered care the same as person-focused care?" [17] the payment for performance could be a good approach to encourage adherence to evidence-based processes of care, but its application could be problematic in terms of attention to people's problems. Quality indicators are mainly related to a few common chronic diseases and this is not conducive in recognizing the vast range of health problems of our patients. Unfortunately, this performance measurement has been extended to interventions that have only a small clinical benefit while many other important aspects of care are neglected.

Using multiple, single disease–focused quality indicators to judge the quality of care provided to older patients with multiple comorbidities creates another level of difficulty. In these patients, we need to balance each patient's overall health status with the burdens, risks, and benefits of complex care, and this is something that single-disease guidelines and their resultant quality indicators do not address [13].

Nowadays, there is the great underestimation of the importance for long-term relationships with patients, which is often independent of the care for specific disease episodes. Rather, the priority seems to be in the interest in individual diseases, chosen because they are costly or because they are thought to cause considerable premature mortality and disability [10]. It is important to point out that these proxy outcomes are, of course important, but along with other factors, which unfortunately are continuously neglected, these indicators met a managerial agenda rather than a clinical one [18]. Recently the QoF scheme has been abandoned in Scotland and radically reshaped in England [18]. The advisory group NHS England urged that one of the key priorities for a reformed QoF was to enable a more holistic, person-centered care approach [19].

Mid-Staffordshire scandal

What can happen when empathy and compassion are not considered priorities? One example is the scandal which happened at the Stafford Hospital in Mid-Staffordshire, England. It concerned poor care amongst patients at a UK hospital in the late 2000s. This scandal grew from a gap between resources and expectations. Mid-Staffordshire's leaders aggressively pushed clinical managers to slash spending to meet approval standards. Waiting-times and other performance targets were introduced. A government-commissioned inquiry by Sir Robert Francis revealed how these circumstances combined to create a major health care scandal [20]: "Mid Staffordshire's leaders imposed cuts without assessing risks, then intimidated the staff into suppressing their concerns. Emergency department

nurses were told to delay the start of antibiotics and pain medication, and staff who missed targets, feared being fired. This fear led to premature discharges and falsification of records. Meals were left out of reach of bedridden patients, drug doses were missed, and incontinent patients weren't cleaned." The final report was published on the 6 February 2013, making 290 recommendations to enforce openness, transparency, and candor amongst NHS staff.

As Gregg Bloche wrote in its editorial in the NEJM we should not minimize the importance of these scandals [21]: "the scandals are often a Sentinel Event of something which is going in the wrong direction. Rules and incentives often corrode intrinsic motivation to avoid shirking and self-dealing." Politicians promise and when things do not work, it's the fault of the institution's leadership. The result is a "toxic atmosphere" that "prevents those who are running the show from telling the truth" and signals doctor and nurses to keep quiet."

Western Societies live under the illusion that some core values can be achieved forever. Unfortunately, this is not always the case. What happened in the past can happen again in the future if the true values of heath care are not regarded as a priority. The problem often hides surprisingly under the guise of "optimal" appropriateness and efficiency. Wisdom, empathy, and compassion are not old-fashioned approaches to deal with our patients, and even less a luxury that we cannot afford to overlook in a period of financial crisis, but essential core values which should always guide our decisions.

Measuring quality in primary health care

Quality indicators should be used with wisdom especially in PHC. The European Society for Quality and Patient Safety in General Practice (EQuiP) recently raised this issue in its position paper "Measuring Quality in Primary Health Care" (appendix 1).

While quality indicators can be useful as starting points for discussions about quality in PHC, their generalized use might pose some issues [22]. Not all data we have in our electronic clinical records can be used to derive good quality indicators and quality indicators cannot reflect the broad scope of PHC. Some core values and characteristics such as person-centered care and continuity of care are particularly difficult to measure, moreover the indicators urge doctors and nurses to spend too much time on the registration and administration of required data rather than dedicating this time to the actual care of the patient. "Not everything that can be counted counts and not everything that counts can be counted" is a quote attributed to Albert Einstein which fits perfectly with the existing quality indicators.

WONCA definition of general practice/ family medicine and the true value of primary health care

According to the WONCA [23]: "General practitioners/family doctors care for individuals in the context of their family, their community and their culture, always respecting patient autonomy. In negotiating management plans with their patients, they integrate physical, psychological, social, cultural, and existential factors, utilizing the knowledge and trust engendered by repeated contacts."

Table 1 below highlights the cultural differences between primary and secondary care [24].

By way of conclusion, we think that primary care doctors who recognize themselves in the WONCA definition, cannot be complacent with the mere achievement of the optimal target of these quality indicators and they cannot be satisfied with the subsequent economic incentives. These indicators measure neither our wit nor our wisdom, neither our compassion nor our devotion to our profession. They measure a variety of factors, except those which perhaps make our profession really worthwhile. They can tell us some important aspects about Primary Care management except not whether we can feel proud to be family doctors.

Table 1. Cultural differences between primary and secondary care

	Secondary health care	Primary health care
Planning	Short perspective Great changes in short time	Long perspective Rest of life
Assessment	Diagnosis and treatment with advanced technology	Functional ability scales, Patient preferences and self-care
Disease	Focus on one diagnosis at the time	Many patients have more than just one chronic disease
Clinical guidelines	Strong adherence	A part the nice guidelines [24] Real guidelines for multimorbidity do not exist
Patient role	Leave to health personnel to decide what to be done	At home the patient decides Don't want to be reminded about the disease

Adapted from Anders Grimsmo, Wonca International Classification Committee (WICC) Meeting (Ravello, Italy, November 2012).

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