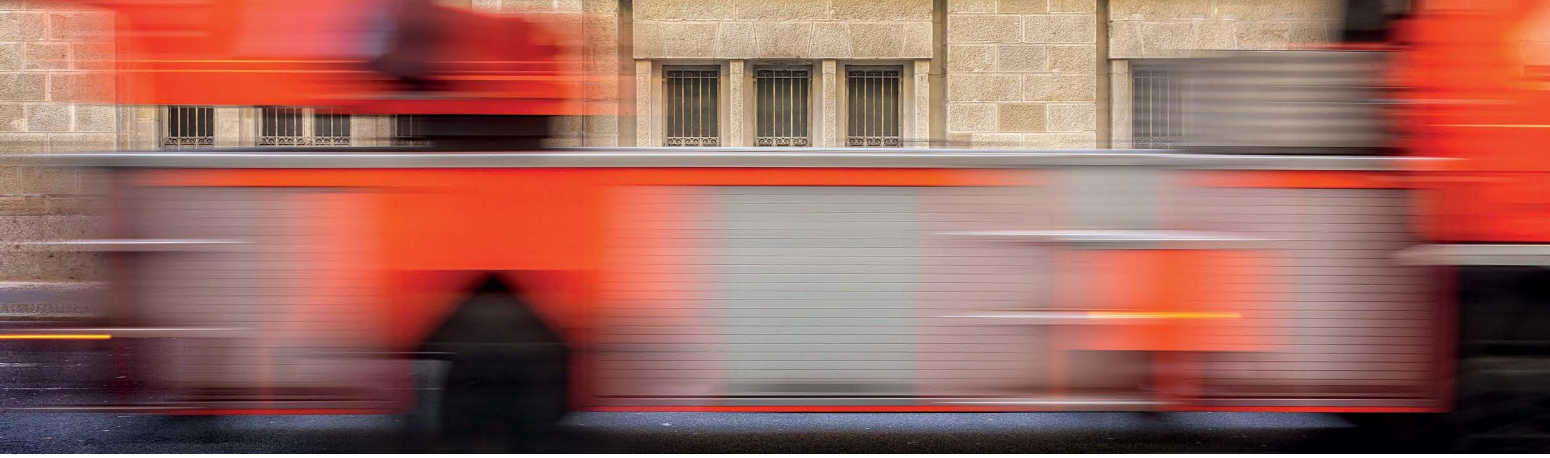

DECEMBER 2021 | VOL. 6 | NO. 4

ISSN 2451–4691
E-ISSN 2543–5957

DISASTER AND EMERGENCY MEDICINE JOURNAL

VIA MEDICA

WWW.JOURNALS.VIAMEDICA.PL

MULTIMEDIALNA PLATFORMA WIEDZY MEDYCZNEJ

tvmed

- **Ponad 5000 wyemitowanych nagrań**
- **Ponad 300 transmitowanych konferencji**
- **Ponad 2000 współpracujących z nami specjalistów**
- **Ponad 1600 godzin materiałów wideo**

Dostęp do najlepszej wiedzy medycznej
w ramach jednej prostej opłaty.
Warto skorzystać już dziś!

www.tvmed.pl

DISASTER AND EMERGENCY MEDICINE JOURNAL

www.journals.viamedica.pl/disaster_and_emergency_medicine

■ **Disaster and Emergency Medicine Journal** (ISSN 2451–4691, e-ISSN 2543–5957) is published by VM Media sp. z o.o. VM Group sp.k., Grupa Via Medica, ul. Swietokrzyska 73, 80–180 Gdansk, tel: (+48 58) 320 94 94, fax: (+48 58) 320 94 60, www.journals.viamedica.pl/disaster_and_emergency_medicine

■ **Editorial Address:** VM Media sp. z o.o. VM Group sp.k., Via Medica Group, ul. Swietokrzyska 73, 80–180 Gdansk, tel: (+48 58) 320 94 94, fax: (+48 58) 320 94 60, www.journals.viamedica.pl/disaster_and_emergency_medicine

■ **Advertising:** For details on media opportunities within this journal please contact the advertising sales department ul. Swietokrzyska 73, 80–180 Gdansk, tel: (+48 58) 320 94 94, e-mail: dsk@viamedica.pl
The Editors take no responsibility for the published advertisements.

Disaster and Emergency Medicine Journal is indexed in CrossRef, Polish Medical Bibliography (PBL), ROAD and Ulrich's Periodicals Directory.

Editorial policies and author guidelines are published on journal website: www.journals.viamedica.pl/disaster_and_emergency_medicine

Legal note: www.journals.viamedica.pl/disaster_and_emergency_medicine/about/legalNote

Polskie Towarzystwo Medycyny Katastrof PTMK

DISASTER AND EMERGENCY MEDICINE JOURNAL

www.journals.viamedica.pl/disaster_and_emergency_medicine

TABLE OF CONTENTS

VIA MEDICA

ORIGINAL ARTICLE

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 155–163
DOI: 10.5603/DEMJ.a2021.0029

ISSN 2451–4691, e-ISSN 2543–5957

PLACE OF TRANEXAMIC ACID IN TRAUMATIC BRAIN INJURY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

Mahdi Al-Jeabory[1, 2], Lukasz Szarpak[2, 3, 4], Zubaid Rafique[5], Nilesh R. Vasan[6], Kecskes Attila[7], Aleksandra Gasecka[8, 9], Wladyslaw Gawel[10], Michal Pruc[1], Marek Malysz[1], Milosz J. Jaguszewski[11], Ivan Savytskyi[12], Natasza Blek[3], Krzysztof J. Filipiak[3], Frank W. Peacock[5]

[1]Outcomes Research Unit, Polish Society of Disaster Medicine, Warsaw, Poland
[2]Research Unit, Polonia Academy, Czestochowa, Poland
[3]Institute of Outcomes Research, Maria Sklodowska-Curie Medical Academy in Warsaw, Poland
[4]Research Unit, Maria Sklodowska-Curie Bialystok Oncology Center, Bialystok, Poland
[5]Henry JN Taub Department of Emergency Medicine, Baylor College of Medicine, Houston, TX, USA
[6]College of Medicine, The University of Oklahoma, USA
[7]NATO Centre of Excellence for Military Medicine, Budapest, Hungary
[8]1st Chair and Department of Cardiology, Medical University of Warsaw, Poland
[9]Department of Cardiology, University Medical Center Utrecht, CX Utrecht, The Netherlands
[10]Department of Surgery, The Silesian Hospital in Opava, Czech Republic
[11]First Department of Cardiology, Medical University of Gdansk, Poland
[12]International European University, Kyiv, Ukraine
[13]Department of Emergency Medical Service, Wroclaw Medical University, Wroclaw, Poland

ABSTRACT

INTRODUCTION: Traumatic brain injury (TBI) is a leading cause of death and disability. In many cases of TBI-related intracranial hemorrhage (ICH) is associated with a high risk of coagulopathy and may lead to an increased risk of hemorrhage growth. Therefore, tranexamic acid (TXA), which is known as an antifibrinolytic agent that reduces bleeding by inhibiting the breakdown of blood clots, might limit ICH expansion.

MATERIAL AND METHODS: We aimed to quantify the effects of TXA in brain injury and thus performed a literature search using PubMed, Web of Science, Scopus, EMBASE, and Cochrane Center Register of Controlled Trials (CENTRAL) for studies that were published between the respective database inception, and April 10, 2021.

RESULTS: A total of nine studies were identified; these included 5845 patients treated with, and 5380 treated without TXA. The 28-day or in-hospital mortality was 17.8% for the TXA group, compared with 19.3% for the no-TXA group (OR = 0.92; 95% CI: 0.83, 1.01; p = 0.08). At 6-months follow-up, mortality was 18.3% vs 19.9% (OR = 0.91; 95% CI: 0.63–1.31; p = 0.60), with and without TXA, respectively. A Glasgow Outcome Scale less than 4 points at 28-days follow-up was reported in 3 studies and was 29.8% vs 34.8% (OR = 0.91; 95% CI: 0.45, 1.82; p = 0.78), with and without TXA, respectively. No differences were found in adverse events between TXA and non-TXA groups.

CONCLUSIONS: Our analysis found showed no statistical significance between TXA and non-TXA treatment of TBI patients, however, in the TXA group a trend to decrease 28-day mortality compared to non-TXA

ADDRESS FOR CORRESPONDENCE:
Natasza Blek, Institute of Outcomes Research, Maria Sklodowska-Curie Medical Academy in Warsaw, Poland
e-mail: natasza.blek@uczelniamedyczna.com.pl

treatment was observed. More high-quality studies are needed to show the significant benefit of using TXA, especially in moderate and severe TBI patient groups.

KEY WORDS: blood conservation, antifibrinolytic, tranexamic acid, hemostasis, head trauma, meta-analysis

Disaster Emerg Med J 2021; 6(4): 155–163

INTRODUCTION

Traumatic brain injury (TBI), which is a form of acquired brain pathology, occurs when a sudden force inflicts damage to the brain [1]. According to the Centers for Disease Control and Prevention, around 2.5 million people in the U.S. report to the emergency departments seeking help regarding TBI [2]. The consequence of TBI results in almost 6 million Americans living with lifelong complications following TBI [3]. While the classification of the TBI can be complicated, most systems consider physical abnormality and dysfunctional severity to assess the injury [4]. One of the most popular and widespread systems is the Glasgow Coma Scale (GCS). It stratifies injury on a 3–15 point scale; where 13–15 is considered mild, 9–12 moderate, and below 9 to be severe brain injury [5]. When discussing severity, one may also classify TBI depending on the length of unconsciousness, where mild, moderate, or severe injury results in the loss of consciousness in terms of seconds, minutes, or hours, respectively [6]. While the vast majority of TBI represents a mild concussion [7], in which the symptoms resolve within 1–2 weeks, around 15% of patients suffer long-term complications [8].

Although accounting for a minority of overall cases, severe TBI is a leading cause of morbidity and mortality worldwide [9]. Severe trauma causes may result in coagulopathy [10], with the consequence of bleeding and cerebral edema. Several procedures have been implemented in order to reduce damage caused by this cascade of events such as hyperventilation, diuretics, and CFS drainage [11]. In order to protect the brain, several drugs are used, e.g., barbiturates, [12] which reduce the brain metabolism; however, U.S. Food and Drug Administration (FDA) has not approved any drug therapy for the treatment of TBI. Tranexamic acid has been proposed as a candidate drug in the management of severe TBI due to its ability to decrease the conversion of plasminogen to plasmin, which reduces fibrinolysis and stabilizes the blood clot [13]. At present, whether it is effective in improving outcomes is unclear.

We thus conducted a systematic review of randomized-controlled trials (RCTs) to evaluate the safety and efficacy of tranexamic acid in acute brain injury, hypothesizing that we would find a clinically meaningful result.

MATERIAL AND METHODS

This systematic review and meta-analysis were performed under the preferred reporting items for systematic review and meta-analysis (PRISMA) guidelines [14]. This study represents a continuation of prior research on the use of TXA previously undertaken by the authors [15, 16].

Search strategy

Two independent reviewers (M.A-J, L.S.) performed a computerized search of EMBASE, PubMed, Scopus, Web of Science and Cochrane Center Register of Controlled Trials (CENTRAL) from database inception until April 10, 2021. We included only English-language publications. Following the strategy, which combined keywords was used: 'tranexamic' or 'TXA' or 'tranexamic acid' or 'hemorrhage control' and 'injuries*' or 'trauma' or 'wounds' or 'head injury' or 'brain injury' or 'traumatic brain injury' or 'TBI' and 'prehospital' or 'military' or 'combat' or 'civil*' or 'emergency medicine' or 'ED' or 'ER'. Additionally, we manually searched references listed in reports and review articles to identify potentially missed trials.

Selection criteria

Studies that were included in this meta-analysis had to fulfill the following PICOS criteria: 1. Participants, patients with head injury 18 years old or older; 2. Intervention, tranexamic acid treatment; 3. Comparison, non-TXA treatment; 4. Outcomes, detailed information for survival or mortality; 5. Study design, randomized controlled trials comparing TXA and non-TXA care for their effects in patients with brain injury. Studies were excluded if they were reviews, observational studies, animal studies, case reports, letters, conference or poster abstracts, or articles not containing original data.

Data extraction

Two reviewers (M.A-J, and L.S.) independently extracted all important information from the full-text original publications and entered it into an electronic data sheet specifically designed for this trial. Any disagreements were discussed and resolved in a consensus meeting with the third reviewer (A.G.). Extracted information included: year of study, country, study design, patient demographics, and study outcomes. Data were extracted for the following outcomes: 28-day or in-hospital mortality, Glasgow Outcome Scale (GOS) less than 4 points in 28-days follow-up [17], length of stay in Intensive Care Unit (ICU), and in-hospital and adverse events including thrombotic events. We also extracted data for longer follow-up if available. Duplicate reports from the same study were excluded.

Risk of bias and quality assessment

Two investigators (M.A-J, and L.S.) independently evaluated studies for risk of bias and quality assessment. Any disagreements were discussed and resolved in a consensus meeting with the third reviewer (A.G.). The RoB 2 tool (revised tool for risk of bias in randomized trials) was used to assess the quality of randomized studies [18] and the ROBINS-I tool (tool to assess the risk of bias in non-randomized studies of interventions) was used to assess the quality of non-randomized trials [19]. The risk of bias assessments was visualized using the Robvis application [20]. The scale has seven main domains (confounding, participant selection, classification of interventions, deviation from interventions, missing data, outcome measurement, and selection of reported results) and assigns one point for each of the following four judgments: critical, serious, moderate, and low. The review authors' judgments about each risk of bias item are provided in Figures 4–5 in Supplementary File 1.

To assess the quality of evidence we applied the Grading of recommendations Assessment, Development, and Evaluation (GRADE) approach [21] with GRADEpro software (version 3.6 for MacOS). Moreover, the quality of evidence was rated (presence or absence) on the following variables: inconsistency, indirectness, imprecision of the results, and publication bias. The quality of evidence for the main outcomes was graded as high, low, and very low.

Outcomes

The primary outcome of the current meta-analysis was 28-day or in-hospital mortality. The secondary outcomes were Glasgow Outcome Scale (GOS) less than 4 points in 28-days follow-up, length of stay in Intensive Care Unit (ICU) and in hospital, and adverse events including thrombotic events.

Statistical analysis

We performed statistical analysis using Review Manager (version 5.4., Nordic Cochrane Centre, The Cochrane Collaboration, Copenhagen, Denmark). To calculate the pooled odds ratio (OR) and 95% confidence interval (CI) of binary outcomes trial data were combined using the Mantel-Haenszel estimator. For continuous outcomes, the pooled mean difference with 95% CI were calculated using inverse-variance estimator. When the continuous outcomes were reported in a study as median, range, and interquartile range, we estimated means and standard deviations using the formula described by Hozo et al. [22].

Statistical heterogeneity was assessed by the Cochrane Q statistic and I2 statistic which indicates the percentage of variability due to heterogeneity rather than sampling error [23]. A p-value < 0.10, and $I2 > 50\%$, indicated heterogeneity. This helps avoid false-negative results and the inclusion of such results in the meta-analysis. We performed a sensitivity analysis using the Hartung–Knapp–Sidik–Jonkman method when the number of studies was less than 10 [24]. Moreover, the random-effects model was used for analyses [25]. A p-value < 0.05 was taken to indicate statistical significance [26]. Statistical testing was 2-tailed.

We planned a priori to investigate potential publication bias using a funnel plot if it included over 10 trials for an outcome. For continuous outcomes, the Egger test was used to detect funnel plot asymmetry [27]. For dichotomous outcomes, we used the arcsine test. We considered publication bias to be present when the p-value was < 0.1 in the asymmetry test.

RESULTS

Study selection and characteristics

We identified 547 articles using the predefined search strategy. Of these, 96 were excluded because of duplication. After an assessment of the titles and abstracts, 415 publications were excluded as not relevant to the analyses. After examination of the full text of the selected articles, we finally include 9 randomized controlled trials for this meta-anal-

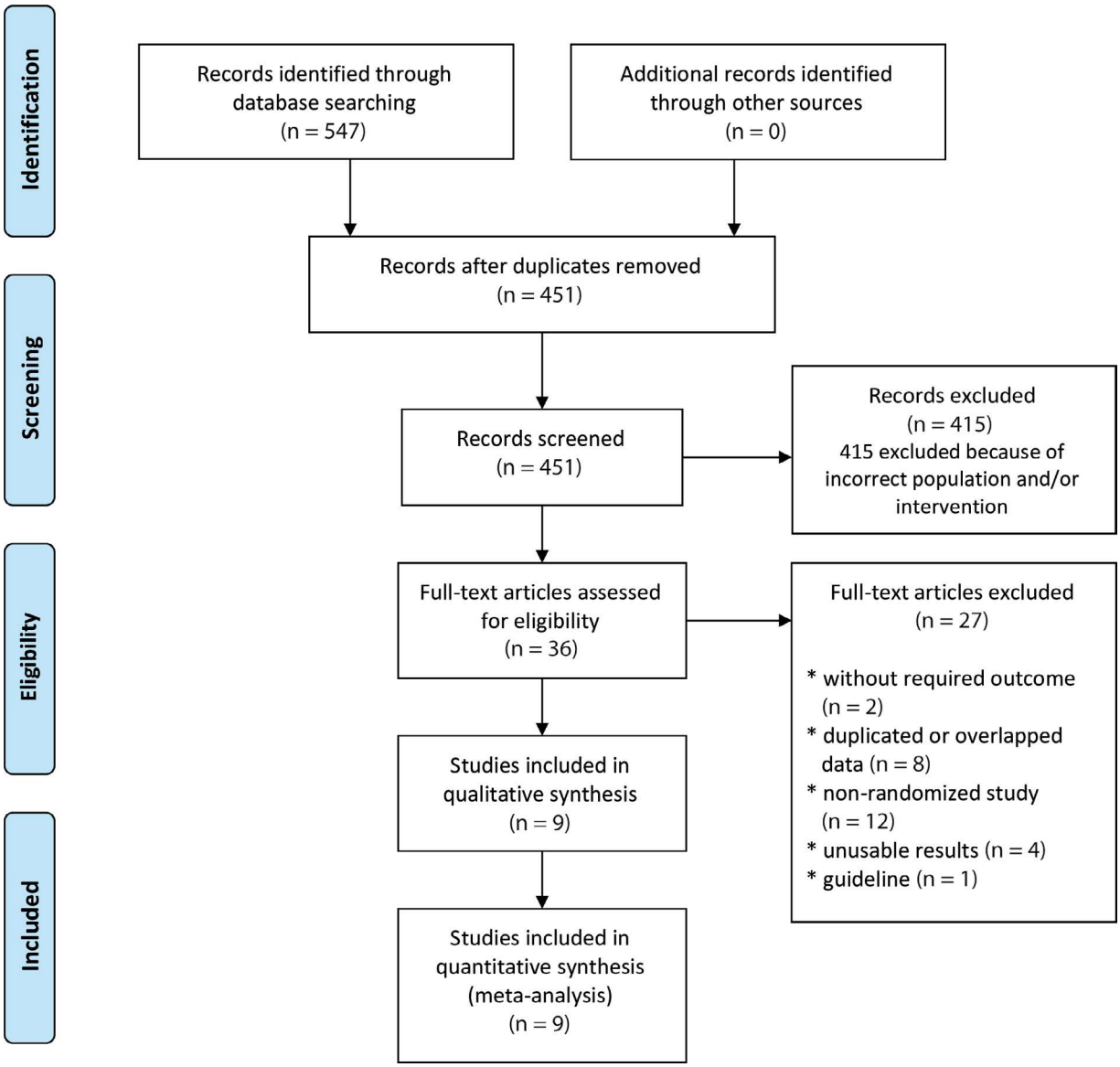

FIGURE 1. Meta-analysis flow chart of included and excluded studies

ysis. We display the process of study selection in the flowchart (Fig. 1). We summarize the details of selected trials in Table 1.

Of the nine trials meeting the inclusion criteria, a total of 5845 patients were treated with, and 5380 without, TXA [17, 28–35]. Four studies were conducted in Iran [31–34], and one in each of the following countries: Tunisia [28] and Thailand [35]. One study was performed in cooperation between the USA and Canada [17], and there were 2 multi-country studies involving more than 2 countries [29, 34].

Outcomes

Twenty-eight-day or in-hospital mortality were reported in six studies [17, 28–35]. It was 17.8% with and 19.3% without TXA (OR = 0.92; 95% CI: 0.83–1.01; p = 0.08; I2 = 0%; Fig 2). Mortality rate between TXA vs non-TXA group was not statistically different at 7-days (14.3% vs 6.8% respectively; OR = 2.28; 95% CI: 0.57–9.15; p = 0.25) and 6-months (18.3% vs 19.9%; OR = 0.91; 95% CI: 0.63–1.31; p = 0.60; SDF).

Glasgow Outcome Scale (GOS) less than 4 points at 28-days follow-up was reported in three studies [28, 34 ,35] and was 29.8% with TXA compared to 34.8% in the non-TXA group (OR = 0.91; 95% CI: 0.45, 1.82; p = 0.78; I2 = 73%; Fig. 3A). GOS less than 4 points at 6-months follow-up was reported in two studies and was 35.8% vs 34.3% (OR = 0.76; 95% CI:

Table 1. Patient characteristics of the included studies

Trial	Country	Study design	TXA group				Non-TXA group			
			No	Age	Sex/male	ISS	No	Age	Sex/male	ISS
Chakroun-Walha et al. 2019	Tunisia	Prospective randomized study	96	44 ± 20	NS	21.8 ± 23.2	84	39 ± 18	NS	23.5 ± 25.6
CRASH-3 2019	Multi-country	Randomized, placebo-controlled trial	4649	41.7 ± 19.0	3,742 (80.5%)	NS	4,553	41.9 ± 19.0	3,660 (80.4%)	NS
Fakharian et al. 2017	Iran	Double-blind, randomized clinical trial	74	42.3 ± 18.3	67 (90.5%)	NS	75	39.3 ± 18.1	66 (88.0%)	NS
Jokar et al. 2017	Iran	Single-blinded, controlled, randomized trial	40	35.4 ± 14.6	32 (40.0%)	NS	40	36.2 ± 14.9	28 (70.0%)	NS
Mojallal et al. 2020	Iran	Double-blind controlled clinical trial	56	41.15 ± 20.3	40 (70.1%)	NS	44	37.40 ± 19.6	40 (90.9%)	NS
Mousavinejad et al. 2020	Iran	A double-blind, randomized, and placebo-controlled trial	20	54.89 ± 19.1	14 (70.0%)	NS	20	55.16 ± 18.15	12 (60.0%)	NS
Perel et al. 2012	Multi-country	A prospective randomised controlled trial	133	36.2 ± 14	111 (83.5%)	NS	137	37 ± 13.7	117 (85.4%)	NS
Rowell et al. 2020	USA/ /Canada	A randomized, double-blind, 3-group, multicenter phase II trial	657	40.4 ± 5.1	482 (73.4%)	17.3 ± 3.2	309	38 ± 5	233 (75.4%)	17.5 ± 3
Yutthakasemsunt et al. 2013	Thailand	A double blinded, placebo controlled randomized trial	120	34.8 ± 16.0	103 (85.8%)	24.7 (5.7)	118	34.1 ± 15.3	107 (90.7%)	25.4 ± 5.7

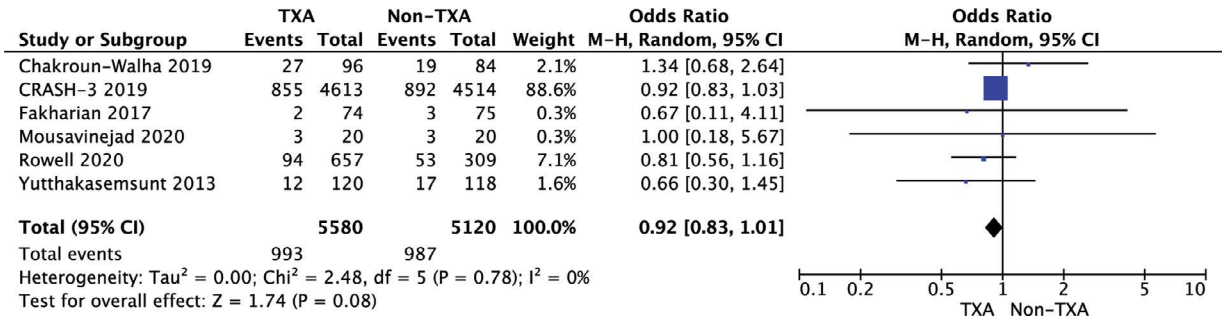

FIGURE 2. Forest plot of 28-day or in-hospital mortality in TXA vs non-TXA group. The center of each square represents the weighted odds ratio for individual trials, and the corresponding horizontal line stands for a 95% confidence interval. The diamonds represent pooled results

0.35–1.67; p = 0.50; I2 = 55%; Fig. 3B) with and without TXA, respectively.

Length of stay in ICU was reported in two studies [28, 30] and was 14.7 ± 15.7 for TXA, and 11.4 ± 12.1 days for the non-TXA group (MD = 2.85; 95%CI: -0.07, 5.76; p = 0.06; I2 = 0%; Figure 4A). Two studies reported length of hospital stay for TXA and non-TXA cohorts [28, 30]. The average length of hospital stay was 14.3 ± 14.9 days, vs 14.4 ± 14.0 days (MD = -0.30; 95% CI: -3.39, 2.79; p = 0.85; I2 = 0%; Fig. 4B), with and without TXA, respectively.

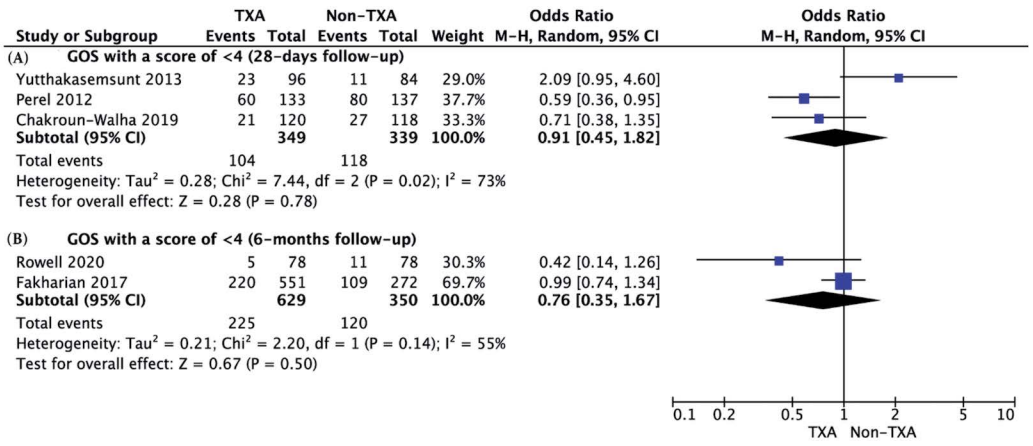

FIGURE 3. Forest plot of Glasgow Outcome Scale less than 4 points at 28-days (A) and 6 months follow-up (B) in TXA vs non-TXA group. The center of each square represents the weighted odds ratio for individual trials, and the corresponding horizontal line stands for a 95% confidence interval. The diamonds represent pooled results

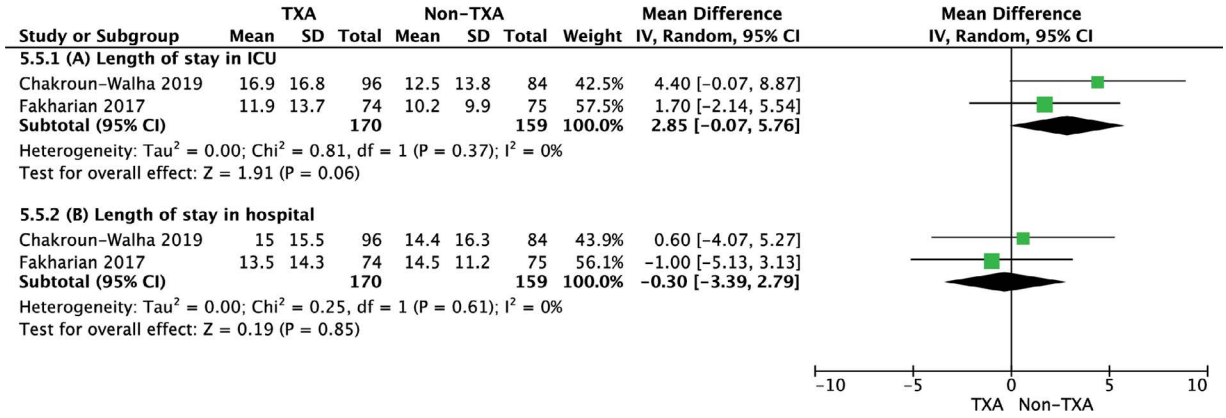

FIGURE 4. Forest plot of length of stay in an intensive care unit (ICU) (A) and length of hospital stay (B) in TXA vs non-TXA group. The center of each square represents the weighted mean difference for individual trials, and the corresponding horizontal line stands for a 95% confidence interval. The diamonds represent pooled results

In the case of the TXA group, the most frequently observed adverse event (in 28-day or in-hospital follow-up) was a seizure, which occurred in 3.2% of patients in TXA group compared to 2.9% in non-TXA group (OR = 1.12; 95% CI: 0.92, 1.36; p = 0.27; I2 = 0%). In the case of other complications, no differences were observed between TXA and non-TXA groups (Tab. 2).

DISCUSSION

This meta-analysis was designed to evaluate the safety and efficacy of TXA in the management of TBI. We found no statistically significant differences in both short- and long-term mortality between patients who received TXA and those who did not. However, while those findings are not statistically significant we observed that TXA decreases mortality in a 28-days period compared to non-TXA treatment (17.5% vs 19.0%, respectively; p = 0.06). Interestingly the authors of the CRASH-3 trial, the largest trial to date on the use of TXA, reported that the early administration (within 3 hours following injury) reduces head injury-related mortality in patients with mild-to-moderate, but not in those with severe head injury [29]. Similarly, Sprigg et al. [36] reported improvement in short-term mortality with TXA, but that long-term status was the same as in the non-TXA administered group.

Others report no mortality effect, although a study by Jokar [31] demonstrated a potential TXA benefit by a reduced size of intracranial hemorrhage. While these findings are supported by Yutthakasemsunt [35] and Mousavinejad, [33] Fakharian [30]

Table 2. Adverse events in 28-days follow-up

Adverse event	No of studies	Events/participants		Events		Heterogeneity between trials		p-value for differences across groups
		TXA group	Non-TXA group	OR	95% CI	p-value	I^2 statistic	
All vascular occlusive event	2	146/7 016 (2.1%)	132/6 589 (2.0%)	0.90	0.70–1.14	0.21	37%	0.38
Stroke	3	62/7 136 (0.9%)	55/6 707 (0.8%)	0.95	0.66–1.37	0.31	15%	0.78
Pulmonary embolus	4	44/7 232 (0.6%)	39/6 791 (0.6%)	1.22	0.45–3.27	0.06	65%	0.70
Deep vein thrombosis	4	35/7 232 (0.5%)	28/6 791 (0.4%)	0.95	0.58–1.57	0.60	0%	0.84
Gastrointestinal bleeding	2	24/6 479 (0.4%)	36/6 398 (0.6%)	0.66	0.40–1.11	0.66	0%	0.11
Myocardial infarction	2	23/7 016 (0.3%)	21/6 589 (0.3%)	0.98	0.54–1.79	0.39	0%	0.95
Renal failure	1	100/6 359 (1.6%)	84/6 280 (1.3%)	1.18	0.88–1.58	NA	NA	0.27
Seizure	2	228/7 016 (3.2%)	193/6 589 (2.9%)	1.12	0.92–1.36	0.49	0%	0.27

found that administration of TXA did not change the size of intracranial hemorrhage nor provide beneficial effects on clinical outcomes.

The lack of clinical outcome benefit was also reflected in our secondary outcome analysis. We found Glasgow Outcome Scale scored below 4 was not significantly different in those receiving TXA or not. In fact, the number of patients who scored below 4 was higher in the TXA group. The study by Roberts [37] revealed that the timing of the TXA administration is crucial. The early administration (up to 3 hours) reduces mortality regardless of confounding factors, while the administration after the 3-hour mark increases the risk of death due to bleeding.

The length of stay in the ICU and the overall length of stay, although not statistically significant was surprisingly shorter for the non-TXA group. This might indicate that the use of TXA does not improve outcomes measured by the time spent in the ICU nor shortens the overall hospitalization time in TBI patients. This stands in contrast to overall trauma patients who benefit from the administration of TXA [37].

The most frequently observed adverse event following TBI was seizures. Although not significantly different, the TXA group experienced 1.12 increase in seizure occurrence. This finding stands in line with those studies that report increased risk of seizure with TXA administration in a dose-dependent manner [38]. Other complications which were not significant but occurred at a numerically higher rate were thrombotic in nature. TXA administration increased the risk of thrombotic events [39] and should be taken into account when treating with this agent. Although some authors [40] indicate that the neurological outcomes after TXA administration in trauma are better than in the control group, possibly due to reduced cytotoxicity in the TLR4/TNF axis [41], it is worth noting that several studies blatantly forbid the use of TXA due to increased risk of thrombosis without additional clinical benefit [42, 43].

The results of our study should be interpreted in the context of its limitations. Most studies were of small size and thus at risk of overestimating treatment effects and underreporting relevant adverse effects. Furthermore, the findings of the CRASH-3 trial due to the high number of patients may distort the results, which is a major limitation in the interpretation of the data.

Substantial heterogeneity was observed and contributed to lowering the evidence grade from high to moderate, however, this value is still high enough to justify the conclusions.

CONCLUSIONS

In summary, our analysis found showed no statistical significance between TXA and non-TXA treatment of TBI.

Conflict of interest

All authors declare no conflict of interest.

REFERENCES

1. Evaluation of the Disability Determination Process for Traumatic Brain Injury in Veterans. 2019, doi: 10.17226/25317.
2. Maas AIR, Menon DK, Adelson PD, et al. InTBIR Participants and Investigators. Traumatic brain injury: integrated approaches to improve prevention, clinical care, and research. Lancet Neurol. 2017; 16(12): 987–1048, doi: 10.1016/S1474-4422(17)30371-X, indexed in Pubmed: 29122524.
3. de la Tremblaye PB, O'Neil DA, LaPorte MJ, et al. Elucidating opportunities and pitfalls in the treatment of experimental traumatic brain injury to optimize and facilitate clinical translation. Neurosci Biobehav Rev. 2018; 85: 160–175, doi: 10.1016/j.neubiorev.2017.05.022, indexed in Pubmed: 28576511.
4. Saatman KE, Duhaime AC, Bullock R, et al. Workshop Scientific Team and Advisory Panel Members. Classification of traumatic brain injury for targeted therapies. J Neurotrauma. 2008; 25(7): 719–738, doi: 10.1089/neu.2008.0586, indexed in Pubmed: 18627252.
5. Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. Lancet. 1974; 2(7872): 81–84, doi: 10.1016/s0140-6736(74)91639-0, indexed in Pubmed: 4136544.
6. Thal SC, Neuhaus W. The blood-brain barrier as a target in traumatic brain injury treatment. Arch Med Res. 2014; 45(8): 698–710, doi: 10.1016/j.arcmed.2014.11.006, indexed in Pubmed: 25446615.
7. Report to Congress on Mild Traumatic Brain Injury in the United States: Steps to Prevent a Serious Public Health Problem. PsycEXTRA Dataset. 2003, doi: 10.1037/e371602004-001.
8. Alexander MP. Mild traumatic brain injury: pathophysiology, natural history, and clinical management. Neurology. 1995; 45(7): 1253–1260, doi: 10.1212/wnl.45.7.1253, indexed in Pubmed: 7617178.
9. Johnson WD, Griswold DP. Traumatic brain injury: a global challenge. Lancet Neurol. 2017; 16(12): 949–950, doi: 10.1016/S1474-4422(17)30362-9, indexed in Pubmed: 29122521.
10. Chang R, Cardenas JC, Wade CE, et al. Advances in the understanding of trauma-induced coagulopathy. Blood. 2016; 128(8): 1043–1049, doi: 10.1182/blood-2016-01-636423, indexed in Pubmed: 27381903.
11. Narayan RK, Maas AIR, Servadei F, et al. Traumatic Intracerebral Hemorrhage Study Group. Progression of traumatic intracerebral hemorrhage: a prospective observational study. J Neurotrauma. 2008; 25(6): 629–639, doi: 10.1089/neu.2007.0385, indexed in Pubmed: 18491950.
12. Roberts I, Sydenham E. Barbiturates for acute traumatic brain injury. Cochrane Database Syst Rev. 2012; 12: CD000033, doi: 10.1002/14651858.CD000033.pub2, indexed in Pubmed: 23235573.
13. Pabinger I, Fries D, Schöchl H, et al. Tranexamic acid for treatment and prophylaxis of bleeding and hyperfibrinolysis. Wien Klin Wochenschr. 2017; 129(9-10): 303–316, doi: 10.1007/s00508-017-1194-y, indexed in Pubmed: 28432428.
14. Moher D, Shamseer L, Clarke M, et al. PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev. 2015; 4: 1, doi: 10.1186/2046-4053-4-1, indexed in Pubmed: 25554246.
15. Al-Jeabory M, Szarpak L, Attila K, et al. Efficacy and Safety of Tranexamic Acid in Emergency Trauma: A Systematic Review and Meta-Analysis. J Clin Med. 2021; 10(5), doi: 10.3390/jcm10051030, indexed in Pubmed: 33802254.
16. Al-Jeabory M, Gasecka A, Wieczorek W, et al. Efficacy and safety of tranexamic acid in pediatric trauma patients: Evidence from meta-analysis. Am J Emerg Med. 2021 [Epub ahead of print], doi: 10.1016/j.ajem.2021.02.009, indexed in Pubmed: 33722435.
17. Rowell SE, Meier EN, McKnight B, et al. Effect of Out-of-Hospital Tranexamic Acid vs Placebo on 6-Month Functional Neurologic Outcomes in Patients With Moderate or Severe Traumatic Brain Injury. JAMA. 2020; 324(10): 961–974, doi: 10.1001/jama.2020.8958, indexed in Pubmed: 32897344.
18. Sterne JAC, Savović J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ. 2019; 366: l4898, doi: 10.1136/bmj.l4898, indexed in Pubmed: 31462531.
19. Sterne JAc, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ. 2016; 355: i4919, doi: 10.1136/bmj.i4919, indexed in Pubmed: 27733354.
20. McGuinness LA, Higgins JPT. Risk-of-bias VISualization (robvis): An R package and Shiny web app for visualizing risk-of-bias assessments. Res Synth Methods. 2021; 12(1): 55–61, doi: 10.1002/jrsm.1411, indexed in Pubmed: 32336025.
21. Guyatt GH, Oxman AD, Vist GE, et al. GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008; 336(7650): 924–926, doi: 10.1136/bmj.39489.470347.AD, indexed in Pubmed: 18436948.
22. Hozo SP, Djulbegovic B, Hozo I. Estimating the mean and variance from the median, range, and the size of a sample. BMC Med Res Methodol. 2005; 5: 13, doi: 10.1186/1471-2288-5-13, indexed in Pubmed: 15840177.
23. Higgins JPT, Thompson SG, Deeks JJ, et al. Measuring inconsistency in meta-analyses. BMJ. 2003; 327(7414): 557–560, doi: 10.1136/bmj.327.7414.557, indexed in Pubmed: 12958120.
24. IntHout J, Ioannidis JPA, Borm GF. The Hartung-Knapp-Sidik-Jonkman method for random effects meta-analysis is straightforward and considerably outperforms the standard DerSimonian-Laird method. BMC Med Res Methodol. 2014; 14: 25, doi: 10.1186/1471-2288-14-25, indexed in Pubmed: 24548571.
25. Schober P, Vetter TR. Meta-Analysis in Clinical Research. Anesth Analg. 2020; 131(4): 1090–1091, doi: 10.1213/ANE.0000000000005001, indexed in Pubmed: 32925329.
26. Safiejko K, Smereka J, Filipiak KJ, et al. Effectiveness and safety of hypotension fluid resuscitation in traumatic hemorrhagic shock: a systematic review and meta-analysis of randomized controlled trials. Cardiol J. 2020 [Epub ahead of print], doi: 10.5603/CJ.a2020.0096, indexed in Pubmed: 32648249.

27. Higgins JPT, Altman DG, Gøtzsche PC, et al. Cochrane Bias Methods Group, Cochrane Statistical Methods Group. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. BMJ. 2011; 343: d5928, doi: 10.1136/bmj.d5928, indexed in Pubmed: 22008217.
28. Chakroun-Walha O, Samet A, Jerbi M, et al. Benefits of the tranexamic acid in head trauma with no extracranial bleeding: a prospective follow-up of 180 patients. Eur J Trauma Emerg Surg. 2019; 45(4): 719–726, doi: 10.1007/s00068-018-0974-z, indexed in Pubmed: 29922895.
29. CRASH-3 trial collaborators. Effects of tranexamic acid on death, disability, vascular occlusive events and other morbidities in patients with acute traumatic brain injury (CRASH-3): a randomised, placebo-controlled trial. Lancet. 2019; 394(10210): 1713–1723, doi: 10.1016/S0140-6736(19)32233-0, indexed in Pubmed: 31623894.
30. Fakharian E, Abedzadeh-Kalahroudi M, Atoof F. Effect of Tranexamic Acid on Prevention of Hemorrhagic Mass Growth in Patients with Traumatic Brain Injury. World Neurosurg. 2018; 109: e748–e753, doi: 10.1016/j.wneu.2017.10.075, indexed in Pubmed: 29074420.
31. Jokar A, Ahmadi K, Salehi T, et al. The effect of tranexamic acid in traumatic brain injury: A randomized controlled trial. Chin J Traumatol. 2017; 20(1): 49–51, doi: 10.1016/j.cjtee.2016.02.005, indexed in Pubmed: 28209450.
32. Mojallal F, Nikooieh M, Hajimaghsoudi M, et al. The effect of intravenous tranexamic acid on preventing the progress of cerebral hemorrhage in patients with brain traumatic injuries compared to placebo: A randomized clinical trial. Med J Islam Repub Iran. 2020; 34: 107, doi: 10.34171/mjiri.34.107, indexed in Pubmed: 33315982.
33. Mousavinejad M, Mozafari J, Ilkhchi RB, et al. Intravenous Tranexamic Acid for Brain Contusion with Intraparenchymal Hemorrhage: Randomized, Double-Blind, Placebo-Controlled Trial. Rev Recent Clin Trials. 2020; 15(1): 70–75, doi: 10.2174/1574887114666191118111826, indexed in Pubmed: 31744452.
34. Perel P, Al-Shahi Salman R, Kawahara T, et al. CRASH-2 (Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage) intracranial bleeding study: the effect of tranexamic acid in traumatic brain injury--a nested randomised, placebo-controlled trial. Health Technol Assess. 2012; 16(13): iii–xii, 1, doi: 10.3310/hta16130, indexed in Pubmed: 22417901.
35. Yutthakasemsunt S, Kittiwatanagul W, Piyavechvirat P, et al. Tranexamic acid for patients with traumatic brain injury: a randomized, double-blinded, placebo-controlled trial. BMC Emerg Med. 2013; 13: 20, doi: 10.1186/1471-227X-13-20, indexed in Pubmed: 24267513.
36. Sprigg N, Flaherty K, Appleton JP, et al. Tranexamic acid to improve functional status in adults with spontaneous intracerebral haemorrhage: the TICH-2 RCT. Health Technol Assess. 2019; 23(35): 1–48, doi: 10.3310/hta23350, indexed in Pubmed: 31322116.
37. Roberts I, Edwards P, Prieto D, et al. Tranexamic acid in bleeding trauma patients: an exploration of benefits and harms. Trials. 2017; 18(1): 48, doi: 10.1186/s13063-016-1750-1, indexed in Pubmed: 28143564.
38. Murkin JM, Falter F, Granton J, et al. High-dose tranexamic Acid is associated with nonischemic clinical seizures in cardiac surgical patients. Anesth Analg. 2010; 110(2): 350–353, doi: 10.1213/ANE.0b013e3181c92b23, indexed in Pubmed: 19996135.
39. Myers SP, Kutcher ME, Rosengart MR, et al. Tranexamic acid administration is associated with an increased risk of posttraumatic venous thromboembolism. J Trauma Acute Care Surg. 2019; 86(1): 20–27, doi: 10.1097/TA.0000000000002061, indexed in Pubmed: 30239375.
40. Cole E, Davenport R, Willett K, et al. Tranexamic acid use in severely injured civilian patients and the effects on outcomes: a prospective cohort study. Ann Surg. 2015; 261(2): 390–394, doi: 10.1097/SLA.0000000000000717, indexed in Pubmed: 25412319.
41. Yoshizaki S, Kijima K, Hara M, et al. Tranexamic acid reduces heme cytotoxicity via the TLR4/TNF axis and ameliorates functional recovery after spinal cord injury. J Neuroinflammation. 2019; 16(1): 160, doi: 10.1186/s12974-019-1536-y, indexed in Pubmed: 31358003.
42. Spinella PC, Thomas KA, Turnbull IR, et al. TAMPITI Investigators. The Immunologic Effect of Early Intravenous Two and Four Gram Bolus Dosing of Tranexamic Acid Compared to Placebo in Patients With Severe Traumatic Bleeding (TAMPITI): A Randomized, Double-Blind, Placebo-Controlled, Single-Center Trial. Front Immunol. 2020; 11: 2085, doi: 10.3389/fimmu.2020.02085, indexed in Pubmed: 33013880.
43. Hu W, Xin Y, Chen X, et al. Tranexamic Acid in Cerebral Hemorrhage: A Meta-Analysis and Systematic Review. CNS Drugs. 2019; 33(4): 327–336, doi: 10.1007/s40263-019-00608-4, indexed in Pubmed: 30741383.

VIA MEDICA

ORIGINAL ARTICLE

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 164–171
DOI: 10.5603/DEMJ.a2021.0034

ISSN 2451–4691, e-ISSN 2543–5957

PARAMEDICS' EDUCATIONAL NEEDS REGARDING CULTURAL COMPETENCE: CROSS-SECTIONAL STUDY OF SELECTED TWO REGIONS OF POLAND

Jerzy Kiszka[1], Romuald Krajewski[1], Krzysztof Jurek[2]

[1]Institute of Health Sciences, College of Medical Sciences of the University of Rzeszow, Poland
[2]Institute of Sociological Sciences, Faculty of Social Sciences, The John Paul II Catholic University of Lublin, Poland

Abstract

INTRODUCTION: Approximately 743 700 foreigners reside permanently in Poland, and 180.2 million visit Poland every year. Paramedics should be prepared to assist foreigners whose expectations and needs related to their culture may be different than those typical of Poles. Education on cultural competence should therefore be a part of both undergraduate education and professional development. The aim of the study was to assess the educational needs of paramedics working in the National Medical Emergency System in terms of cultural competence.

MATERIAL AND METHODS: The study group consisted of all paramedics working in National Medical Emergency System in the Subcarpathian and West Pomeranian provinces. Responses were obtained from 563 out of the total of 2229 participants invited to participate in the study. The questionnaire used to study the educational needs of paramedics was created by a team of executors of the international project Multicultural Care in European Intensive Care Units (MICE-ICU) and adapted to study paramedics.

RESULTS: Paramedics from the Subcarpathian province ($M = 3.56$; $SD = 0.67$) reported greater educational needs in terms of cultural competence than their colleagues from the West Pomeranian province ($M = 2.84$; $SD = 0.82$, $p < 0.001$). In the Subcarpathian province, 80.4% of paramedics declared willingness to improve their knowledge of foreign languages, while in the West Pomeranian province this number amounted to 45.9%. In both provinces, paramedics with MSc in another field of study and BSc in emergency medical services reported greater educational needs compared to paramedics with lower education. In the Subcarpathian province, the preferred form of education was a conference (60.8% of respondents), while in the West Pomeranian province the respondents opted for workshops with experts representing various ethnic and religious groups (39.4%). The percentage of paramedics interested in online courses on multicultural emergency medicine was 41.74%.

CONCLUSIONS: The study demonstrated that paramedics from provinces located on opposite ends of the country who had contact with different groups of foreigners have great educational needs in the field of cultural competence and education in this area should be a constant part of professional development. Conferences and workshops are the preferred form of education.

KEY WORDS: educational needs, cultural competence, paramedics, emergency medical service

Disaster Emerg Med J 2021; 6(4): 164–171

ADDRESS FOR CORRESPONDENCE:
Jerzy Kiszka, Institute of Health Sciences, College of Medical Sciences of the University of Rzeszow, Poland; e-mail: jerzykiszkarm@gmail.com

INTRODUCTION

The number of foreigners permanently residing in Poland amounts to approximately 743.7 thousand. Every year 180.2 million foreigners cross the Polish border. The growing number of foreigners residing permanently and temporarily in Poland means that paramedics more and more often provide help to people with cultural values different from those most commonly encountered in Poland and different expectations towards medical staff. Insufficient cultural competence on the part of paramedics may cause patients of different cultural backgrounds to fear violation of their values, lack trust and avoid contact with the health care service, be aggressive, and take legal action. On the part of the staff, however, it causes difficulties in providing adequate assistance, stress and violation of the patient's rights [1–4].

Paramedics are required to update their knowledge and practical skills in a five-year settlement period by participating in various forms of professional development. Postgraduate education should broaden and update the knowledge and skills necessary to carry out the tasks of a paramedic. Training topics may also include issues related to multiculturalism and the development of the cultural competence among paramedics [5].

Education in the field of cultural competence, defined as acquiring the ability to help patients of a different cultural background, is currently included in the curriculum of emergency medicine field of study [6]. Paramedics with such preparation graduated from higher education. Paramedics with secondary education also work in the medical rescue system. The curriculum of paramedics who graduated from post-secondary school did not include the subject "Multiculturalism in medical rescue" [7, 8]. Cultural competence is among the social skills that enable proper communication with the patient, enhance trust and sensitivity to the patients' expectations and needs. Therefore, it should be constantly broadened as a part of the professional development of paramedics [4, 9]. Fulfilling the obligation of paramedic's professional development by collecting educational points is not a sufficient form of lifelong learning. Efforts should be made to improve this process and standardize the education system and create the possibility of supplementary education. Continuing education will allow paramedics to validate and update their skills [10].

The review of the Polish literature did not bring any publications on the educational needs of paramedics in terms of cultural competence. The aim of the study was to obtain information on whether professionally active paramedics require training in the field of cultural competence and what forms of education on multiculturalism they consider most useful.

MATERIAL AND METHODS

Study design and setting

The study was conducted from January 2018 to August 2018. The study population included 2229 paramedics. The paramedics were employed in the units of the National Medical Emergency System. These include the emergency response team (ERT) and hospital emergency departments (HED). Paramedics employed in the National Medical Emergency System were at the same time registered in the Safety and Emergency Management Department of Rzeszów and Szczecin Provincial Offices [11]. The list of paramedics was obtained on the basis of data contained in the National Medical Emergency System Action Plan for both provinces [12, 13].

The analysis included two provinces located on two opposite sides of Poland. One is adjacent to Germany, the other one to Ukraine. These nationalities are perceived by Poles as those with whom Poles most willingly cooperate. At the same time, the willingness to help is the strongest towards Ukrainians. In both provinces, the number of people of the Roman Catholic denomination is by far the most numerous. Significant differences can be expected in the paramedics' experience and educational needs regarding the cultural competence from these provinces.

The invitation to participate in the study was sent to all the National Medical Emergency System in both provinces. The respondents constitute 25% of the surveyed population, being a representative group. As such, we adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (*Supplementary materials 1*) [14]. The study was approved by the Bioethics Committee of the University of Rzeszów – the resolution no 2017/12/7.

Methods of measurements

Studying the paramedics' educational needs was a part of the research project *Assessment of cultural competence of paramedics working in the emer-*

gency medical system. To study the paramedics' educational needs, the questionnaire assessing the cultural competence of medical staff was used created by a team of implementers of the international project Multicultural Care in Intensive Care Units in Europe (MICE-ICU). After obtaining the consent of the authors, it was adapted to study paramedics. The questionnaire is used to assess competence but also includes questions related to educational needs. There are 12 questions to assess educational needs. The first question tests the paramedics' own belief that they are prepared to provide effective help to patients from different cultures. The next two questions concern own assessment of the need to expand one's knowledge and skills in the field of multiculturalism, and the next three items indicate which form of education is the most preferred. The questionnaire also includes a question about the development of foreign language skills. In the next 7 questions, the respondents are asked about their attitude to broadening knowledge about various ethnic and religious groups, about communication and conflict resolution skills, and about undertaking resuscitation in patients representing a different culture. The questions are formulated as learning statements and the answers are provided on a five-point scale from "strongly disagree" to "strongly agree".

The participation of paramedics in the study consisted of completing an online questionnaire, available on the Internet platform https://ap.admin-project.eu/.

Inclusion criteria

The group of people invited to participate in the study included all paramedics working in the National Medical Emergency System in the Subcarpathian and West Pomeranian provinces for at least 1 year. The location of the above-mentioned provinces on the map of Poland with neighboring countries is presented in *Supplementary materials 2*.

Data analysis

The obtained data was collected by the interviewing system and processed in spreadsheets (Excel). The collected research material was statistically developed using a statistical package IBM SPSS Statistics (v. 25).

RESULTS

Characteristics of study subjects

The questionnaire was completed by a total of 563 male and female paramedics. In the Subcarpathian province, it was filled by 347 paramedics. In the West Pomeranian province, 216 paramedics completed all the questions contained in the survey.

The mean age of the respondents was 36.66 years (SD = 9.50) and the average work seniority was 11.28 years (SD = 7.71). Men accounted for 86.7% of the respondents. 49.9% of the respondents had a Secondary School Diploma as a paramedic (lack of the subject "Multiculturalism in medical rescue" in the curriculum). The rest of them completed a BSc in Emergency Medical Services. The characteristics of the studied population are presented in Tables 1 and 2.

Main results

In the entire study group, 305 respondents expressed their interest in broadening their knowledge of multiculturalism (56% of the answers — strongly agree and rather agree). The willingness to improve

Table 1. Age and seniority of the respondents

	n	M (SD)	Min	Max	Q1	Me	Q3
AGE							
Subcarpathian province	347	**37.84 (9.46)**	20.00	61.00	30.00	**36.00**	45.00
West Pomeranian province	216	**34.77 (9.28)**	22.00	61.00	28.00	**33.00**	40.00
Total	563	36.66 (9.50)	20.00	61.00	29.00	35.00	43.00
WORK SENIORITY							
Subcarpathian province	347	11.98 (7.62)	1.00	38.00	6.00	10.00	15.00
West Pomeranian province	216	10.15 (7.74)	1.00	35.00	4.00	8.00	15.00
Total	563	11.28 (7.71)	1.00	38.00	5.00	10.00	15.00

M — mean; Me — median; SD — standard deviation; Q1 — first quartile; Q3 — third quartile

Table 2. Characteristics of the Study Population

	Subcarpathian province		West Pomeranian province		Total	
	n	%	n	%	n	%
Sex						
Woman	46	13.3	29	13.4	75	13.3
Man	301	86.7	187	86.6	488	86.7
Total	347	100.0	216	100.0	563	100.0
The level of education						
Secondary School Diploma of a paramedic	181	52.2	100	46.3	281	49.9
BSc of Public Health with a specialization in emergency medical services	37	10.7	53	24.5	90	16.0
BSc of emergency medical services	83	23.9	39	18.1	122	21.7
MSc in the other field of study and BSc of emergency medical services	19	5.5	6	2.8	25	4.4
MSc in Public Health and BSc of emergency medical services	27	7.8	18	8.3	45	8.0
Total	347	100.0	216	100.0	563	100.0

their practical skills in this field was expressed by 301 people (55%). The preferred forms of training were conferences (52%) and workshops with experts in multiculturalism (55%). The interest in online courses was slightly lower (44%).

The need to improve the skills in foreign languages was expressed by 71% of the surveyed paramedics (strongly agree or rather agree). This need was most frequently reported in the study. The socio-cultural characteristics of various ethnic and religious groups enjoyed the least interest (item 57) with 41% of the respondents willing to improve it. Significant differences between the paramedics from Subcarpathian and West Pomeranian provinces concerned items from 51 to 55 marked (*) in Table 1. The paramedics from Subcarpathian province were more interested in developing foreign language skills than those from West Pomeranian province ($M = 4.08$; $SD = 0.96$ vs $M = 3.31$; $SD = 1.26$; $p < 0.001$) and expanding knowledge in the field of multiculturalism ($M = 3.73$; $SD = 1.02$ vs $M = 3.10$; $SD = 1.18$, $p < 0.001$). Paramedics from West Pomeranian province demonstrated lower educational needs in all responses compared to paramedics from Subcarpathian province ($M = 2.84$; $SD = 0.82$ vs $M = 3.56$; $SD = 0.67$, $p < 0.001$) (Tab. 3).

The analysis of the relationship between educational needs and education, age, and place of work showed that in the West Pomeranian province, paramedics with an "MSc in the other field of study and BSc of emergency medical services" had higher educational needs than paramedics with lower education. There was no such correlation was found in the Subcarpathian province. In the Subcarpathian province, the educational needs of paramedics increased with age. This correlation did not exist in the West Pomeranian. Work in the HED and the ERT was associated with higher education needs than among paramedics working in the West Pomeranian. The results of the analysis of the correlation of these factors with educational needs are presented in Tab. 4. The remaining analyzed features (including knowledge of foreign languages) did not show statistically significant differences.

DISCUSSION

Comparing the populations of foreigners (including unregistered immigrants) in the Subcarpathian and the West Pomeranian province, it can be noticed that they are different. In the Central Statistical Office report: "Foreigners in the domestic labor market by region", citizenship is considered. In individual provinces, 4 groups of foreigners are distinguished: Ukrainians, Belarusians, "others" (*i.e.* Vietnamese, Indians), and "EU countries". The report shows that the largest number of citizens from Ukraine and "others" live and work in the Subcarpathian province. In turn, the West Pomeranian province has the highest number of foreigners from EU countries and Ukrainians. Foreigners most often stay in large cities and Szczecin (2.5% of all foreigners) is one of them. Few foreigners reside in the subregions, which include i.e. the Krosno subregion, located in

Table 3. Results of the assessment of paramedics' educational needs concerning cultural competence

ITEM	I strongly agree	I rather agree	I have no opinion	I rather disagree	I strongly disagree
51*. I am interested in expanding my knowledge in the field of multiculturalism (n = 541)	19%	37%	24%	14%	6%
52*. I am interested in developing my practical skills in the field of multiculturalism (n = 546)	13%	42%	23%	15%	7%
53*. A conference with lectures by experts in the field of multicultural life saving of patients in a state of health and life emergency is a form of education that interests me (n = 532)	17%	35%	27%	13%	8%
54*. Workshops with experts representing various ethnic and religious groups are a form of education on multicultural life saving of patients in a state of health and life emergency, which interests me (n = 525)	17%	38%	27%	12%	7%
55*. An online course is a form of education on multicultural life saving of patients in a state of health and life emergency, which interests me (n = 532)	14%	30%	32%	17%	8%
56*. As a paramedic, I should improve my skills in foreign languages (n = 539)	31%	40%	15%	9%	6%
57. As a paramedic, I should know more about the socio-cultural characteristics of different ethnic and religious groups (n = 518)	8%	33%	36%	17%	6%
58. As a paramedic, I should know more about the risks to health and life in different ethnic groups (n = 543)	12%	46%	23%	12%	7%
59. As a paramedic, I should know more about the socio-cultural aspects when undertaking CPR (n = 533)	14%	41%	23%	16%	8%
60. As a paramedic, I should know more about the eating habits of different ethnic and religious groups (n = 523)	10%	39%	31%	12%	8%
61. As a paramedic, I should know more about treatment procedures for patients from different ethnic and religious groups (n = 543)	8%	37%	27%	19%	8%
62. As a paramedic, I should know more about verbal and non-verbal patterns of communication with patients from different cultural groups (n = 546)	11%	41%	24%	18%	6%
63. As a paramedic, I should know more about the methods of solving conflicts occurring during the work of a paramedic, which is based on cultural differences (n = 543)	12%	41%	27%	15%	6%

* Marking significant differences in the educational needs of paramedics from the Subcarpathian and the West Pomeranian provinces

the Subcarpathian province (0.2% of all foreigners). The number of foreigners in both provinces differs significantly. It is estimated at 8289 people in the Subcarpathian while in the West Pomeranian province there are almost three times as many people — 23 316 [10, 15].

Table 4. Relationship of education, age, and place of work with educational needs

	The Subcarpathian province (n = 347)		The West Pomeranian province (n = 216)		Total (n = 563)	
	H	p	H	p	H	p
Education (M = 3.63, SD = 0.77 vs M = 3.03, SD = 0.80)	2.529	0.470	10.245	0.017	20.049	< 0.001
Age (M = 3.55, SD = 0.17 vs M = 3.01, SD = 0.26)	0.212	< 0.001	0.041	0.564	0.189	< 0.001
Place of work (M = 3.10, SD = 0.84 vs M = 3.52, SD = 0.72)	–0.275	0.783	–2.944	0.003	2.467	0.291

M — mean; SD — standard deviation

Paramedics with varying degrees of education work currently in the national medical emergency system. Paramedics with higher education had a subject in the field of multiculturalism during their studies. On the other hand, paramedics with secondary education did not have developed cultural competence in their undergraduate education. They constitute 49.9% of all surveyed paramedics. The studies of nurses and doctors working with patients of different cultural backgrounds indicate a need for medical staff training in the field of cultural competence. Majda et al. published a study on nurses' attitudes towards patients of Islamic denomination. The conclusions indicate that cultural competence and cultural intelligence should be improved within the framework of intercultural pre- and post-graduate education. This will reduce stereotypes, eliminate prejudices, as well as change negative attitudes towards patients of different cultural backgrounds [16]. Dobrowolska et al. [17] conducted research that shows that prior multicultural nursing education is significantly correlated with higher scores on cultural competence.

There are very few publications studying education and development of interpersonal skills in paramedic students compared to nursing students which were confirmed by a literature review by Ross. She also pointed out that the assessment of humanities skills is much more difficult than the assessment of clinical skills. Assessment tools in conjunction with students' self-esteem are an accurate and relevant way of testing humanities skills. It has also been shown that interpersonal skills are paramount to the ability of paramedics and nurses to operate in diverse, challenging environments as well as in highly emotional situations. The research shows that there was a deficit in the area of interpersonal relations with patients, colleagues, and superiors among paramedic graduates. Much greater emphasis is required on teaching complex interpersonal skills at the university level [18].

The study of educational needs of paramedics working in the National Medical Emergency System is the first such a large study in this field conducted in Poland. The study also provided information on the age, work experience, education, and foreign language skills of paramedics in the Subcarpathian and the West Pomeranian provinces. Rębak et al. [19] conducted a study of 336 professionally active paramedics working in Poland. The respondents worked in ERT. The needs and the applicable forms of continuous education for paramedics were assessed. The results of the study indicate that, in the opinion of paramedics, there is a need to improve their professional qualifications. The paramedics do not accept the current form of professional development, assessed by obtaining 200 educational points. The results also show that paramedics' self-development is not a sufficient form of training to ensure a high standard in providing help. Improving the process of postgraduate education should consist in standardizing the education system and creating opportunities for supplementary education. This will allow paramedics to validate and update their skills. The surveyed paramedics from both provinces report great interest in developing their practical skills in the field of multiculturalism. As in the study by Rębak et al. paramedics are interested in the practical form of training. In lifelong learning, paramedics were most interested in participating in a training course that ended with an exam, hands-on training, and a seminar.

Irish paramedics also find scenario-based hands-on training most appropriate for their profession. E-learning programs were considered irrelevant. However, they gain significance when they are supplemented with a practical module [20]. Similarly, the study of educational needs of paramedics indi-

cates that they are not interested in online courses as a form of education on multicultural lifesaving for patients in a state of health and life emergency.

The studies on educational needs in working with refugees were conducted by Bapolisi et al. in the Mbarara District Hospital in Uganda in 2016. They also assessed the attitudes of postgraduate medical interns towards refugees in the host country. The results showed a positive attitude towards refugees. The mean score on the "Attitude" scale was 2.8 (SD = 1.7). All respondents had contact with refugees, and 89% (n = 72) reported the need for further training in the use of interpreters, support staff, and health behavior [21]. The results are similar to those obtained in our study and indicate that the need to develop cultural competence of paramedics is common. Research by the Helsinki Foundation for Human Rights shows that it is important to conduct social campaigns and educational activities aimed at the entire society, regardless of education. Their aim is to familiarize Poles with ethnic diversity. They should also shape patterns of behavior in contact with people of different cultural backgrounds, eliminate xenophobia and condemn acts of racism [22]. In their study, Kietzmann et al. indicate a relationship between the knowledge of the language used by both interviewees and the overall satisfaction with pre-hospital emergency care [23]. In our study, paramedics from both provinces who knew a foreign language had similar educational needs to people who did not know a foreign language. However, the interest in raising the level of knowledge of foreign languages is high, also among people declaring knowledge of the language. Improving foreign language skills should be a part of professional development. Jongen et al. indicate that training in cultural competence improves the knowledge, skills, attitudes, and beliefs of people participating in them [24]. Similarly, Lie et al. [25] in the conclusions of the literature review indicate that there are limited studies showing a positive relationship between training in cultural competence and better patient outcomes. The results of these studies confirm the purposefulness of training in cultural competence.

Limitations

The selection of respondents from among paramedics working in 2 provinces does not allow to generalize results to the entire population of paramedics in Poland. Additionally, large numbers of respondents in both provinces indicate that the study group is representative of all paramedics from these provinces, but this cannot be accurately assessed as detailed information on all employed paramedics is not available.

CONCLUSIONS

Paramedics report a great demand for education in the field of cultural competence, mainly through workshops and conferences with experts representing various ethnic and religious groups. The desire to acquire knowledge and skills in cultural competence increases with age. Paramedics with an MSc in a different field of study and a BSc in Emergency Medical Services have greater educational needs than paramedics with lower education.

Conflict of interest

There are no conflicts of interest.

REFERENCES

1. Padela AI, Punekar IRA. Emergency medical practice: advancing cultural competence and reducing health care disparities. Acad Emerg Med. 2009; 16(1): 69–75, doi: 10.1111/j.1553-2712.2008.00305.x, indexed in Pubmed: 19055674.
2. Lin CJ, Lee CK, Huang MC. Cultural Competence of Healthcare Providers: A Systematic Review of Assessment Instruments. Journal of Nursing Research. 2017; 25(3): 174–186, doi: 10.1097/jnr.0000000000000153.
3. Majda A, Zalewska-Puchała J. Kompetencje kulturowe i inteligencja kulturowa w pielęgniarstwie. Pielęgniarstwo Polskie. 2018; 68(2): 196–203, doi: 10.20883/pielpol.2018.24.
4. Swihart DL, Martin RL. Cultural Religious Competence In Clinical Practice. StatPearls, Treasure Island (FL): StatPearls Publishing. 2020.
5. Rozporządzenie Ministra Zdrowia z dnia z dnia 13 grudnia 2019 r. w sprawie doskonalenia zawodowego ratowników medycznych. Dz.U. z 2019 r. poz. 2464 n.d.
6. Rozporządzenia Ministra Nauki i Szkolnictwa Wyższego z dnia 26 lipca 2019r. w sprawie standardów kształcenia przygotowującego do wykonywania zawodu lekarza, lekarza dentysty, farmaceuty, pielęgniarki, położnej, diagnosty laboratoryjnego, fizjoterapeuty i ratownika medycznego. Dz. U. 2019 Poz. 1573 n.d.
7. Program nauczania Ratownik Medyczny 322[06]. Ministerstwo Edukacji i Nauki. 322[06]/SP/MEiN/2006.02.06 n.d.
8. Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 12 lipca 2007 r. w sprawie standardów kształcenia dla poszczególnych kierunków oraz poziomów kształcenia, a także trybu tworzenia i warunków, jakie musi spełniać uczelnia, by prowadzić studia międzykierunkowe oraz makrokierunki. Dz.U. 2007 Nr 164 Poz. 1166 z późn. zm. n.d.
9. Projekt Building Intercultural Competencies for Ambulance Services (BICAS) n.d. http://bicas-online.eu/pl/home_pl/ (2.02.2019).

10. Mapy i dane statystyczne imigrantów i służb migracyjnych Polski n.d. 16.02.2021, https://migracje.gov.pl/statystyki/zakres/polska/typ/dokumenty/widok/mapa/rok/2020/?x=0.2263&y=0.6314&level=0.5.
11. Ustawa z dnia 8 września 2006 r. o Państwowym Ratownictwie Medycznym. Dz. U. 2006 Nr 191 poz. 1410 z późn. zm. n.d.
12. Aktualizacja Nr 18 Planu Działania Systemu Państwowego Ratownictwa Medycznego Województwa Zachodniopomorskiego. Zachodniopomorski Urząd Wojewódzki w Szczecinie. 12.07.2018r n.d.
13. Aktualizacja Nr 23 Planu Działania Systemu Państwowe Ratownictwo Medyczne Województwa Podkarpackiego. Podkarpacki Urząd Wojewódzki w Rzeszowie. 23.10.2018r. n.d.
14. von Elm E, Altman DG, Egger M, et al. STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Int J Surg. 2014; 12(12): 1495–1499, doi: 10.1016/j.ijsu.2014.07.013, indexed in Pubmed: 25046131.
15. Centrum Badań i Edukacji Statystycznej GUS. Cudzoziemcy na krajowym rynku pracy w ujęciu regionalnym. Warszawa 2018. n.d.
16. Majda A, Matusik-Baziak R, Zalewska-Puchała J. Postawy pielęgniarek wobec pacjentów wyznających islam. (Attitudes of nurses towards Muslim patients). Hygeia Public Health. 2017; 52: 428–34.
17. Dobrowolska B, Gutysz-Wojnicka A, Ozga D, et al. European intensive care nurses' cultural competency: An international cross-sectional survey. Intensive Crit Care Nurs. 2020; 60: 102892, doi: 10.1016/j.iccn.2020.102892, indexed in Pubmed: 32536518.
18. Ross L. Interpersonal skills education for undergraduate nurses and paramedics. Journal of Paramedic Practice. 2012; 4(11): 655–661, doi: 10.12968/jpar.2012.4.11.655.
19. Rębak D, Głuszek S, Nowak-Starz G, et al. Potrzeba ustawicznego kształcenia ratowników medycznych na tle innych zawodów regulowanych. Nursing Problems / Problemy Pielęgniarstwa. 2012; 20: 201–10.
20. Knox S, Cullen W, Dunne C. Continuous professional competence (CPC) for emergency medical technicians in Ireland: educational needs assessment. BMC Emerg Med. 2013; 13: 25, doi: 10.1186/1471-227X-13-25, indexed in Pubmed: 24345064.
21. Bapolisi A, Crabtree K, Jarolimova J, et al. Assessment of attitudes and targeted educational needs for refugee care providers in a Ugandan hospital. International Journal of Medical Education. 2018; 9: 221–225, doi: 10.5116/ijme.5b64.9630.
22. Mikulska A. Rasizm w Polsce. Raport z badań wśród osób, które doświadczyły przemocy ze względu na swoje pochodzenie etniczne, rasowe lub narodowe. Warszawa: Helsińska Fundacja Paw Człowieka.; 2010.
23. Kietzmann D, Wiehn S, Kehl D, et al. Migration background and overall satisfaction with pre-hospital emergency care. Appl Nurs Res. 2016; 29: 96–100, doi: 10.1016/j.apnr.2015.05.009, indexed in Pubmed: 26856496.
24. Jongen C, McCalman J, Bainbridge R. Health workforce cultural competency interventions: a systematic scoping review. BMC Health Serv Res. 2018; 18(1): 232, doi: 10.1186/s12913-018-3001-5, indexed in Pubmed: 29609614.
25. Lie DA, Lee-Rey E, Gomez A, et al. Does cultural competency training of health professionals improve patient outcomes? A systematic review and proposed algorithm for future research. J Gen Intern Med. 2011; 26(3): 317–325, doi: 10.1007/s11606-010-1529-0, indexed in Pubmed: 20953728.

VIA MEDICA

ORIGINAL ARTICLE

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 172–182
DOI: 10.5603/DEMJ.a2021.0035

ISSN 2451–4691, e-ISSN 2543–5957

COMMUNICATION SKILLS LEARNING DURING MEDICAL STUDIES IN POLAND: OPINIONS OF FINAL-YEAR MEDICAL STUDENTS

Piotr Przymuszala[1], Magdalena Cerbin-Koczorowska[1], Patrycja Marciniak-Stepak[2, 3], Lidia Szlanga[2, 4], Lucja Zielinska-Tomczak[1], Marek Dabrowski[1], Ryszard Marciniak[1]

[1]Chair and Department of Medical Education, Poznan University of Medical Sciences, Poznan, Poland
[2]Department of Medical Simulation, Chair of Medical Education, Poznan University of Medical Sciences, Poznan, Poland
[3]Department of Pediatric Oncology, Hematology and Transplantology, Poznan University of Medical Sciences, Poznan, Poland
[4]Polish Society of Medical Simulation, Poland

Abstract

INTRODUCTION: Despite the increasing emphasis on the medical curriculum, students' empathy and communication skills decline with time. As students' attitudes and experiences may influence the effectiveness of communication training and their future communication style, this study aimed to evaluate the opinions of last-year medical students on communication skills learning.

MATERIAL AND METHODS: Following the fully mixed concurrent equal status design methodology, we invited sixth-year medical students of our university to fill a paper questionnaire with closed and open questions on their perspectives on communication skills learning.

RESULTS: Questionnaires were completed by a representative sample of 166 students. The majority of them recognized the importance and benefits of communication training, and the need to increase its significance in the medical curriculum. They noticed that students with low communication skills lack motivation for improvement. Students also underlined the significance of the hidden curriculum, reporting a contrast between communication classes and the behavior of some physicians. Moreover, students less positively inclined towards communication training doubted its effectiveness and importance, suggesting that it should be offered for volunteers.

CONCLUSIONS: In order to meet the expectations of students with positive opinions and overcome the lack of motivation or engagement of negatively inclined students, more emphasis should be placed on communication training. Changes in communication training should include increasing its practical character and intensity, emphasizing its importance and benefits, and paying more attention to hidden curriculum aspects. Revisions to the medical school application system should be considered to underline the importance of interpersonal competencies already at the admission stage.

KEY WORDS: communication skills learning, communication training, medical students, medical curriculum, hidden curriculum

Disaster Emerg Med J 2021; 6(4): 172–182

ADDRESS FOR CORRESPONDENCE:
Piotr Przymuszala, Chair and Department of Medical Education, Poznan University of Medical Sciences, Poznan, Poland
e-mail: pprzymuszala@wp.pl

INTRODUCTION

The patient-centered model of healthcare emphasizes the importance of patient-physician cooperation and increases the active role of patients in the therapeutic process [1]. It also stresses the significance of communication skills in the professional life of doctors [2], considering them as one of their most critical competencies [3–6]. Good communication skills of physicians improve the course and outcomes of the therapeutic process, increase patients' satisfaction, comprehension, and compliance with doctors' instructions, and decrease numbers of complaints and malpractice suits [4, 6, 7]. Positive effects of proper communication are also sensed by doctors in the form of increased comfort and satisfaction from doing their job [4]. In addition, studies show that communication skills are not innate but can be trained and systematically improved [4, 7, 8]. As a result, many medical schools introduced their teaching into curricula [8].

However, the success of communication skills learning programs may be dependent on students' attitudes towards the topic and their previous experiences, among others [9]. Furthermore, students' perception of their communication training may influence their future communication style [9]. This is consistent with Ajzen's Theory of Planned Behavior (TBP) linking behavioral intentions with attitudes, subjective norms, and perceived behavioral control [10]. Meanwhile, students' communication skills and attitudes towards them seem to decline with time [6]. For instance, Rees and Sheard [11] and Cleland et al. [12] independently showed that students in higher years presented less positive attitudes towards learning communication skills than students in lower years. Bachmann et al. [2] observed that, although last-year medical students performed better in terms of time management and differential diagnostics, deficits in their history taking and basic communication skills were noticeable. A similar decrease in their empathy levels was also observed, suggesting a close correlation between empathy, communication skills, and attitudes towards them [2, 13, 14]. The need for further studies was noticed to improve the understanding of final-year medical students' perspectives on communication deficiencies, including their experiences, challenges, role models, and educational needs [2].

Accordingly, this study aimed to examine previous experiences and opinions of last-year medical students on communication skills learning in the medical curriculum.

MATERIAL AND METHODS

Researchers' characteristic

The main researcher is a PhD student at the Department of Medical Education, who recently obtained his medical degree. During his studies, he often observed deficiencies in communication skills and differentiated attitudes towards them among other students and doctors. As a result, after graduation, he decided to examine this phenomenon more thoroughly. To avoid bias caused by the main researcher's personal experiences, the research team was broadened to include researchers with different backgrounds. The second researcher is a pharmacist experienced in qualitative research methods. The third researcher is a physician with a specialty in pediatric hemato-oncology and experience in teaching communication skills with simulated patients. The fourth researcher is a nurse and the sixth researcher is a medical rescuer — they both are experienced simulation instructors. The fifth researcher is a pharmacist with an additional Bachelor's degree in Public Health, serving as an asset in the data interpretation process. The senior researcher is a physician with a specialty in surgery and extensive clinical experience.

Research approach

The mixed-methods research utilizes both qualitative and quantitative approaches during the data collection and analysis, integrating findings and drawing interferences to increase the depth of understanding of a given phenomenon [15, 16]. It should be distinguished from multi-method research, which collects multiple types of qualitative or quantitative data [17]. Moreover, mixed-methods research should not only aim to collect both qualitative and quantitative data but rather integrate both approaches and data sets across the entire study [18]. In this study, we chose the fully mixed concurrent equal status design according to the classification proposed by Leech and Onwuegbuzie [19]. We chose this method to collect data from a bigger, representative group of students and therefore increase the generalizability of our results in comparison with a purely qualitative approach using interviews, for instance. In this way, we tried to avoid a situation when only students with strong positive or negative opinions would agree to participate in the study. As we wanted to make this study an indication of areas that, in students' opinion, might require some changes in the

shape of the medical curriculum at our institution, it was also crucial for us to ensure that respondents present their genuine views on the topic. We believed that an anonymous paper questionnaire seems to suit this purpose better than an interview, which could be potentially associated with a risk of students hiding their negative thoughts and experiences.

Study settings

The study was conducted on a sample of sixth-year medical students of Poznan University of Medical Sciences in the academic year 2019/2020. Students were approached on the first day of the Advanced Medical Simulation clerkship in the Center for Medical Simulation and asked to fill a paper questionnaire on their previous experiences and opinions on communication skills learning. The survey consisted of closed questions with a vignette of answers followed by open questions asking students to explain their choice of answer to that question. It allowed us to get a deeper understanding and context of their responses regarding the topic of the study. The outline of questions asked in the study was presented in the tables in the Results section. Exemplary students' responses to open questions were accompanied in the Results section with a brief demographic characteristic of respondents (for example, F/24 next to a quote indicates that this particular response was added by a female student who is 24 years old). The questionnaire was pre-tested on 10 respondents participating in the first edition of the clerkship to ensure its clarity.

Medical studies in Poland last for six years and are regulated by an appropriate Ordinance of the Ministry of Science and Higher Education. Members of the study group started their studies in 2014, when the Ordinance of May 9, 2012, was in force [20]. Learning outcomes dedicated to communication skills imposed by it are presented in Table 1. Respondents' medical curriculum was divided into two years of pre-clinical training focused on basic sciences, followed by four years of clinical education, during which students rotated between different clerkships (Tab. 2). Most of the formal communication training was conducted during the first two years of their studies, for instance, during professionalism or psychology classes. From the third year onwards, their curriculum assumed learning communication mostly with real patients during clinical rounds and medical simulation clerkships. Additionally, willing students could choose communication classes among their electives.

There were 271 sixth-year medical students in the academic year 2019/2020. Initially, we planned to invite all of them to participate in the study. How-

Table 1. Learning outcomes dedicated to communication skills in the Ordinance of may 9, 2012

In terms of knowledge, a graduate:	
D.W4.	"Understands the significance of verbal and non-verbal communication in the communication process with patients and the notion of trust in the interaction with the patient"
D.W12.	"Knows the rules of motivating patients to pro-health behaviors and informing about adverse prognosis"
In terms of skills, a graduate:	
D.U1.	"Acknowledges in the therapeutic process subjective needs and expectations of the patient arising from socio-cultural factors"
D.U4	"Builds the atmosphere of trust during the whole therapeutic process"
D.U5.	"Conducts a conversation with an adult patient, a child and the family using active-listening and showing empathy techniques and talks with a patient on their life situation"
D.U6.	"Informs the patient about the aim, course and eventual risk of proposed diagnostic and therapeutic actions and obtains their informed consent"
D.U7.	"Gives the patient and their family about adverse prognosis"
D.U8.	"Gives advice on compliance with therapeutic orders and pro-health lifestyle"
D.U9.	"Identifies risk factors of violence, recognizes violence and reacts adequately"
D.U10.	"Utilizes to the basic degree motivating and supporting psychological interventions"
E.U1.	"Takes a history from an adult patient"
E.U2.	"Takes a history from a child and their family"

Developed on the basis of: Ordinance of the Minister of Science and Higher Education of May 9, 2012 on the standards of education for faculties: medical, dentistry, pharmacy, nursing and obstetrics. [*Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 9 maja 2012 r. w sprawie standardów kształcenia dla kierunków studiów: lekarskiego, lekarsko-dentystycznego, farmacji, pielęgniarstwa i położnictwa*.] Retrived from: http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20120000631.

Table 2. An outline of the curriculum of students participating in the study
First year
Anatomy (200 h); Histology and embryology (110 h); Physiology (75 h); Biochemistry (65 h); English (60 h); Biophysics (55 h); Molecular biology (30 h); Chemistry (30 h); First aid with elements of nursing (30 h); Cytophysiology (20 h); Biostatistics with elements of informatics (20 h); History of medicine (15 h); Hygiene (15 h); Electives (4x15 h); Summer internship (120 h)
Second year
Physiology (80 h); Biochemistry (70 h); Pathophysiology (70 h); Laboratory diagnostics (65 h); English (60 h); Microbiology (60 h); Immunology (60 h); Cardiopulmonary resuscitation (30 h); Medical ethics with elements of deontology (30 h); Medical psychology (30 h); Parasitology (25 h); Sociology of medicine (25 h); Epidemiology (20 h); Elements of professionalism (20 h); Biostatistics with elements of informatics (20 h); Electives (4x15 h); Summer internship (120 h)
Third year
Pathology (170 h); Pharmacology and toxicology (140 h); Pediatrics (75 h); Genetics (70 h); Radiology (70 h); Dermatology (65 h); Internal diseases (60 h); Surgery (60 h); Emergency medicine (35 h); Oncology (30 h); Electives (4x15 h); Summer internship (120 h)
Fourth year
Internal diseases (120 h); Surgery (120 h); Pediatrics (95 h); Gynecology and obstetrics (80 h); Orthopedic surgery and traumatology (60 h); Infectious diseases (60 h); Psychiatry (60 h); Oncology (45); Palliative medicine (30); Geriatrics (30 h); Emergency medicine (30 h); Neonatology (30 h); Tropical and parasitic diseases (30 h); Medical simulation (20 h); Transplantology (20 h); Rehabilitation (20 h); Public health (20 h); Nuclear medicine (15 h); Electives (4x15 h); Summer internship (120 h)
Fifth year
Internal diseases (120 h); Surgery (100 h); Neurology (95 h); Gynecology and obstetrics (90 h); Pediatrics (80 h); Family medicine (60 h); Anesthesiology (60 h); Otolaryngology (60 h); Ophthalmology (60 h); Forensic medicine and medical law (50 h); Clinical pharmacology (35 h); Audiology and phoniatrics (15 h); Electives (4x15 h); Summer internship (120 h)
Sixth year
Internal diseases (240 h); Pediatrics (120 h); Surgery (120 h); Gynecology and obstetrics (60 h); Psychiatry (60 h); Emergency medicine (60 h); Family medicine (60 h); Medical simulation (20 h); Chosen specialty (180 h)

ever, due to the COVID-19 pandemic outbreak, all stationary classes at Polish schools and universities were canceled in the middle of March 2020 by the government authorities and continued online. By that time, we already collected 166 received questionnaires, which signifies an adequate sample size [21]. As a result, we decided not to put additional pressure and burden on students in these difficult times and resigned from continuing data collection online.

Data analysis

Data obtained from the questionnaires were transcribed and subjected to subsequent analysis. Quantitative data were analyzed with the Wilcoxon signed-rank test, the Mann-Whitney U test, and Fisher's exact test, as appropriate, using the Statistica Software (StatSoft) and PQStat Software. Qualitative data were encoded and analyzed with the Atlas.ti Software (ATLAS.ti 8 EDU) by two independent researchers. They individually familiarized themselves with data, identified important fragments of students' respondents, then compared their results and debated until reaching consensus. We decided to use phenomenology as a qualitative approach to obtain a thorough picture of students' opinions and experiences on the topic [22].

Ethical considerations

The study protocol was presented to the institutional review board (Bioethics Committee of Poznan University of Medical Sciences) for opinion, which decided that ethical approval was not necessary under the Polish law. Before receiving the questionnaires, students were informed about the aims and protocol of the study. They were assured that their participation was voluntary and that all data would be obtained and processed anonymously. No data enabling their identification were collected. Students were asked to sign a written consent form, which also contained the information listed above. During the study, we paid attention to meeting the Ethical Guidelines for Educational Research [23].

RESULTS

Of the 166 students who returned the questionnaires, 104 (62.65%) were female, 60 (36.14%) male and 2 (1.20%) did not disclose their gender. The age of respondents ranged from 22 to

34 years (mean = 24.8; median = 24; interquartile range = 24–25). As indicated above, the qualitative data presented below were supplemented with the demographical characteristic of the respondent, including their gender (F — female, M — male) and age.

As presented in Table 3, the majority of students (n4+5 = 158; 96.34%) considered the communication skills necessary for physicians. Still, in their opinion, they were only occasionally made aware of that during the studies. On average, students rated the communication skills of physicians as moderate but admitted that their level was diversified. Students' opinions were not influenced by their gender.

There were doctors who communicated perfectly and ones who did not have such skills. (F/24)

Unfortunately, the communication skills of most doctors were not too good. (F/24)

Students appreciated doctors who acknowledged the perspective and needs of the patient, provided clear and detailed information on their condition and treatment options, and were showing them empathy and respect. On the other hand, students were dissatisfied with doctors who were clearly in a hurry, spent little time talking to the patients, or interrupted them. They were also displeased when doctors asked predominantly closed questions, did not verify whether patients understood the information, were patronizing and did not focus on the patient's emotions. Additionally, difficulties of some physicians with giving bad news were noted. Students also pointed out that some doctors might not perceive communication with patients as one of their duties or just not care about it. They also noticed that physicians might be tired, overworked, burnt-out, and lack time to improve their communication.

Communication skills of physicians encountered as students were rated statistically higher than those of physicians contacted as patients or the family of the patient (p = 0.002). Some students pointed out that the communication skills of academic teachers may be improved by their teaching experience and awareness of the hidden curriculum. However, it was also suggested that a narrow profile of patients at clinical hospitals might work at their disadvantage.

Table 3. Students' experiences and opinions on communication skills

Question asked	Group	n1	n2	n3	n4	n5	Mean (SD)	M	Q_1	Q_3	p-value
Are communication skills necessary in the physician's profession? (1: definitely no, 5: definitely yes)	Total n = 164	1	3	2	42	116	4.64 (0.66)	5	4	5	
	Females n = 103	0	1	1	25	76	4.71 (0.53)	5	4	5	0.238
	Males n = 59	1	2	1	16	39	4.53 (0.83)	5	4	5	
How often during your studies were you made aware of the role of communication in the physician's profession? (1: not at all, 5: very often)	Total n = 164	6	43	47	56	12	3.15 (1.01)	3	2	4	
	Females n = 104	5	23	25	45	6	3.23 (1.01)	3	2	4	0.086
	Males n = 58	1	20	21	10	6	3.00 (1.00)	3	2	4	
Rate communication skills of physicians you encountered as a patient/patient's family member (1: very poor, 5: very good)	Total n = 164	11	27	79	39	8	3.04 (0.93)	3	3	4	
	Females n = 102	8	18	46	28	2	2.98 (0.92)	3	2.25	4	0.440
	Males n = 60	3	8	32	11	6	3.15 (0.95)	3	3	4	
Rate communication skills of physicians you encountered as a student (1: very poor, 5: very good)	Total n = 163	5	15	91	44	8	3.21 (0.80)	3	3	4	
	Females n = 102	3	6	62	27	4	3.23 (0.74)	3	3	4	0.726
	Males n = 60	2	9	29	16	4	3.18 (0.88)	3	3	4	

nX: the number of respondents who chose particular answers; M: median; Q_1: lower quartile; $^{hh}Q_3$: upper quartile, p-values analyze gender differences in students' answers

Academic teachers, due to the character of their work, have better-developed communication skills than the majority of 'common' doctors. (M/25)

Often good communication with patients because they want to give us a good example. (F/26)

Clinicians are much less empathic; it rather resembles mass treatment than paying attention to the patient. (M/24)

Communication with patients constituted an easy task for 49.09% of students and a difficult task for 15.76% of them. The majority of students believed that learning communication skills should be an obligatory part of the medical curriculum (135; 81.33%) and that the amount of time dedicated to it during their studies was insufficient (104; 63.03%). On the contrary, 53 (32.12%) students replied that the amount of time dedicated to learning communication skills was adequate, and 8 (4.85%) students thought that too much time was spent on it. The detailed results are presented in Table 4. Students' responses did not differ statistically in terms of their gender.

Students who responded that communication training should be obligatory for medical students noticed it would allow for better preparation for conversations with actual patients and bring many profits for them and their future patients. As a result, learning communication skills was seen as an investment in the future. Respondents argued that good communication skills are essential for physicians as they influence patients' perception of care quality and facilitate patient-physician cooperation. Good communication with patients was also seen as helpful in understanding the patient's perspective, showing them respect, and realizing their right to information about their condition and treatment options. Its importance was emphasized, especially in the context of difficult conversations with patients. However, respondents noticed that learning communication skills is highly dependent on the willingness, motivation, and engagement of students.

There is a gap between talking with patients at clinical classes and talking with patients on our own. Communication classes allow us to fill it. (M/24)

It [learning communication skills] allows starting to work as a physician more easily. (F/23)

Better preparation for the conversation with a patient, sensing what they want to know, what their expectations are. (F/24)

Good communication shows the class of a physician. (M/24)

Students noticed that some of their colleagues might have bigger deficits in communication skills and interpersonal competencies, especially that they are not taken into account when applying to medical schools in Poland.

Many people beginning medical studies have poorly developed emotional intelligence, and due to their young age, they do not have experience in communication with people from the entire cross-section of society. (F/24)

Table 4. Students' opinions on communication skills learning

Question asked	Answers	n (%)			p-value*
		Total	Females	Males	
For me, communicating with patients is …	Easy	81 (49.09)	50 (48.08)	30 (50.85)	0.951
	Difficult	26 (15.76)	18 (17.31)	8 (13.56)	
	Hard to say	58 (35.15)	36 (34.62)	21 (35.59)	
Should communication skills learning be an obligatory part of the medical curriculum?	Yes	135 (81.33)	84 (80.77)	50 (83.33)	0.428
	No	9 (5.42)	7 (6.73)	2 (3.33)	
	Hard to say	22 (13.25)	13 (12.50)	8 (13.33)	
The amount of time dedicated to learning communication skills in the curriculum is…	Too big	8 (4.85)	7 (6.73)	1 (1.69)	0.414
	Appropriate	53 (32.12)	35 (33.65)	17 (28.81)	
	Insufficient	104 (63.03)	62 (59.62)	41 (69.49)	
Could some changes be made to improve the communication skills of future doctors?	Yes	92 (55.76)	58 (56.31)	33 (55.00)	0.242
	No	17 (10.30)	7 (6.80)	10 (16.67)	
	Hard to say	56 (33.94)	38 (36.89)	17 (28.33)	

*p-values analyze gender differences in students' answers

It is important in the light of societal changes happening under the influence of technological development and weakening of the interpersonal relations. (M/26)

Because the sole admission criterion to medical schools is the result of the baccalaureate exams, there are many medical students with low social and interpersonal competencies. (M/26)

Students who opposed the idea of obligatory communication training were skeptical about its effectiveness and saw it as a waste of their time. They also emphasized the importance of individual student's engagement and motivation, suggesting that communication skills learning should be offered as electives.

If someone was not able to learn throughout the years to communicate with people appropriately, classes won't change that. (M/24)

I think it is a waste of time on such time-absorbing studies. (F/24)

If someone doesn't want to acquire communication skills, they won't gain anything from these classes. (F/24)

Students who remained undecided argued that not every physician might need communication skills. They also doubted the effectiveness of communication training or expressed indifference to the topic.

I think that it cannot be learned. (M/24)

It all depends on the person […]. However, if someone is interested, it might be helpful. (F/24)

The majority of students declared that the amount of time dedicated to communication skills learning during their studies was insufficient, especially in comparison with basic sciences. Students noted that most of the communication training was offered as elective classes, and many topics were overlooked. As a result, they suggested increasing the intensity of communication skills learning both in the pre-clinical and clinical training. Respondents acknowledged deficits in communication skills among students, and therefore expressed a demand for more individual conversations with patients, and believed that students' communication skills should be assessed. Another theme emerging from students' comments was the significance of the hidden curriculum. They reported a contrast between what they were told at communication classes and the example given by some medical teachers.

During the classes, we talk with patients, but in groups. There is a lack of individual conversations. (M/25)

Many situations from the everyday work of a physician are not discussed. (M/24)

It would be best if aspects of interculturalism were also brought up. There are only elective classes on that. (F/23)

It is never too much. Moreover, physicians giving other classes too rarely comply with the knowledge from simulation classes [on communication skills]. (M/24)

Students who responded that too much time was spent on communication training believed that it should be conducted in a clinical setting. They also doubted its effectiveness and regarded communication skills as less important than medical knowledge, for instance.

Students believing that the amount of time was appropriate suggested its better use, for instance, introducing more simulation methods instead of theory. They also referred to students' motivation and proposed additional elective courses for volunteers.

Even if there were more of them, some [students] still wouldn't learn it. (F/24)

Classes should only show a path of development. Students should train out of their own will. (M/24)

Some students should be motivated to communicate, because, in my group, there are people who never speak, take the history from the patient. (F/24)

For interested people, elective courses on the topic can be organized. (F/24)

Finally, nearly 56% of students indicated that some changes could be introduced to improve the communication skills of future doctors (Table 4). They proposed more compulsory communication classes and occasions to practice their skills during pre-clinical and clinical training, including simulation methods (e.g., simulated patients), peer role-plays, or psychology classes. Students also suggested paying more attention to their communication skills during other classes, more individual interactions with patients, and wished for more teacher feedback in this regard. They expressed a particular demand for elaborating on the topic of difficult conversations with patients. Respondents also mentioned workshops for teachers and broadening the curriculum to include interprofessional education and courses focused on multicultural and minority patients. Finally, apart from curricular changes, students also implied a revision of the medical school application system in Poland.

More classes with simulated patients and working in pairs, where people play given roles and situations. (M/25)

Bringing it up during clinical classes — observation of our history-taking skills and then comments on it. (F/24)

More practical classes oriented towards conversations with patients, not necessarily in simulated conditions — one or two students and a medical teacher. (M/25)

Not only history taking, but also the possibility to observe and actively participate in difficult conversations. (F/25)

More training sessions for medical teachers so they could show the importance of communication skills by giving a good example. (F/24)

Interfaculty classes with nursing, medical rescue, midwifery students should be organized. (F/24)

A multicultural patient, LGBT+, a requirement of at least 30 minutes at every ward about the specificity of their patients. (F/23)

Not only [changes in] the curriculum, but also, e.g., psychological tests before the studies. (F/24)

Admission interviews and selecting the candidates with regards to psychological predispositions; more soft skills learning. (M/22)

DISCUSSION

The majority of students acknowledged the importance of communication skills in their future profession. However, the comparatively lower frequency with which they were made aware of that during their studies might raise concerns. Students who are less positively inclined to learn communication skills may even see it as a subliminal message that maybe the topic is not so important after all. Furthermore, it is essential for medical students, as adult learners, to know why they should learn something and how it is relevant for their future work [24, 25]. Students moderately rated the communication skills of doctors encountered in the past, noting a requirement for improvement in some cases. Interestingly, we observed a statistically significant difference in their perception of the communication skills of physicians encountered as medical students and patients. Meanwhile, Ajzen's Theory of Planned Behavior places subjective norms among variables influencing one's behavioral intentions [10]. As a result, the attention that medical teachers, as authority figures, pay to communication skills, and the example they give to their students may be of great importance. Students' comments show the significance of the hidden curriculum and how carefully they observe their teachers. They provided many examples of qualities indicating good and bad communication role-models, mirrored by the literature [26]. The significance of positive and negative role models was also demonstrated in previous studies [27, 28]. It was even suggested that negative examples might leave a more profound impact on students in terms of what not to do [28]. Still, it seems advisable to avoid and correct them in order to prevent their legitimization. In this aspect, medical teachers should be aware of their communication style, limitations, being a role model, and the need for constant improvement [29].

Students strongly believed that communication skills learning should be an obligatory part of the medical curriculum, and the majority of them would welcome the opportunity to have more classes on it, providing many reasons for both answers. Simultaneously, they recognized the struggles of some students with talking to patients. On the other hand, students with less positive opinions on communication training expressed skepticism about its effectiveness in terms of communication skills as something that cannot be learned. They also pointed out that communication skills might not be required in particular medical specialties and emphasized that students unwilling or unmotivated to learn communication skills would not benefit from them anyway. Similar negative attitudes of some students towards communication skills learning were noted previously [30, 31]. Knowles also underlined the importance of internal motivation and learner-centeredness in adult education [24, 25].

Students proposed many changes that could be introduced to their communication training, including increasing its intensity and practical relevance. They suggested more classes with simulated patients, peer role-play, psychology classes, and more conversations with real patients in supervised conditions with subsequent feedback. Rees et al. [32] also noted positive attitudes of students towards experiential learning methods and suggested increasing their opportunities for conversations with simulated and real patients. Moreover, medical simulation presents students with the opportunity to practice their communication skills in safe conditions with respect to scenarios that would otherwise be difficult to implement in their curriculum, for instance, patients' death, aggression, or cultural differences [33]. Additionally, it not only allows learners to improve and develop their knowledge, skills, and critical thinking

but also prepares them for handling similar situations in their future professional work [34]. Other studies showed learners' positive perception and effectiveness of communication training in a clinical setting [35–37]. The role of feedback in improving students' communication is also invaluable [38]. As demonstrated by this and other studies [39, 40], students expect to be observed and receive feedback on their performance. However, reports show that it either happens rarely or is performed only superficially [29].

Students mentioned broadening the curriculum to include interprofessional education and courses focused on multicultural and minority patients. Given that currently they are only being introduced into the Polish medical curriculum and, at least at our institution, are offered only as elective courses, we were positively surprised that students start to notice a requirement for them. It could signify their readiness for them as a compulsory part of the curriculum. However, verification of this would require additional studies. Finally, apart from curricular changes, students also implied a revision of the medical school application system in Poland, including admission interviews and evaluation of psychological predispositions of candidates. It should be explained that currently, according to Polish law, admission to any university is based only on the results of baccalaureate exams. In the case of medical schools, results in Biology, Chemistry, and sometimes Physics are taken into account. However, as our respondents also noticed, it may lead to people with deficits in communication and interpersonal skills getting into medical schools. Furthermore, given that currently, communication skills are not formally assessed during medical studies, their deficits may remain undetected. It seems that more emphasis should be placed on communication skills in the Polish medical curriculum, including their formative and summative assessment with equal treatment as other exams.

We acknowledge the limitations of this study. Due to circumstances beyond our control caused by the COVID-19 pandemic outbreak, we were not able to collect data from all sixth-year students as we initially planned. Still, the sample size was representative of the entire group of students. Furthermore, the number of male respondents was lower than females, but it was corresponding with the general demographic characteristic of medical students. According to the data provided by the Office for Student Affairs of Poznan University of Medical Sciences, among 271 sixth-year medical students in the academic year 2019/2020, there were 176 (64.94%) females and 95 (35.06%) males. Furthermore, a research bias cannot be excluded, given a strong attachment of the primary author to the topic. However, to compensate for that, researchers with different backgrounds were invited to the study. Finally, this study was conducted among students of only one medical university, and students from other institutions might present different opinions on communication skills. Further studies are needed to extend our results to a broader population.

CONCLUSIONS

Medical students observe the communication style of their teachers and pay attention to the hidden curriculum conveyed by them. They report a contrast between the behavior of some physicians and issues raised during communication classes. For the majority of students, communication skills learning should be obligatory in medical schools, and due to its many benefits, it was perceived as an investment in the future. However, students who were undecided or opposing this idea doubted its effectiveness and underlined the importance of individual students' attitudes and motivation as essential for its success. Most students believed that, for many reasons, more time should be spent on communication training in the medical curriculum. Necessary changes proposed by respondents that could be introduced into the medical curriculum included increasing the intensity and emphasis on communication training, bigger use of experiential learning methods, interprofessional education, and multicultural education. Students noted that medical teachers should pay more attention to their communication style during clinical classes and provide them with more occasions for individual conversations with patients, followed by feedback on their skills. Revisions to the medical school application system were suggested, for instance, psychological screening and admission interviews with candidates.

Acknowledgments

We wish to express our gratitude to all students who agreed to participate in the study.

Conflict of interest

The authors declare that there are no conflicts of interest.

REFERENCES

1. Epstein RM, Street RL. The values and value of patient-centered care. Ann Fam Med. 2011; 9(2): 100–103, doi: 10.1370/afm.1239, indexed in Pubmed: 21403134.
2. Bachmann C, Roschlaub S, Harendza S, et al. Medical students' communication skills in clinical education: Results from a cohort study. Patient Educ Couns. 2017; 100(10): 1874–1881, doi: 10.1016/j.pec.2017.05.030, indexed in Pubmed: 28601262.
3. Cömert M, Zill JM, Christalle E, et al. Assessing Communication Skills of Medical Students in Objective Structured Clinical Examinations (OSCE)--A Systematic Review of Rating Scales. PLoS One. 2016; 11(3): e0152717, doi: 10.1371/journal.pone.0152717, indexed in Pubmed: 27031506.
4. Löffler-Stastka H, Seitz T, Billeth S, et al. Significance of gender in the attitude towards doctor-patient communication in medical students and physicians. Wien Klin Wochenschr. 2016; 128(17-18): 663–668, doi: 10.1007/s00508-016-1054-1, indexed in Pubmed: 27516078.
5. Baig LA, Violato C, Crutcher RA. Assessing clinical communication skills in physicians: are the skills context specific or generalizable. BMC Med Educ. 2009; 9: 22, doi: 10.1186/1472-6920-9-22, indexed in Pubmed: 19445685.
6. Braverman G, Bereknyei Merrell S, Bruce JS, et al. Finding the Words: Medical Students' Reflections on Communication Challenges in Clinic. Fam Med. 2016; 48(10): 775–783, indexed in Pubmed: 27875600.
7. Alotaibi FS, Alsaeedi A. Attitudes of medical students toward communication skills learning in Western Saudi Arabia. Saudi Med J. 2016; 37(7): 791–795, doi: 10.15537/smj.2016.7.14331, indexed in Pubmed: 27381541.
8. Taylor S, Bobba S, Roome S, et al. Simulated patient and role play methodologies for communication skills training in an undergraduate medical program: Randomized, crossover trial. Educ Health (Abingdon). 2018; 31(1): 10–16, doi: 10.4103/1357-6283.239040, indexed in Pubmed: 30117467.
9. Wright KB, Bylund C, Ware J, et al. Medical Student Attitudes Toward Communication Skills Training and Knowledge of Appropriate Provider-Patient Communication: A Comparison of First-Year and Fourth-Year Medical Students. Med Educ Online. 2006; 11(1): 4594, doi: 10.3402/meo.v11i.4594, indexed in Pubmed: 28253797.
10. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991; 50(2): 179–211, doi: 10.1016/0749-5978(91)90020-t.
11. Rees C, Sheard C. The relationship between medical students' attitudes towards communication skills learning and their demographic and education-related characteristics. Med Educ. 2002; 36(11): 1017–1027, doi: 10.1046/j.1365-2923.2002.01333.x, indexed in Pubmed: 12406261.
12. Cleland J, Foster K, Moffat M. Undergraduate students' attitudes to communication skills learning differ depending on year of study and gender. Med Teach. 2005; 27(3): 246–251, doi: 10.1080/01421590400029541, indexed in Pubmed: 16011948.
13. Hojat M, Vergare MJ, Maxwell K, et al. The devil is in the third year: a longitudinal study of erosion of empathy in medical school. Acad Med. 2009; 84(9): 1182–1191, doi: 10.1097/ACM.0b013e3181b17e55, indexed in Pubmed: 19707055.
14. Neumann M, Edelhäuser F, Tauschel D, et al. Empathy decline and its reasons: a systematic review of studies with medical students and residents. Acad Med. 2011; 86(8): 996–1009, doi: 10.1097/ACM.0b013e318221e615, indexed in Pubmed: 21670661.
15. Tashakkori A, Creswell J. Editorial: The New Era of Mixed Methods. Journal of Mixed Methods Research. 2016; 1(1): 3–7, doi: 10.1177/2345678906293042.
16. Johnson R, Onwuegbuzie A, Turner L. Toward a Definition of Mixed Methods Research. Journal of Mixed Methods Research. 2016; 1(2): 112–133, doi: 10.1177/1558689806298224.
17. Denzin NK, Lincoln YS. The SAGE Handbook of Qualitative Research. 4th ed. SAGE Publications 2011.
18. Hadi MA, Alldred DP, Closs SJ, et al. Mixed-methods research in pharmacy practice: basics and beyond (part 1). Int J Pharm Pract. 2013; 21(5): 341–345, doi: 10.1111/ijpp.12010, indexed in Pubmed: 23418918.
19. Leech N, Onwuegbuzie A. A typology of mixed methods research designs. Quality & Quantity. 2007; 43(2): 265–275, doi: 10.1007/s11135-007-9105-3.
20. Ordinance of the Minister of Science and Higher Education of May 9, 2012 on the standards of education for faculties: medical, dentistry, pharmacy, nursing and obstetrics. [Rozporządzenie Ministra Nauki i Szkolnictwa Wyższego z dnia 9 maja 2012 r. w sprawie standardów kształcenia dla kierunków studiów: lekarskiego, lekarsko-dentystycznego, farmacji, pielęgniarstwa i położnictwa.] Retrived from: http://prawo.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20120000631.
21. Krejcie R, Morgan D. Determining Sample Size for Research Activities. Educational and Psychological Measurement. 2016; 30(3): 607–610, doi: 10.1177/001316447003000308.
22. Cleland JA. The qualitative orientation in medical education research. Korean J Med Educ. 2017; 29(2): 61–71, doi: 10.3946/kjme.2017.53, indexed in Pubmed: 28597869.
23. British Association for Educational Researchers. Ethical Guidelines for Educational Research. fourth edition, 2018. https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2018.
24. Knowles MS. The modern practice of adult education: From pedagogy to andragogy. Chicago. Association Press 1980.
25. Knowles MS. Andragogy in action: Applying modern principles of adult learning. San Francisco. Jossey-Bass Publishers, 1984 .
26. Jochemsen-van der Leeuw HG, van Dijk N, van Etten-Jamaludin FS, et al. The attributes of the clinical trainer as a role model: a systematic review. Acad Med. 2013; 88(1): 26–34, doi: 10.1097/ACM.0b013e318276d070, indexed in Pubmed: 23165277.
27. Paice E, Heard S, Moss F. How important are role models in making good doctors? BMJ. 2002; 325(7366): 707–710, doi: 10.1136/bmj.325.7366.707, indexed in Pubmed: 12351368.

28. Egnew TR, Wilson HJ. Faculty and medical students' perceptions of teaching and learning about the doctor-patient relationship. Patient Educ Couns. 2010; 79(2): 199–206, doi: 10.1016/j.pec.2009.08.012, indexed in Pubmed: 19748201.
29. Junod Perron N, Sommer J, Louis-Simonet M, et al. Teaching communication skills: beyond wishful thinking. Swiss Med Wkly. 2015; 145: w14064, doi: 10.4414/smw.2015.14064, indexed in Pubmed: 25664624.
30. Rees CE, Sheard CE, McPherson AC. A qualitative study to explore undergraduate medical students' attitudes towards communication skills learning. Med Teach. 2002; 24(3): 289–293, doi: 10.1080/01421590220134123, indexed in Pubmed: 12098416.
31. Nogueira-Martins MC, Nogueira-Martins LA, Turato ER. Medical students' perceptions of their learning about the doctor-patient relationship: a qualitative study. Med Educ. 2006; 40(4): 322–328, doi: 10.1111/j.1365-2929.2006.02411.x, indexed in Pubmed: 16573667.
32. Rees C, Sheard C, McPherson A. Medical students' views and experiences of methods of teaching and learning communication skills. Patient Educ Couns. 2004; 54(1): 119–121, doi: 10.1016/S0738-3991(03)00196-4, indexed in Pubmed: 15210269.
33. Adamczuk J, Nieckula M, Dabrowska A, et al. Recommendations for the use of simulation methods in a selected area of health sciences based on an example simulation scenario. Disaster and Emergency Medicine Journal. 2019; 4(4): 173–179, doi: 10.5603/demj.a2019.0031.
34. Abelsson A. Learning through simulation. Disaster and Emergency Medicine Journal. 2017; 2(3): 125–128, doi: 10.5603/demj.2017.0027.
35. Williams KN, Ramani S, Fraser B, et al. Improving bedside teaching: findings from a focus group study of learners. Acad Med. 2008; 83(3): 257–264, doi: 10.1097/ACM.0b013e3181637f3e, indexed in Pubmed: 18316871.
36. Tariq M, Motiwala A, Ali SU, et al. The learners' perspective on internal medicine ward rounds: a cross-sectional study. BMC Med Educ. 2010; 10: 53, doi: 10.1186/1472-6920-10-53, indexed in Pubmed: 20618929.
37. Berkhof M, van Rijssen HJ, Schellart AJM, et al. Effective training strategies for teaching communication skills to physicians: an overview of systematic reviews. Patient Educ Couns. 2011; 84(2): 152–162, doi: 10.1016/j.pec.2010.06.010, indexed in Pubmed: 20673620.
38. Veloski J, Boex JR, Grasberger MJ, et al. Systematic review of the literature on assessment, feedback and physicians' clinical performance: BEME Guide No. 7. Med Teach. 2006; 28(2): 117–128, doi: 10.1080/01421590600622665, indexed in Pubmed: 16707292.
39. Malhotra A, Gregory I, Darvill E, et al. Mind the gap: Learners' perspectives on what they learn in communication compared to how they and others behave in the real world. Patient Educ Couns. 2009; 76(3): 385–390, doi: 10.1016/j.pec.2009.07.024, indexed in Pubmed: 19674863.
40. Rosenbaum ME, Axelson R. Curricular disconnects in learning communication skills: what and how students learn about communication during clinical clerkships. Patient Educ Couns. 2013; 91(1): 85–90, doi: 10.1016/j.pec.2012.10.011, indexed in Pubmed: 23154147.

VIA MEDICA

RESEARCH LETTER

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 183–185
DOI: 10.5603/DEMJ.a2021.0028

ISSN 2451–4691, e-ISSN 2543–5957

IMPACT OF COVID-19 ON PEDIATRIC OUT-OF-HOSPITAL CARDIAC ARREST IN THE MASOVIAN REGION

Jaroslaw Meyer-Szary[1], Milosz J. Jaguszewski[2], Jacek Smereka[3, 4], Aleksandra Gasecka[5], Mohamed S. Emam[5], Ivo John[5], Zubaid Rafique[6], Frank W. Peacock[6], Francesco Chirico[7, 8], Dorota Sagan[9], Marta Jachowicz[9], Lukasz Szarpak[4, 10, 11]

[1]Department of Paediatric Cardiology and Congenital Heart Diseases, Medical University of Gdansk, Poland
[2]1st Department of Cardiology, Medical University of Gdansk, Poland
[3]Department of Emergency Medical Service, Wroclaw Medical University, Wroclaw, Poland
[4]Polish Society of Disaster Medicine, Warsaw, Poland
[5]1st Chair and Department of Cardiology, Medical University of Warsaw, Poland
[6]Henry JN Taub Department of Emergency Medicine, Baylor College of Medicine Houston, Texas, USA
[7]Post-graduate School of Occupational Health, Università Cattolica del Sacro Cuore, Rome, Italy
[8]Health Service Department, Italian State Police, Milan, Italy
[9]Students Research Club, Maria Sklodowska-Curie Medical Academy in Warsaw, Poland
[10]Institute of Outcomes Research; Maria Sklodowska-Curie Medical Academy in Warsaw, Poland
[11]Research Unit, Maria Sklodowska-Curie Bialystok Oncology Center, Bialystok, Poland

KEY WORDS: out-of-hospital cardiac arrest, OHCA, pediatric, SARS-CoV-2, COVID-19

Disaster Emerg Med J 2021; 6(4): 183–185

To the Editor,

the epidemiology of pediatric out-of-hospital cardiac arrest (OHCA) is reasonably well described [1–6], with annual occurrence rates estimated at 7–8 per 100 000 children [7], although extensive variation exists, ranging from 2.28 to 18.0 per 100 000 person-years [5, 8–12], depending on the location and timing of the study. Data on pediatric OHCA during COVID-19 pandemic are very limited. Our purpose was to examine the changes in the characteristics and survival outcomes of pediatric OHCA following the COVID-19 outbreak in the Masovian region (Poland).

We conducted a retrospective cohort study from a National Emergency Medical Service Command Support System which is a prospective registry of medical interventions performed by emergency medical services (EMS) in Poland [13]. Our study was conducted according to the STROBE (strengthening the reporting of observational studies in epidemiology) guidelines [14] and complies with the Declaration of Helsinki. The study protocol was approved by the Institutional Review Board of the Polish Society of Disaster Medicine (approval no. 01.03.21.IRB).

All eligible consecutive pediatric patients suffering an OHCA from March 1 to December 30 in the years 2019 (pre-pandemic period) and 2020 (pandemic period), were enrolled. Children eligible for inclusion were > 48 hours and < 18 years of age and suffered an OHCA with pediatric advanced life support implementation by EMS teams. Subjects were excluded if the information on gender or cardiopulmonary resuscitation outcomes was missing. The pediatric population count was based on the Polish Central Statistical Office report for the year 2019. The outcomes included before-and-after comparative analyses focusing on the COVID-19 outbreak period and the analogous period in 2019. Statistical analysis was performed using STATA version 16.1EN (StataCorp LLC, Texas, USA).

There were 1 091 319 children living in the analyzed region in 2019. Since data for 2020 were not available, it was assumed there was no substantial change in the population during the study period. Overall, a total of 47 pediatric OHCA patients were included in this analysis [mean age 6.1 (6.3) years, 59.6% males; 18 in pre-COVID-19 and 29 in the

ADDRESS FOR CORRESPONDENCE:
Lukasz Szarpak, Maria Sklodowska-Curie Medical Academy in Warsaw
e-mail: lukasz.szarpak@gmail.com

Table 1. Comparison of OHCA subjects in 2019 and 2020 periods

Variable	Pre-COVID-19 (2019)	COVID-19 (2020)	Difference (95%CI)*	p-value
n	18	29		0.10
n per 100.000	1.65	2.66		0.10
Males (%)	13 (72.2%)	15 (51.7%)	–0.22 (–0.49, 0.05)	0.11
Age, years (SD)	5.1 (6.5)	6.7 (6.2)	1.60 (–2.16, 5.36)	0.40
EMS arrival time, min (SD)	11.2 ± 5.4	9.9 ± 4.2	–1.30 (–4.23, 1.63)	0.38
OHCA cause Medical Trauma	 17 (94.4%) 1 (5.6%)	 24 (82.8%) 5 (17.2%)	 0.56 (0.10, 3.26) 3.75 (0.40, 34.96)	 0.52 0.25
Presenting rhythm, n (%) Shockable Not shockable	 1 (5.6%) 17 (94.4%)	 1 (3.4%) 28 (96.6%)	 0.64 (0.04, 10.94) 1.65 (0.10, 28.09)	 0.76 0.73
Adrenaline administered, n (%)	8 (42.1%)	14 (48.3%)	1.17 (0.36, 3.80)	0.80
Atropine administered, n (%)	2 (11.1%)	3 (10.3%)	0.92 (0.14, 6.14)	0.93
Amiodarone administered, n (%)	0 (0.0%)	2 (6.9%)	3.36 (0.15, 74.15)	0.44
Airway management, n (%) Supraglottic airway device Endotracheal tube	 8 (44.4%) 4 (22.2%)	 6 (20.7%) 16 (55.2%)	 0.33 (0.09, 1.19) 4.31 (1.14, 16.30)	 0.09 0.03
Intraosseous access, n (%)	7 (38.9%)	1 (3.4%)	0.06 (0.01, 0.51)	0.01
Outcome, n (%) Death in the field Transported with ongoing CPR Transported with ROSC	 6 (33.3%) 5 (27.8%) 8 (44.4%)	 10 (34.5%) 13 (44.8%) 6 (20.7%)	 1.05 (0.30, 3.65) 2.11 (0.60, 7.48) 0.33 (0.09, 1.19)	 0.94 0.25 0.09

CI — confidence interval; CPR — cardiopulmonary resuscitation; EMS — emergency medical service; OHCA — out-of-hospital cardiac arrest; ROSC — return of spontaneous circulation; SD — standard deviation
*Differences are expressed as rate difference or mean difference and 95% confidence intervals.

COVID-19 periods]. Patient characteristics, OHCA cause, and the presenting rhythm (either unshockable or not) were similar in the pre-COVID-19 and COVID-19 periods (Tab. 1). Time to EMS arrival and EMS interventions were similar with regard to the medical therapy administered (the rates of adrenaline, atropine, and amiodarone administered). However, children with OHCA in the COVID-19 period more often received an endotracheal tube compared to the pre-COVID-19 period ($p = 0.03$), although the use of a supraglottic airway device did not change. The use of intraosseous access decreased during the COVID-19 period ($p = 0.01$). The outcomes were similar in the categories of 'death in the field', 'transported with ongoing CPR', and 'transported with ROSC', although numerically more patients were transported with ongoing CPR, and much fewer did not have ROSC.

To conclude, we found no significant changes regarding outcomes, demographics, and field resuscitation rates, although we did find a marked increase in the rate of endotracheal tube intubation. Our findings may be due to the overall poor outcomes that occur with pediatric OHCA or relatively small sample size, but we did not observe a negative 'COVID-19 effect' on outcomes in pediatric OHCA. Of note, the number of pediatric OHCA was higher during COVID-19 period, with a marked increase in traumatic OHCA. While this may not be a direct effect of COVID-19 infection in the pediatric population, it may be related to limited access to healthcare, increased psychosocial stress, and exposure to domestic violence. Although the number of cases of traumatic OHCA is limited, the relative rise in cases over a year is further investigation. A similar analysis in other regions and countries will distinguish between an alarming trend and an anomalous data point.

As a retrospective evaluation of the previously collected data, our paper is limited to hypothesis generation. Further, as pediatric OHCA is a relatively uncommon event, our sample size is small which limits our conclusions. Finally, because no COVID-19 testing results were recorded, we cannot confirm if any of the cases of OHCA were related to COVID-19.

Altogether, pediatric OHCA in the Masovian region is not common and has a poor prognosis.

The COVID-19 pandemic may have increased the number of OHCA, but has not changed the patient characteristics, presenting rhythm, or outcomes. Larger studies are needed to elucidate the trends noted here.

Conflict of interest

All authors declare no conflict of interest.

REFERENCES

1. Johnson MA, Grahan BJH, Haukoos JS, et al. Demographics, bystander CPR, and AED use in out-of-hospital pediatric arrests. Resuscitation. 2014; 85(7): 920–926, doi: 10.1016/j.resuscitation.2014.03.044, indexed in Pubmed: 24681302.
2. Okamoto Y, Iwami T, Kitamura T, et al. Regional variation in survival following pediatric out-of-hospital cardiac arrest. Circ J. 2013; 77(10): 2596–2603, doi: 10.1253/circj.cj-12-1604, indexed in Pubmed: 23823852.
3. Foltin GL, Richmond N, Treiber M, et al. Pediatric prehospital evaluation of NYC respiratory arrest survival (PHENYCS). Pediatr Emerg Care. 2012; 28(9): 859–863, doi: 10.1097/PEC.0b013e3182675b61, indexed in Pubmed: 22929130.
4. Moler FW, Donaldson AE, Meert K, et al. Pediatric Emergency Care Applied Research Network, Pediatric Emergency Care Applied Research Network. In-hospital versus out-of-hospital pediatric cardiac arrest: a multicenter cohort study. Crit Care Med. 2009; 37(7): 2259–2267, doi: 10.1097/CCM.0b013e3181a00a6a, indexed in Pubmed: 19455024.
5. Atkins DL, Everson-Stewart S, Sears GK, et al. Resuscitation Outcomes Consortium Investigators. Epidemiology and outcomes from out-of-hospital cardiac arrest in children: the Resuscitation Outcomes Consortium Epistry-Cardiac Arrest. Circulation. 2009; 119(11): 1484–1491, doi: 10.1161/CIRCULATIONAHA.108.802678, indexed in Pubmed: 19273724.
6. Donoghue AJ, Nadkarni V, Berg RA, et al. CanAm Pediatric Cardiac Arrest Investigators. Out-of-hospital pediatric cardiac arrest: an epidemiologic review and assessment of current knowledge. Ann Emerg Med. 2005; 46(6): 512–522, doi: 10.1016/j.annemergmed.2005.05.028, indexed in Pubmed: 16308066.
7. Meert KL, Telford R, Holubkov R, et al. Therapeutic Hypothermia after Pediatric Cardiac Arrest (THAPCA) Trial Investigators. Pediatric Out-of-Hospital Cardiac Arrest Characteristics and Their Association With Survival and Neurobehavioral Outcome. Pediatr Crit Care Med. 2016; 17(12): e543–e550, doi: 10.1097/PCC.0000000000000969, indexed in Pubmed: 27679965.
8. Law AKK, Ng MH, Hon KL, et al. Out-of-Hospital Cardiac Arrest in the Pediatric Population in Hong Kong: A 10-Year Review at a University Hospital. Pediatr Emerg Care. 2018; 34(3): 179–184, doi: 10.1097/PEC.0000000000000661, indexed in Pubmed: 26760831.
9. Sirbaugh P, Pepe P, Shook J, et al. A Prospective, Population-Based Study of the Demographics, Epidemiology, Management, and Outcome of Out-of-Hospital Pediatric Cardiopulmonary Arrest. Annals of Emergency Medicine. 1999; 33(2): 174–184, doi: 10.1016/s0196-0644(99)70391-4.
10. Kuisma M, Suominen P, Korpela R. Paediatric out-of-hospital cardiac arrests — epidemiology and outcome. Resuscitation. 1995; 30(2): 141–150, doi: 10.1016/0300-9572(95)00888-z.
11. Ong MEH, Osmond MH, Gerein R, et al. OPALS study group. Comparing pre-hospital clinical diagnosis of pediatric out-of-hospital cardiac arrest with etiology by coroner's diagnosis. Resuscitation. 2007; 72(1): 26–34, doi: 10.1016/j.resuscitation.2006.05.024, indexed in Pubmed: 17101206.
12. Broides, A., Sofer, S. & Press, J. Outcome of "out of hospital" cardiopulmonary arrest in children admitted to the emergency room. Isr Med Assoc J. 2000; 2: 672–674.
13. Borkowska MJ, Jaguszewski MJ, Koda M, et al. Impact of Coronavirus Disease 2019 on Out-of-Hospital Cardiac Arrest Survival Rate: A Systematic Review with Meta-Analysis. J Clin Med. 2021; 10(6), doi: 10.3390/jcm10061209, indexed in Pubmed: 33803944.
14. Elm Ev, Altman D, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for reporting observational studies. International Journal of Surgery. 2014; 12(12): 1495–1499, doi: 10.1016/j.ijsu.2014.07.013.

VIA MEDICA

REVIEW ARTICLE

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 186–193
DOI: 10.5603/DEMJ.a2021.0033

ISSN 2451–4691, e-ISSN 2543–5957

THE KNOWLEDGE, ATTITUDES, AND PRACTICE (KAP) OF THE IRANIAN PUBLIC TOWARDS COVID-19: A SYSTEMATIC REVIEW

Ali Sahebi[1], Mohamad Golitaleb[2], Fatemeh Aliakbari[3], Kosar Yousefi[1], Hojjat Sheikhbardsiri[4]

[1]Non-Communicable Diseases Research Center, Ilam University of Medical Sciences, Ilam, Iran
[2]Department of Nursing, School of Nursing, Arak University of Medical Sciences, Arak, Iran
[3]Community-Oriented Nursing Midwifery Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran
[4]Health in Disasters and Emergencies Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

ABSTRACT

INTRODUCTION: COVID-19 is an extremely contagious disease that has led to a global pandemic. Control of this pandemic requires community awareness and adherence to preventive behaviors. The aim of this review is to investigate the knowledge, attitudes, and practices (KAP) of the Iranian public towards the COVID-19 pandemic.

MATERIAL AND METHODS: This review was conducted according to the PRISMA guidelines. Databases including Magiran, SID, ISC, Scopus, PubMed, Web of Science, Cochrane, ProQuest, Science Direct, and Google Scholar were searched for literature. The searches were conducted in both Farsi and English without any time limit until the end of December 2020. The research question and inclusion and exclusion criteria were designed according to the PICO. For qualifying studies, the NOS checklist was used. We used narrative synthesis for synthesizing the entered studies.

RESULTS: 138 studies were found during the initial search, of which 13 were systematically reviewed. All studies identified had a cross-sectional design and used researcher-designed tools for data collection. Overall, 11 111 people (4900 men and 6211 women) from the public population of Iran were included.

CONCLUSIONS: The majority of Iranians studied had appropriate (KAP) regarding COVID-19 precautions. Policymakers should continue public health education measures.

KEY WORDS: general population, knowledge, attitude, practice, systematic review, COVID-19

Disaster Emerg Med J 2021; 6(4): 186–193

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was first reported in Wuhan, China. The disease has since led to a global pandemic with widespread economic, social, and health consequences [1]. One of the important features of COVID-19 is its high transmissibility, necessitating adherence to strict personal and social hygiene [2]. The rapid spread of the virus has overwhelmed the health care infrastructures of many countries [3]. As of January 26, 2021, over 99 million people have been infected with the virus globally, and over 2 million have died [4]. Although the ma-

ADDRESS FOR CORRESPONDENCE:
Hojjat Sheikhbardsiri, Health in Disasters and Emergencies Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran
e-mail: hojat.sheikhbardsiri@gmail.com

jority of deaths and infections occur in individuals over 50 years of age and those with underlying chronic diseases, the risk of contracting the infection extends to the whole population. This highlights the importance of preventive measures for everyone, as asymptomatic carriers can transmit the disease to high-risk individuals [5]. Promoting physical distancing, mask-wearing, and hand hygiene are basic policies that health officials can employ to control the epidemic [6]. The World Health Organization has declared regular hand washing, observing respiratory hygiene, keeping proper physical distance, and avoiding handshakes and hugs as important behaviors to prevent the spread of the disease [7].

Studies have shown that perceived knowledge, attitude, and threat are important predictors of adherence to health behaviors [8]. As there is no definitive treatment for COVID-19, the best way to prevent the spread of this disease is to implement and promote preventive measures (while enrolling in vaccination campaigns). Currently, the most important strategies to control the pandemic, beyond vaccination, include early diagnosis, contact tracing, and quarantine. Another important measure is adherence to personal protective health measures by all members of society. As such, the population should be adequately aware of these measures to plausibly control the spread of the disease [9]. Promoting improved knowledge, a supportive attitude, and compliant behavior among the public, creates an environment of adherence of the public to health instructions aimed at preventing the spread of the disease [9, 10]. Experiences from the severe acute respiratory syndrome (SARS) outbreak in 2003 and the Middle East respiratory syndrome (MERS) in 2012 demonstrated that inadequate knowledge and negative attitudes can exaggerate the fear of disease and lead to stigmatization of patients [10, 11]. This fear can itself compromise the preventive measures aiming to control the disease. Therefore, it is imperative to improve the awareness and attitudes of health care workers and the public [10, 11]. Insufficient knowledge and negative attitudes can lead to inappropriate practices and increase the spread of this infection [12]. Thus, a key step to control the pandemic is to provide effective instructions to increase public knowledge about the symptoms, prevention strategies, and transmission routes of COVID-19 [10, 13].

Our review aimed to investigate the KAP of Iran's public population about COVID-19. Our findings are expected to help health managers and policymakers to understand public perceptions and implement appropriate infection control policies.

MATERIAL AND METHODS

The present study was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines [14]. The study protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) under the code CRD42021238983.

Search strategy

Databases of SID, Magiran, ISC, Scopus, PubMed, Web of Science, Cochrane, ProQuest, Science Direct, and Google Scholar were searched using valid English keywords and their Farsi equivalents including knowledge, attitude, opinion, performance, practice, function, "2019 novel coronavirus disease", COVID-19, "COVID-19 pandemic", "SARS-CoV-2 infection", "COVID-19 virus disease", "2019 novel coronavirus infection", "2019-nCoV infection", "Coronavirus disease 2019", "2019-nCoV disease", "COVID-19 virus infection", and Iran. Syntax search was used for this purpose. Initially, using Boolean operators, keywords, and search fields, a syntax search was designed for PubMed. For other databases, the search strategy was defined according to the syntax search developed for PubMed. The searches were conducted in both Farsi and English without any time limit up to December 2020. An example of the search strategy in PubMed has been provided below, and search strategies in other databases. The search strategy for pubmed includes the following: ((Knowledge) AND (Attitude* OR Opinion*) AND (Performance OR practice OR Function) AND ("2019 novel coronavirus disease" OR COVID19 OR "COVID-19 pandemic" OR "SARS-CoV-2 infection" OR "COVID-19 virus disease" OR "2019 novel coronavirus infection" OR "2019-nCoV infection" OR "Coronavirus disease 2019" OR "2019-nCoV disease" OR "COVID-19 virus infection") AND (Iran)).

Eligibility criteria

The research question and inclusion and exclusion criteria were designed according to the PICO principle: participants (Iranian public), Interventions/exposure (COVID-19), comparison (any), Outcome (KAP) Studies that evaluated KAP in other countries, and infectious diseases other than COVID-19 were excluded from the study. All types of studies like ob-

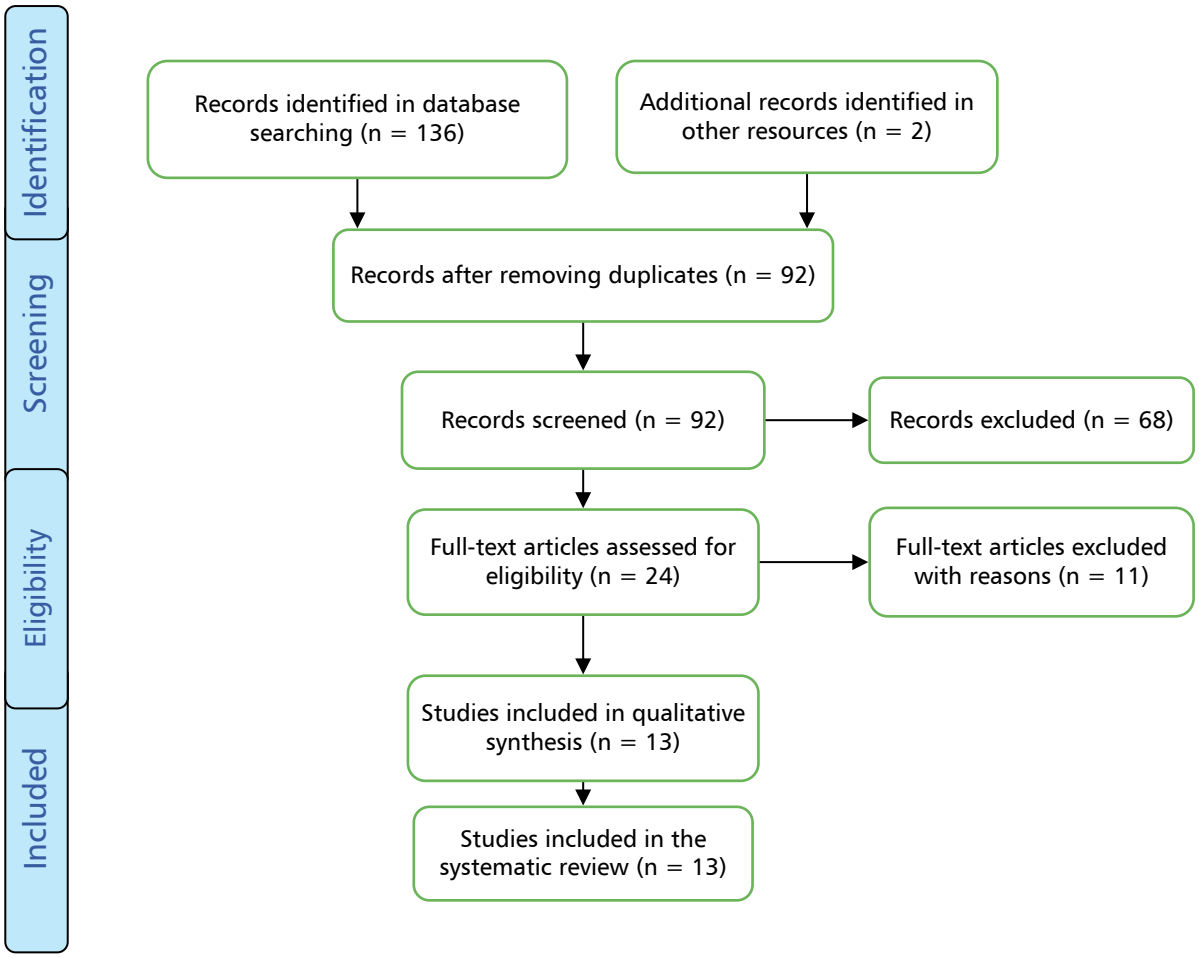

FIGURE 1. Study flowchart based on the PRISMA guideline

servational, interventional, review, and letter to the editor are included.

Study selection

After the preliminary search in the databases, 138 articles were entered into EndNote X7 software (Clarivate, London, United Kingdom). First, duplicate articles were removed, and then 92 articles were screened. Subsequently, 24 potentially related studies were selected and reviewed independently in detail by 2 of the researchers (AS, MG). Ultimately, 13 studies were selected for quality assessment.

Qualification and data extraction

We used The Newcastle-Ottawa Scale (NOS) scale to assess the quality of the studies. NOS scale was used to evaluate the quality of studies. Two authors, AS and MG, used this scale independently to assess the methodological quality, scale (comparability), and outcome of each study, and if there was any disagreement between them, a third author opinion was used to make the agreement, and a score of 7 out of 10 was considered as the good quality of the studies. In this research, studies that gain scores seven and higher were included [15], because different methods and scales were used in studies to report the results, and there was a high heterogeneity, so it was not possible to perform meta-analysis on them, so we used narrative synthesis to summarize the research findings. A researcher-designed checklist was used to record the required data including title, first author, location, the total number of subjects, number of subjects by gender, and study findings.

RESULTS

In the primary search, 138 studies were identified, of which 46 duplicate studies were removed, and 92 studies were further screened. Finally, 13 studies were subjected to quality assessment, and all of them entered the systematic review process. Figure 1 outlines the steps of study selection.

Overall, 11 111 Iranians (4 900 men and 6 211 women) were included. The methodology of all the studies was cross-sectional. All studies were of good quality, and based on the consultation of the research team, after the narrative synthesis, it was concluded that the factors affecting KAP include education, information, demographic characteristics, and specific groups. because different methods and scales were used in studies to report the results, and there was a high heterogeneity, so it was not possible to perform meta-analysis on them, so we used narrative synthesis to summarize the research findings. Table 1 shows the characteristics and findings of these studies.

DISCUSSION

Most of the evaluated studies reported that Iranians had appropriate KAP to prevent the spread of COVID-19. Similarly, a review by Puspitasar et al. [29] on the general population, health care workers, and medical students in the United States, the United Kingdom, Italy, Jordan, and China showed that the subjects had good levels of knowledge and performance and were optimistic about COVID-19. The results of another study by Kamali et al. [30] in Iran showed that health care workers had an acceptable level of knowledge and good attitudes and practices regarding COVID-19. These findings along with our observation in the present study indicate appropriate KAP towards COVID-19 in most communities, including the general public, patients, and health care workers. Nevertheless, people's knowledge, attitudes, and behaviors should be improved as much as possible by continuing education campaigns. The results of studies by Moradzadeh [17] and Kalani [28] showed that men's KAP regarding COVID-19 infection needs improvement [11]. Similarly, a study in China showed that men had less knowledge, more negative attitudes, and worse performance than women towards COVID-19 infection control measures [11]. This was in line with the results of our review. The cause of this discrepancy is unclear. To improve men's awareness and preventive behaviors regarding COVID-19, we suggest that health systems actively target men in educational programs. In their study, Shaygannejad et al. [22] showed no significant differences comparing the KAP with chronic neurological problems and healthy individuals. According to Sahraian et al. [25], COVID-19 patients had a good understanding of the disease. A study in India revealed that adults with type 1 diabetes had moderate knowledge, positive attitudes, and appropriate preventive practice towards COVID-19 [31]. Ajay et al. [32] in Pakistan showed that despite having adequate knowledge about COVID-19, diabetes patients had taken inappropriate preventive measures like washing hands frequently, maintaining social distancing, avoiding touching eyes, nose, and mouth, staying home when sick, except to get medical care, covering mouth and nose with bent elbow or tissue when coughing or sneezing and maintaining at least 1 m or 3 ft distance between yourself and anyone who is coughing or sneezing. Other studies such as one in Ethiopia have shown that a higher level of knowledge is associated with better performance and adherence to preventive measures against COVID-19 [33]. Based on the results of these studies and those of this review, it can be concluded that the levels of knowledge and awareness of patients, especially those with chronic diseases, are appropriate and comparable with that of the general public. Based on the results of most of the reviewed studies, institutions rely heavily on information technologies such as the internet, social media, and text messaging for public education. In one study, Alzoubi et al. [34] investigated the knowledge and information resources of medical and non-medical students at Jordan University regarding COVID-19. They showed that most students had been using the internet, social media, and mass media while medical and post-graduate students had also used scientific papers and websites as their sources of information [34]. A study by Chan et al. [35] showed that social media if used correctly and appropriately, can be one of the most effective methods of communication to disseminate information about the COVID-19 pandemic. This study was performed on the public, considering that the public is less prone to COVID-19 disease than health care workers and may not receive the necessary training, so measures such as timely education can make a change in their KAP. In conclusion, it seems that most people use the internet and social media to obtain COVID-19-related information during this pandemic. Since a majority of the population has access to social media and the Internet, these platforms can be the fastest routes to impart important information during the COVID-19 pandemic. However, illiterate people or those who do not have access to the Internet and social media may miss the information provided via these tools. Therefore,

Table 1. The characteristics and findings of the studies included in meta-analysis

Article title	First author	Location	Total participants	Number of males	Number of females	Studied group	Findings
Knowledge, attitudes, and practices toward coronavirus disease 2019 in the Central Area of Iran: a population-based study	Moradzadeh [17]	Arak	544	167	376	Public	The KAP of men and housewives needs to be promoted. Text messages regarding the preventive measures against COVID-19 from the Ministry of Health were among the most effective methods of educating the public.
Knowledge, attitudes, and practices among the general population during COVID-19 outbreak in Iran: a national cross-sectional online survey	Kakemam [9]	Iranian people	1394	597	797	Public	KAP of people regarding COVID-19 are at high levels, but their knowledge about recovered patients is low, so they need information and education to be able to appropriately communicate with recovered patients.
A survey of knowledge, attitude, and practice of the older people about COVID-19 pandemic in Isfahan, Iran	Rahimi [18]	Isfahan	249	130	119	older people	Elders' knowledge positively correlated with their level of education. Also, their attitudes and practice are influenced by their knowledge, so improving can promote elders' attitudes and practice towards COVID-19.
Public knowledge, attitude and practice regarding home quarantine to prevent COVID-19 in Sabzevar city, Iran	Fallahi [19]	Sabzevar	836	213	830	Public	Improving people's knowledge alone cannot promote their adherence to COVID-19 preventive measures. Gender, occupation, and attitude towards home quarantine were associated with individuals' performance.
Knowledge and attitude regarding COVID-19 among pregnant women in Southwestern Iran in the early period of its outbreak: a cross-sectional study	Maharlouei [20]	Shiraz	540	–	540	Pregnant women	Most pregnant women had an acceptable level of knowledge regarding the symptoms and transmission routes of COVID-19, but their knowledge was low in terms of the serious symptoms requiring referral to the hospital.
Knowledge, attitudes, risk perceptions, and practices of adults toward COVID-19: a population and field-based study from Iran	Honarvar [21]	Shiraz	1331	629	702	Public	The knowledge and practice of adults about COVID-19 were somehow adequate. In two-thirds of the cases, participants' performance did not correlate with their knowledge. Most people were unaware of common COVID-19 symptoms and did not know when to refer them to the hospital.
Assessment of mental health, knowledge, and attitude of patients with multiple sclerosis and neuromyelitis optica spectrum disorder in response to 2019 novel coronavirus	Shaygannejad [22]	Isfahan	538	425	113	Patients and healthy individuals	There was no difference comparing the knowledge and attitudes of healthy people and patients about COVID-19.
Assessment of knowledge, attitude, and practice toward COVID-19 among a sample of Iranian general population	Nourmoradi [23]	Iranian people	558	342	216	Public	Most people have appropriate KAP about COVID-19. However, they had poor performance regarding some health behaviors, necessitating the widespread implementation of health education programs.

→

Table 1. The characteristics and findings of the studies included in meta-analysis (continued)

Article title	First author	Location	Total participants	Number of males	Number of females	Studied group	Findings
Assessment of knowledge, attitude, and factors associated with the preventive behaviors of COVID-19 in Qom, Iran, in 2020	Nasirzadeh [24]	Qom	2423	1048	1375	Public	Participants had a good level of knowledge and a positive attitude towards COVID-19. They had high observed preventive measures.
Knowledge regarding COVID-19 pandemic in patients with multiple sclerosis: a report from Iran	Sahraian [25]	Tehran	233	180	53	Patients	Patients had a good understanding of COVID-19, but around one-third of them did not follow quarantine instructions.
Knowledge, attitudes and practice of Tehran citizens regarding the social distancing rules and its related factors during the COVID-19 pandemic	Hosseini [26]	Tehran	371	294	77	Public	People had a good level of knowledge, but not a positive attitude, regarding social distancing amid COVID-19 pandemic.
Knowledge, attitude, and practice towards COVID-19 among parents or guardians of patient children	Noori [27]	Zahedan	524	209	315	Parents or guardians of illness children	Participants had good knowledge, a positive attitude, and appropriate performance regarding COVID-19.
Knowledge, attitude and practice against the 2019 novel coronavirus (COVID-19) among the Jahrom city people: a cross-sectional study	Kalani [28]	Jahrom	1570	666	904	Public	Overall, people had relatively good levels of KAP about COVID-19, but young participants and men had poor KAP in this regard.

the health system should employ a variety of educational methods, including face-to-face training, traditional news, and information media, to increase public awareness of the disease.

Strengths and limitations

This is the only systematic review on the KAP of Iranians towards COVID-19. Most studies conducted in Iran regarding the KAP of people towards COVID-19 are descriptive and cross-sectional. We did not find any comprehensive studies on this issue. One of the limitations of this review is that some of the evaluated publications did not report the overall levels of KAP of the populations studied. Furthermore, all of the studies were essentially questionnaire-based, which lead to multiple biases and limitations. Finally, the geographic locations of the studies were limited to a few major cities, and thus the data is not representative of the entire country.

CONCLUSIONS

Based on our systematic review, the public population of Iran has a good level of KAP to prevent the spread of COVID-19. Public information and COVID-19-related training is primarily achieved through new information technology methods. Since higher awareness and knowledge correlate with better performance, policymakers should continue their public health education efforts to control this pandemic.

Acknowledgments

the Ethics Committee of Kerman University of Medical Sciences approved this study; A Systematic Review design was employed in 2021, the pajoohan number was 400000861. The authors would like to express their gratitude to the Vice-Chancellor of Research and Technology of Kerman University of Medical Sciences for the financial support of this research.

Funding sources

kerman University of Medical Sciences financially supported this study.

Conflicts of interest

the authors declare that they have no competing interests.

REFERENCES

1. Vardanjani AE, Moayedi S, Golitaleb M. COVID-19 pandemic hemoperfusion therapy versus plasma exchange therapy in intensive care.

Iran J Allergy Asthma Immunol. 2020; 19(S1): 7–9, doi: 10.18502/ijaai.v19i(s1.r1).2848, indexed in Pubmed: 32534513.
2. Zhai P, Ding Y, Wu X, et al. The epidemiology, diagnosis and treatment of COVID-19. Int J Antimicrob Agents. 2020; 55(5): 105955, doi: 10.1016/j.ijantimicag.2020.105955, indexed in Pubmed: 32234468.
3. Doshmangir L, Ahari AM, Qolipour K, et al. East Asia's strategies for effective response to COVID-19: lessons learned for Iran. Manage Strat Health Syst. 2020; 4(4): 370–373, doi: 10.18502/mshsj.v4i4.2542.
4. Word Health Organization. Coronavirus disease (COVID-19), situation report, 102. Geneva, 2020.
5. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. J Autoimmun. 2020; 109: 102433, doi: 10.1016/j.jaut.2020.102433, indexed in Pubmed: 32113704.
6. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese center for disease control and prevention. JAMA. 2020; 323(13): 1239–1242, doi: 10.1001/jama.2020.2648, indexed in Pubmed: 32091533.
7. World Health Organization. Coronavirus disease (COVID-19) advice for the public. Geneva, 2020.
8. Noar SM, Zimmerman RS. Health behavior theory and cumulative knowledge regarding health behaviors: are we moving in the right direction? Health Educ Res. 2005; 20(3): 275–290, doi: 10.1093/her/cyg113, indexed in Pubmed: 15632099.
9. Kakemam E, Ghoddoosi-Nejad D, Chegini Z, et al. Knowledge, attitudes, and practices among the general population during COVID-19 outbreak in Iran: a national cross-sectional online survey. Front Public Health. 2020; 8: 585302, doi: 10.3389/fpubh.2020.585302, indexed in Pubmed: 33363083.
10. Shahabi N, Kamalzadeh Takhti H, Hassani Azad M, et al. Knowledge, attitude, and preventive behaviors of Hormozgan residents toward COVID-19, one month after the epidemic in Iran. Z Gesundh Wiss. 2021 [Epub ahead of print]: 1–12, doi: 10.1007/s10389-020-01454-1, indexed in Pubmed: 33432291.
11. Zhong BL, Luo W, Li HM, et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci. 2020; 16(10): 1745–1752, doi: 10.7150/ijbs.45221, indexed in Pubmed: 32226294.
12. Adab Z, Azizi M, Solhi M, et al. Dormitory student's knowledge and atittiude about influenza a (H1N1) disease. Rahavard Salamat J. 2016; 2: 10–17.
13. McEachan R, Taylor N, Harrison R, et al. Meta-analysis of the reasoned action approach (RAA) to understanding health behaviors. Ann Behav Med. 2016; 50(4): 592–612, doi: 10.1007/s12160-016-9798-4, indexed in Pubmed: 27169555.
14. Moher D, Liberati A, Tetzlaff J, et al. PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009; 6(7): e1000097, doi: 10.1371/journal.pmed.1000097, indexed in Pubmed: 19621072.
15. Feleke DG, Alemu Y, Bisetegn H, et al. Intestinal parasitic infections and associated factors among street dwellers and prison inmates: A systematic review and meta-analysis. PLoS One. 2021; 16(8): e0255641, doi: 10.1371/journal.pone.0255641, indexed in Pubmed: 34352000.
16. Modesti PA, Reboldi G, Cappuccio FP. Panethnic differences in blood pressure in Europe: A systematic review and meta-analysis. PLoS One. 2016; 11(1): e0147601, doi: 10.1371/journal.pone.0147601.
17. Moradzadeh R, Nazari J, Shamsi M, et al. Knowledge, attitudes, and practices toward coronavirus disease 2019 in the central area of Iran: a population-based study. Front Public Health. 2020; 8: 599007, doi: 10.3389/fpubh.2020.599007, indexed in Pubmed: 33364226.
18. Rahimi M, Maracy MR, Shahraki RA. A survey of knowledge, attitude and practice of the older people about COVID-19 pandemic in Isfahan, Iran. Journal of Gerontology and Geriatrics. 2020; 68(4): 204–211, doi: 10.36150/2499-6564-253.
19. Fallahi A, Mahdavifar N, Ghorbani A, et al. Public knowledge, attitude and practice regarding home quarantine to prevent COVID-19 in Sabzevar city, Iran. J Mil Med. 2020; 22(6): 580–588, doi: 10.30491/JMM.22.6.580.
20. Maharlouei N, Asadi N, Bazrafshan K, et al. Knowledge and attitude regarding COVID-19 among pregnant women in Southwestern Iran in the early period of its outbreak: a cross-sectional study. Am J Trop Med Hyg. 2020; 103(6): 2368–2375, doi: 10.4269/ajtmh.20-0608, indexed in Pubmed: 33124530.
21. Honarvar B, Lankarani KB, Kharmandar A, et al. Knowledge, attitudes, risk perceptions, and practices of adults toward COVID-19: a population and field-based study from Iran. Int J Public Health. 2020; 65(6): 731–739, doi: 10.1007/s00038-020-01406-2, indexed in Pubmed: 32583009.
22. Shaygannejad V, Afshari-Safavi A, Hatef B. Assessment of mental health, knowledge, and attitude of patients with multiple sclerosis and neuromyelitis optica spectrum disorder in response to 2019 novel coronavirus. Neurol Sci. 2021; 42(7): 2891–2901, doi: 10.1007/s10072-020-04905-5, indexed in Pubmed: 33219424.
23. Nourmoradi H, Kazembeigi F, Kakaei H, et al. Assessment of knowledge, attitude, and practice toward COVID-19 among a sample of Iranian general population. Open Access Macedonian Journal of Medical Sciences. 2020; 8(T1): 167–174, doi: 10.3889/oamjms.2020.5094.
24. Nasirzadeh M, Aligol M. Assessmentof knowledge, attitude, and factors associated with the preventive behaviors of COVID-19 in Qom, Iran, in 2020. Qom Univ Med Sci J. 2020; 14(7): 50–57, doi: 10.29252/qums.14.7.50.
25. Sahraian MA, Gheini MR, Rezaeimanesh N, et al. Knowledge regarding COVID-19 pandemic in patients with multiple sclerosis (MS): a report from Iran. Mult Scler Relat Disord. 2020; 42: 102193, doi: 10.1016/j.msard.2020.102193, indexed in Pubmed: 32420011.

26. Hosseini J, Nematollahi S, Pour ME, et al. Knowledge, attitudes and practice of Tehran citizens regarding the social distancing rules and its related factors during the COVID-19 pandemic. Men's Health Journal. 2020; 4(1): e17, doi: 10.22037/mhj.v4i1.32646.
27. Noori N, Teimouri A, Khalili M, et al. Knowledge, attitude, and practice towards COVID-19 among parents or guardians of patient children. CJHR. 2020; 5(2): 39–44, doi: 10.29252/cjhr.5.2.39.
28. Kalani N. Knowledge, attitude and practice against the 2019 novel coronavirus (COVID-19) among the Jahrom city people: a cross-sectional study. IJMRA. 2020; 3(9), doi: 10.47191/ijmra/v3-i9-11.
29. Puspitasari IM, Yusuf L, Sinuraya RK, et al. Knowledge, attitude, and practice during the COVID-19 pandemic: a review. J Multidiscip Healthc. 2020; 13: 727–733, doi: 10.2147/JMDH.S265527, indexed in Pubmed: 32801735.
30. Haghighi FK, Kouhi P, Amini M, et al. Knowledge, attitude, and practice toward COVID-19 among healthcare workers in Shiraz, Iran. Shiraz E-Med J. 2020; 21(12): e108872, doi: 10.5812/semj.108872.
31. Pal R, Yadav U, Grover S, et al. Knowledge, attitudes and practices towards COVID-19 among young adults with type 1 diabetes mellitus amid the nationwide lockdown in India: a cross-sectional survey. Diabetes Res Clin Pract. 2020; 166: 108344, doi: 10.1016/j.diabres.2020.108344, indexed in Pubmed: 32710997.
32. Ajay K, Hamza I, Deepika K, et al. Knowledge & awareness about COVID-19 and the practice of respiratory hygiene and other preventive measures among patients with diabetes mellitus in Pakistan. European Scientific Journal ESJ. 2020; 16(12): 53, doi: 10.19044/esj.2020.v16n12p53.
33. Melesie Taye G, Bose L, Beressa TB, et al. COVID-19 knowledge, attitudes, and prevention practices among people with hypertension and diabetes mellitus attending public health facilities in Ambo, Ethiopia. Infect Drug Resist. 2020; 13: 4203–4214, doi: 10.2147/IDR.S283999, indexed in Pubmed: 33262615.
34. Alzoubi H, Alnawaiseh N, Al-Mnayyis A, et al. COVID-19 - knowledge, attitude and practice among medical and non-medical university students in Jordan. J Pure Appl Microbiol. 2020; 14(1): 17–24, doi: 10.22207/jpam.14.1.04.
35. Chan AKM, Nickson CP, Rudolph JW. Social media for rapid knowledge dissemination: early experience from the COVID-19 pandemic. Anaesthesia. 2020; 75(12): 1579–1582, doi: 10.1111/anae.15057, indexed in Pubmed: 32227594.

VIA MEDICA

REVIEW ARTICLE

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 194–203
DOI: 10.5603/DEMJ.a2021.0032

ISSN 2451–4691, e-ISSN 2543–5957

OCCUPATIONAL EXPOSURE TO BIOLOGICAL AGENTS IN POLISH PARAMEDICS: A NARRATIVE REVIEW

Agnieszka Gonczaryk[1], Jaroslaw Chmielewski[2], Malgorzata Dziechciaz[3], Izabela Wroblewska[4], Jarogniew J. Luszczki[5]

[1]Department of Health and Social Policy, Marshal's Office in Warsaw, Poland
[2]College of Rehabilitation in Warsaw, Poland
[3]Health Care Institute, State School of Higher Vocational and Economic Education, Jaroslaw, Poland
[4]Department of Internal Nursing, Department of Nursing and Midwifery, Faculty of Health Sciences, Wroclaw Medical University, Wroclaw, Poland
[5]Institute of Rural Health in Lublin, Poland

ABSTRACT

INTRODUCTION: Research into occupational exposure to biological pathogens during medical personnel work is to a small degree concerned with paramedics. Coming in contact with biological pathogens, like HIV, HCV and HBV viruses, tubercle bacilli, or recently the SARS-CoV-2 virus in the workplace is a contamination risk. This study aims to analyze the occupational exposure of paramedics to biological pathogens at work, the possibilities of paramedics developing contagious diseases as occupational illnesses, and the prophylaxis this involves.

MATERIAL AND METHODS: The publication was prepared on the basis of a literature review of works available in the PubMed, SCOPUS, and Google Scholar databases, and on websites of institutions functioning in the area of public health.

BRIEF DESCRIPTION OF THE STATE OF KNOWLEDGE: In Poland, in 2020, there were 1 255 625 cases of SARS-CoV-2 registered, 3020 of which are cases found in paramedics, and 12 524 cases of Lyme borreliosis, 990 HBV cases, 942 HCV cases, 934 HIV cases. In 2020, there were 1861 occupational diseases, 504 of which were contagious or parasitic. Approximately 37 000 needlesticks are estimated to happen every year in medical facilities. 40% to 80% of the people who got injuries or cut in the workplace did not report the incident.

CONCLUSIONS: There is a need to implement prophylactic and preventative measures to prevent occupational needlestick injuries and blood-borne infections amongst paramedics. Paramedics show insufficient knowledge of their ability to apply for an occupational disease diagnosis caused by exposure to biological pathogens present in the work environment.

KEY WORDS: paramedics, biological factors, workplace, occupational exposure, prophylaxis of occupational infections, biological hazards, personal protective equipment, occupational disease.

Disaster Emerg Med J 2021; 6(4): 194–203

INTRODUCTION

The quality of the environment is a significant factor of individual and public health. It is assumed that environmental health is determined by biological, chemical, physical, and social factors. It involves both theoretical and practical concepts as far as the evaluation, elimination, and prevention are concerned when it comes to the presence

ADDRESS FOR CORRESPONDENCE:
Jarosław Chmielewski, College of Rehabilitation in Warsaw, Warsaw, Poland
e-mail: j.chmielewski@ios.gov.pl

of such factors, which can negatively affect the health of the current and subsequent generations, in the environment. Environmental health is entirely consistent with the broad understanding of worker healthcare. The health of workers is directed at the measures related to the promotion and maintenance of the highest level of physical and psychological fitness, as well as the well-being of employees, which are interested in technical, medical, and organizational means of reducing harmful health effects resulting from the work process [1].

Paramedics carry out their professional tasks in extremely difficult work environment conditions. The work they do in healthcare units is considered one of the occupations where healthcare workers (HCW) are exposed to illnesses caused by biological pathogens. They are at a greater risk of falling ill in comparison with the general society, especially during a contagious disease pandemic.

Microorganisms, internal parasites, acellular units capable of replication or transferring genetic material, including genetically modified cell cultures, which may be the cause of infection, allergy, or poisoning [2].

In the most general sense, the work environment is understood as a collection of spatially or organizationally defined workplaces, shaped by the conditions of the material environment with particular biological pathogens, where the process of work takes place and workers carry out professional activities [3].

Studies suggest a significant effect of the work environment on the individual health condition of a worker [3, 4–7]. In the process of caring for the health of workers, it is of importance to properly identify factors that are potentially detrimental to the health and are a result of the work environment as well as appropriately choosing preventative measures, including personal protective equipment, depending on the identified threat or an established scale of health hazard [1, 8, 9].

The risk of biological pathogen infection incidence may significantly affect the health condition. Coming in contact with dangerous biological pathogens in the workplace, such as hepatitis B virus (HBV), hepatitis type C (HCV), human immunodeficiency virus (HIV), tubercle bacilli, or contemporarily, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causes there to be a real danger of an individual HCW's health condition deteriorating, resulting in, e.g., infection, mental health deterioration, or even death [9–12].

Table 1 shows the employment status of HCW and the exposure to identified biological pathogen factors present in the work environment, relative to the general employed population in the year 2020 [13].

According to the data contained in the epidemiological reports (EPIMELD) of the National Institute of Public Health NIH — National Research Institute (NIZP PZH-PIB), in 2020 in Poland, there have been 1 255 625 cases of SARS-CoV-2 infection registered, 12 524 cases of Lyme borreliosis, 990 cases of HBV, 942 cases of HCV, 934 cases of HIV, 265 cases of viral meningitis, 158 cases of tick-borne encephalitis (TBE) infection and 109 cases of hepatitis A virus infections (HAV) [14].

Table 2 shows the SARS-CoV-2 virus infection rated for HCW in 2020 [11].

According to the data of the Chief Sanitary Inspectorate (CSI) in Poland, in 2020, there have been 1 861 occupational diseases diagnosed (in 2019 — 2 059), 504 of which are cases of contagious or parasitic diseases (in comparison with 2019 — 705 cases) [15].

Table 1. Employment status and the exposure to identified biological pathogens present in the work environment in 2020 (modified) [13]

Exposure to biological risk factors by sections and divisions in 2020						
SPECIFICATION a — total b — per 1000 employees in units covered by the survey		Employees exposed to risk factors which were, over the year				As of 31 December
		Eliminated or reduced			Identified (including newly arisen risks)	
		Total	Eliminated or reduced to the standard level	Reduced		
TOTAL	a	13705	3890	9815	11871	19752
	b	2.3	0.6	1.6	2.0	3.3
Only division Human health activities	a	7396	1487	5909	8191	12760
	b	13.6	2.7	10.9	15.1	23.5

Table 2. People working in medicine who have been diagnosed with a SARS-CoV-2 virus infection, including incidences of illness and death due to COVID-19 (modified) [11]

Medical profession	Number of confirmed COVID-19 cases	Number of deaths from COVID-19 among hospitalized patients
Doctor	20 476	66
Dentist	1884	10
Nurse	50 990	51
Midwife	4764	4
Paramedic	3020	5
Pharmacist	2106	5
Laboratory diagnostician	1555	0
Feldsher	26	4
Total	84 821	145

Table 3. Shortcomings in the area of health and safety at work detected during inspections of medical entities in the years 2018–2020 — the percentage of the entities where shortcomings were found (modified) [16]

Specification	2018	2019	2020
Lack of a documented evaluation of the occupational risk at all of the work posts	42	37	46
Shortcomings related to equipment with a work uniform and work shoes	35	42	41
Improper identification of the risks related to the carried-out work	41	45	33
Shortcomings related to the initial training	39	25	24

The clear fall in the number of reported contagious disease cases is largely a result of the declaration of a pandemic, in relation to the SARS-CoV-2 virus infections, as well as the implementation of epidemiological safety rules, which consist of wearing protective face masks, more frequent washing and disinfecting hands, maintaining social distancing. It has to be noted, however, that the data largely omit cases of acute contagious disease of the respiratory system caused by the SARS-CoV-2 (COVID-19) virus infection, which is a contagious disease classified as an occupational disease amongst HCW. The above is most likely the result of underreporting by HCWs [11].

The data of the National Labor Inspectorate (PIP) confirm just how important the issues of health and safety at work, including the correct identification of risk factors, and consequently the effect of the exposure to harmful factors of the work environment on the health of HCW, are in the area of worker healthcare. In 2020, PIP investigated 46 medical entities employing 16.3 thousand people. Compliance with health and safety at work regulations related to preparing for work, exposure to harmful and cumbersome agent activity, personal protection equipment, work uniforms and shoes, the supervision and control over the state of health and safety at work, were all under investigation. In PIP's opinion, the lack of knowledge of employers and managers in charge of employees is a frequent cause of shortcomings in the area of health and safety at work. It causes failures to occur during the evaluation of occupational risk, including the identification of threats present in the work environment. The identified shortcomings involved, e.g., a lack of descriptions of evaluated workspaces specifying what tools and materials were in use, as well as the absence of the identification of all the threats, including those caused by biological pathogens, such as SARS-CoV-2, present in the work environment. HCW was noted to not be properly equipped with work uniforms and shoes, as well as personal protection equipment, in 41% and 11% of the investigated entities respectively. There have been cases of HCW using their own clothes and shoes when carrying out work where exposure to harmful biological pathogens takes place [16].

Table 3 shows the shortcomings in the area of health and safety at work detected during inspections of medical entities in the years 2018–2020 [16].

The proper protection of the professional group that paramedics constitute, in both the context of

individual and population health, against the negative effects of biological factor activity on the body is an important issue. An indication of that could be, for example, the fact that, as demonstrated by the Supreme Audit Office (NIK) in their post-control address, in February of 2020, disposable Individual Personal Protection Packages, which were in possession of the Cracow Emergency Medical Services (KPR), were enough to protect just 50% of the paramedics. In the period between 01.01.2018 and 30.05.2020, KPR had one disposable transport isolator, the G07 model, to transport people who were suspected of suffering from a particularly dangerous and highly contagious disease. Another indication of insufficient protection of paramedics against the possibility of SARS-CoV-2 virus infection during transport is the fact that in the initial stages of the pandemic, KPR had transported 457 people suspected of COVID-19 by the 5th of May 2020. Before the outbreak of the pandemic caused by the SARS-CoV-2 virus, KPR employees had not partaken in practical exercises on how to proceed in case of a particularly dangerous and highly contagious disease threat [17].

According to the data from NIK for Poland in 2019, there were 1577 Emergency Response Teams (369 of which specialized, and 1208 general) functioning under the Emergency Medical Service System [18], meanwhile according to the data of the e-Health Centre, there were 14 473 paramedics working in healthcare facilities in 2019 [19].

The emergence of new species of microorganisms, as well as the development of research techniques, causes new biological factors, which are occupational hazards, to be detected in the work environment. Important issues surrounding biological factors of occupational hazards for paramedics include, e.g., blood-borne viruses; new species of viruses (SARS-CoV-2), prions and bacteria, germs carried by ticks (in cases of carrying out work tasks in wooded areas); allergenic and immunotoxic factors of microbe, plant, and animal origin present in organic dust [20–24].

The small number of paramedics determines the number of studies and publications on the subject of occupational exposure to biological pathogens present during work and the related health effects. The knowledge of paramedics, their personal stance in the face of a possibility of contracting contagious diseases, as well as the environment they work in, may become an obstacle in the prevention of adverse health effects from occurring. These barriers increase the risk of susceptibility to contagious diseases.

Prophylactic measures aimed at the minimalization of the risk of infection amongst paramedics should include information about biological factors (pathogens) that may possibly be encountered in the work environment, infection spreading pathways, and guidelines regarding the protection against any such threats. We distinguish three pathways via which infections spread: direct (e.g., direct contact with a patient during an examination, direct contact with blood and body fluids), indirect (e.g., through air and droplets, through air and dust, objects of everyday use) and mixed [1, 3].

BLOOD-BORNE ETIOLOGICAL FACTORS

The possibility of paramedics coming in contact with human blood is an important issue in the area of occupational exposure to biological factors in this particular group of healthcare workers. As far as biological hazards in the work environment are concerned, HIV, HBV, and HVC are of the most significant importance due to the rate of incidence and their effects on health.

Available information and data regarding occupational exposure to blood amongst paramedics give basis to the claim that exposure to blood-borne pathogens is a genuine risk in this professional group. The percentages of paramedics who have been exposed to blood in the year leading up to the study vary greatly between countries, fluctuating between 22% in the USA to 63% in Thailand, meanwhile in Poland results oscillate between 14 and 78% [25–28].

Viruses of human origin that are transported by blood or other body fluids are the most frequent cause of occupational diseases amongst HCW. Due to the nature of the tasks they have to carry out at work, they are naturally exposed to blood and body fluids in the workplace. A lack of due caution while carrying out work tasks, needlesticks, cuts, lack of personal protection equipment, are the factors that make infections with blood-borne pathogens, including HIV, HBV, HCV, or the Ebola virus (EBOV), plausible and capable of taking place in the work process [29–32]. It is estimated that the risk of contracting HBV amongst HCW is approximately 10 times higher than for the general population [33].

One study, the aim of which was to estimate incidence rates of occupational blood exposure by route of exposure (needlesticks; cuts from sharp objects; mucous membrane exposures to the eyes, nose, or mouth; bites; and blood contact with nonintact skin) in the target population of active paramedics in the USA, including the state of California, studied 2664 people. The study showed that the proportions of paramedics who reported exposure in the previous year were 21.6% (95% confidence interval [CI], 17.8–25.3) for the national sample and 14.8% (95% CI, 12.2–17.4) for California. The overall incidence rate was 6.0/10 000 calls (95% CI, 3.9–8.1). These rates represent more than 49 000 total exposures and more than 10 000 needlesticks per year among paramedics in the United States. Rates for mucocutaneous exposures and needlesticks were similar (w1.2/10 000 calls). Rates for California were one-third to one-half the national rates. Sensitivity analysis showed that potential response bias would have little impact on the policy and intervention implications of the findings [29].

Research into the occupational risk towards blood-borne infections among 161 members of ambulance personnel in a provincial hospital network in Thailand showed that 82% of the personnel came in contact with jaundice patients in the past, 95% of the personnel came in contact with acquired immunodeficiency syndrome (AIDS) patients in the past. The study also showed that 63.4% of the personnel came in contact with a patient's blood through injuries; 64.7 had a needlestick injury, and 24,5% got cuts from sharp objects [30].

Research carried out on a group of 220 paramedics employed in Emergency Departments and medical rescue teams showed that as many as 80% of the surveyed people reported frequent contact with patients' blood [31].

A study carried out amongst 145 chosen paramedics employed in different healthcare facilities across Poland intending to identify the rate of incidence of coming in contact with blood and other body fluids, showed that 78% of paramedics had this kind of contact a couple of times a week, with 41.4% of the paramedics had this kind of contact more than ten times a day [32].

The results of the research, in which 215 paramedics took part, showed that 57.7% of the surveyed stated that in the period of the last twelve months before the study took place, they came in contact with potentially contagious material via unharmed skin at least a few times, 22.3% via mucous membranes, over 16% a couple of times a year via damaged skin, and 3.7% were exposed to infection several times during that period as a result of a deep cut. As part of the study, paramedics pointed out that the cause of the cuts was most often the fact that they were in a hurry, the patient's unexpected behavior, insufficient concentration, a stressful situation requiring urgent intervention, an overload of duties [34].

Research shows that in the years 2005–2010, the emergency medical services in Wrocław recorded 49 incidences of dirty needlestick injuries involving paramedics. The circumstances of such events were usually related to the necessity of injecting an anxious patient in a hurry or under bad light [35].

HIV is also a real threat to paramedic health in cases of exposure to blood [36].

The results of the studies show that the risk of seroconversion after percutaneous exposure to infected blood is approximately 0.1–0.3% for HIV, 2% for HCV, and 6–60% for HBV [37].

Table 4, illustrating the number of HBV, HCV, AIDS cases, and HIV infections in Poland in the years 2011–2020, shows just how significant of an occupational exposure factor contaminated blood may be for paramedics [14].

Approximately 37 000 needlestick injuries are estimated to take place every year in medical facilities across Poland. Studies show that 40–80% of the people who suffered from needlesticks or cuts in the workplace did not report the incident [39, 40].

ETHOLOGICAL FACTORS TRANSPORTED IN THE DROPLET AND AIR PATHWAYS

Currently, there is a lack of complete quantitative data on the subject of occupational exposition to biological factors transported in the droplet and air pathway for paramedics. However, literature data related to the incidence of biological factors capable of spreading in such a manner in the environment give basis to the claim that the susceptibility of paramedics to getting infected with them is significant enough not to be neglected while creating safe working conditions. As far as biological hazards in the work environment are concerned, bioaerosols, nowadays the SARS-CoV-2 virus, and tubercle bacilli, are of the greatest importance due to their rate of incidence and health consequences [11, 41].

Tubercle bacilli (Mycobacterium tuberculosis) is a biological factor that has also qualified to haz-

Table 4. Number of HBV, HCV, AIDS cases, and HIV infections in Poland in the years 2011–2020 [14]

Year/number of cases	Disease			
	HBV	HCV	AIDS	HIV
2011	1583	2189	241	1188
2012	1583	2265	190	1135
2013	1541	2644	191	1159
2014	2763	3551	151	1110
2015	3518	4285	134	1295
2016	3806	4261	119	1387
2017	3363	4010	117	1463
2018	3202	3441	121	1304
2019	2860	3341	123	1751
2020	990	942	43	934

Own work

ard group 3 [2]. The source of infection is an active and non-treated patient, bacteria are transported through droplets and the infection gateways are the respiratory tracts. Incidental infection via an implant pathway, through the skin or mucous membranes, is also possible [42].

Meningococcal infection is caused by bacteria — meningitis diplococci, also referred to as meningococci (*Neisseria meningitidis*). Meningococci are present in the oronasal cavity of healthy people (so-called carriers), without causing any ailments or symptoms. Infection takes place as a result of a vulnerable person coming in contact with an asymptomatic carrier or a sick person. The transport of meningococci takes place via droplets (while coughing or sneezing). Meningococci are the most frequent cause of meningitis or sepsis (septicemia), which together are referred to as the meningococcal invasive disease. They can also cause, albeit much more rarely, pneumonia, otitis media, pericarditis, endocarditis, arthritis, and other inflammations. Meningococcal invasive disease is a direct threat to one's health and life [43].

SARS Coronavirus Infection, a severe contagious disease characterized by a fever above 38ºC and respiratory system symptoms, which may lead to acute respiratory failure and death. The source of infection is other sick people. The primary pathway of severe acute respiratory syndrome's (SARS) spread is the droplet pathway — via droplets secreted by the respiratory tracts in the process of coughing or sneezing at a distance of approximately 1 meter. In some rare cases of particularly contagious patients, the infection may spread in the air at greater distances of as much as a few meters. Infection may take place when respiratory tract secretions of an infected person are transported onto the mucus of a healthy person via hands or objects [44, 45].

MERS-CoV Infection, a severe contagious disease caused by the MERS-CoV virus, is characterized by a fever above 38ºC, coughing, and other respiratory system symptoms, such as shortness of breath, dyspnea. Death occurs in over 50% of the patients hospitalized due to MERS-CoV infection. During a pandemic, sick people may be the source of infection. The pathways of spread for the virus have not been identified as of yet. There is data confirming that the germ can be spread via close contact (possibly through droplets and direct contact). The gateway of infection has not been identified. These may possibly include, e.g., oral mucosa and the respiratory system epithelium [44].

SARS-CoV-2 (Severe Acute Respiratory Syndrome coronavirus 2) Infection, is a highly contagious and pathogenic virus causing a severe respiratory system disease called COVID-19. Bioinformatic analyses showed that SARS-CoV-2 had characteristics typical of the family. It belongs to the betacoronavirus 2B lineage. SARS-CoV-2 is transmitted via fomites and droplets during close unprotected contact between the infected and uninfected. The main source of infection is symptomatic and asymptomatic patients. The virus may also spread via indirect contact. Droplets containing the virus contaminate the hands, subsequently people touch the mucous tissue of the mouth, nose, and eyes, causing in-

Table 5. Biological pathogen factors which present a risk in the work environment of a paramedic [50]

Biological pathogen agent	Method of spread	Effect on people	Prophylaxis
Adenoviruses (*Adenoviridae*)	Droplet or airborne; direct	Contagious — adenovirus fevers	PPE
Coronaviruses (*Coronaviridae*)	Droplet or airborne	Contagious — mild upper respiratory tract diseases	PPE
Human B-lymphotropic virus (HBLV-HHV-6) (*Herpesviridae*)	Direct	Contagious — rash, kidney transplant rejection	PPE, disinfection, sterilization
Echovirus (*Picornaviridae*)	Droplet or airborne; direct	Contagious — respiratory system inflammation, fever, encephalitis and meningitis, paralysis, hepatitis, enteritis, dermatitis and rash, conjunctivitis, diarrhea, myocarditis, and pericarditis	PPE, disinfection, sterilization
Bacteria (obligatory anaerobic Gram-negative rods) Haemophilus influenzae/ influenza rods	Cirect, droplet or airborne	Contagious — respiratory system inflammation, sinusitis, otitis, epiglottitis, meningitis, cellulitis	PPE, preventative vaccinations disinfection, sterilization
Bacteria (Rickettsia) Anaplasma phagocytophilum (synonym: Ehrlichia phagocytophila)	Tick bite	Contagious (*zoonosis*) — fever, anaplasmosis (*ehrlichiosis*) granulocytic	PPE, quick removal of the attached ticks, repellents, disinfection

PPE — personal protection equipment

fection. SARS-CoV-2 transmission is not limited to respiratory tracts. Some studies have shown SARS-CoV-2 to spread through aerosol. SARS-CoV-2 is a direct threat to one's health and life [11, 45, 46].

INFECTION PROPHYLAXIS

The knowledge of the mechanisms in which biological factors affect the human body enables the undertaking of effective measures of preventing contagious diseases from spreading among paramedics.

Regardless of existing legal regulations [2], an important element of prophylaxis is the education and supplying of personal protection equipment (PPE), as well as compulsory and recommended preventative vaccines recognized in legal regulations [47–49], which are an important aspect of prophylactic healthcare of the workers. Strengthening the awareness of possible threats among medical workers should encourage the development of behaviors enabling the minimalization of health risks. Widespread use of PPE is able to protect an employee from potential harm coming from biological factors.

Proper protection against biological factors in the work of a paramedic should primarily rely on complying with the commonly existing and adopted epidemiological-sanitary rules, and a well-carried out the evaluation of occupational risk, including the possible work conditions that might come about and its inherent dangers like exposure to harmful biological pathogens while carrying out specific work tasks [1, 3]. Possible examples of harmful biological pathogen factors with are a hazard in the work environment of a paramedic are summarized in Table 5 [50].

CONCLUSIONS

1. Research into the effects of biological factors on the health of paramedics is incomplete.
2. Further research aiming to fully understand the effect spectrum of biological factors on the incidence of contagious diseases in this professional group is required.
3. Estimating the scale of the phenomenon and decreasing the number of occupational exposure incidences amongst paramedics should be a priority as far as epidemiological safety is concerned.
4. Training that aims to increase awareness in the area of existing procedures, including the use of PPEs and the obligation to register injuries suffered from sharp objects, plays a significant role in prophylaxis.
5. Prophylactic measures need to be implemented on a multidimensional scale, and their effectiveness should be ensured through constant monitoring and supervision on each level of evaluating working conditions.

Conflict of interest

the authors declare no potential conflict of interest with respect to the authorship and/or publication of this article.

REFERENCES

1. Chmielewski J, Dziechciaż M, Czarny-Działak M, et al. Environmental health threats in the work process [in Polish]. Environ Med. 2017; 20(2): 52–61, doi: 10.19243/2017207.
2. Rozporządzenie Ministra Zdrowia z dnia 22 kwietnia 2005 r. w sprawie szkodliwych czynników biologicznych dla zdrowia w środowisku pracy oraz ochrony zdrowia pracowników zawodowo narażonych na te czynniki/Ordinance of the Minister of Health of 22 April 2005 on biological agents harmful to health in the workplace and health protection of workers occupationally exposed to such agents (Dz. U. nr 81 poz. 716, z późn. zm.). https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20050810716/O/D20050716.pdf (2021-11-08).
3. Chmielewski J, Galińska EM, Nagas T. Environmental biological hazards in veterinary practic [in Polish]. Życie Weterynaryjne. 2015; 90(6): 353–357.
4. Leineweber C, Marklund S, Gustafsson K, et al. Work environment risk factors for the duration of all cause and diagnose-specific sickness absence among healthcare workers in Sweden: a prospective study. Occup Environ Med. 2020; 77(11): 782–789, doi: 10.1136/oemed-2020-106510, indexed in Pubmed: 32764106.
5. Sagha Zadeh R, Shepley MM, Owora AH, et al. The importance of specific workplace environment characteristics for maximum health and performance: healthcare workers' perspective. J Occup Environ Med. 2018; 60(5): e245–e252, doi: 10.1097/JOM.0000000000001248, indexed in Pubmed: 29227360.
6. Ornell F, Halpern SC, Kessler FH, et al. The impact of the COVID-19 pandemic on the mental health of healthcare professionals. Cad Saude Publica. 2020; 36(4): e00063520, doi: 10.1590/0102-311X00063520, indexed in Pubmed: 32374807.
7. Chmielewski J, Nowak-Starz G, Rutkowski A, et al. Occupational exposure to carcinogens and mutagens in the work environment [in Polish]. Przem Chem. 2020; 99(3): 397–405, doi: 10.15199/62.2020.3.8.
8. Chmielewski J, Galińska EM, Anusz K, et al. Personal protection measures in veterinary practice [in Polish]. Życie Weterynaryjne. 2015; 90(5): 277–280.
9. Ganczak M, Topczewska K, Biesiada D, et al. Frequency of occupational bloodborne infections and sharps injuries among polish paramedics from selected ambulance stations. Int J Environ Res Public Health. 2020; 18(1): 60, doi: 10.3390/ijerph18010060, indexed in Pubmed: 33374768.
10. Nguyen J, Liu A, McKenney M, et al. Impacts and challenges of the COVID-19 pandemic on emergency medicine physicians in the United States. Am J Emerg Med. 2021; 48: 38–47, doi: 10.1016/j.ajem.2021.03.088, indexed in Pubmed: 33836387.
11. Chmielewski J, Raczek M, Puścion M, et al. COVID-19 caused by the SARS-CoV-2 virus as an occupational disease of medical professionals [in Polish]. Med Og Nauk Zdr. 2021; 27(3): 235–243, doi: 10.26444/monz/139319.
12. Ornell F, Halpern SC, Kessler FH, et al. The impact of the COVID-19 pandemic on the mental health of healthcare professionals. Cad Saude Publica. 2020; 36(4): e00063520, doi: 10.1590/0102-311X00063520, indexed in Pubmed: 32374807.
13. Główny Urząd Statystyczny. Warunki pracy w 2020 r./Central Statistical Office. Working conditions in 2020. https://stat.gov.pl/obszary-tematyczne/rynek-pracy/warunki-pracy-wypadki-przy-pracy/warunki-pracy-w-2020-roku,1,15.html (2021-11-08).
14. Narodowy Instytut Zdrowia Publicznego PZH – Państwowy Instytut Badawczy. Meldunki epidemiologiczne EPIMELD/National Institute of Public Health PZH – National Research Institute. EPIMELD epidemiological medlocations. http://wwwold.pzh.gov.pl/oldpage/epimeld/index_p.html (2021-11-08).
15. Główny Inspektorat Sanitarny. Stan Sanitarny Kraju w 2020 r./Chief Sanitary Inspectorate. The Sanitary Status of the Country in 2020. https://www.gov.pl/web/gis/stan-sanitarny-kraju-w-2020-roku (2021-11-08).
16. Państwowa Inspekcja Pracy. Sprawozdanie z działalności Państwowej Inspekcji Pracy w 2020 r./State Labour Inspectorate. Report on the activities of the State Labour Inspectorate in 2020. https://www.pip.gov.pl/pl/f/v/242408/Sprawozdanie%202020.pdf#page=102 (2021-11-08).
17. Najwyższa Izba Kontroli Delegatura w Katowicach. Wystąpienie pokontrolne LKA.411.001.07.2020 Krakowskie Pogotowie Ratunkowe w Krakowie/Supreme Chamber of Control Katowice Branch. Post-audit report LKA.411.001.07.2020 Krakow Ambulance Service in Krakow. https://www.nik.gov.pl/kontrole/R/20/001/LKA/ (2021-11-08).
18. Najwyższa Izba Kontroli. Informacja o wynikach kontroli LWA.430.005.2020 Funkcjonowanie Systemu Ratownictwa Medycznego/Supreme Audit Office. Information on the results of the audit LWA.430.005.2020 Functioning of the Medical Rescue System. https://www.nik.gov.pl/plik/id,23528,vp,26262.pdf (2021-11-08).
19. Centrum e-Zdrowia. Biuletyn Statystyczny 2020/Center for eHealth. Statistical Bulletin 2020. https://cez.gov.pl/fileadmin/user_upload/Biuletyny_informacyjny/biuletyn_statystyczny_2020_5fa959206ef00.pdf (2021-11-08).
20. Daugherty EL, Carlson AL, Perl TM. Planning for the inevitable: preparing for epidemic and pandemic respiratory illness in the shadow of H1N1 influenza. Clin Infect Dis. 2010; 50(8): 1145–1154, doi: 10.1086/651272, indexed in Pubmed: 20225936.
21. Bentley MA, Levine R. A national assessment of the health and safety of emergency medical services professionals. Prehosp Disaster Med. 2016; 31(S1): S96–S104, doi: 10.1017/S1049023X16001102, indexed in Pubmed: 27890031.
22. Dowlati M, Seyedin H, Moslehi S. Hospital preparedness measures for biological hazards: a systematic review and meta-synthesis. Disaster Med Public Health Prep. 2020 [Epub ahead of print]: 1–14, doi: 10.1017/dmp.2020.132, indexed in Pubmed: 32713417.
23. Sacadura-Leite E, Mendonça-Galaio L, Shapovalova O, et al. Biological hazards for healthcare workers: occupational exposure to vancomy-

cin-resistant staphylococcus aureus as an example of a new challenge. Port J Public Health. 2018; 36(1): 26–31, doi: 10.1159/000487746.

24. Lewandowicz-Uszyńska A, Naporowski P, Pasternak G, et al. Identification of etiological agents of selected bacterial and viral infections based on serological tests. Postepy Hig Med Dosw. 2018; 72: 1162–1178, doi: 10.5604/01.3001.0012.8266.
25. Boal WL, Leiss JK, Ratcliffe JM, et al. Blood exposure among paramedics: incidence rates from the national study to prevent blood exposure in paramedics. Ann Epidemiol. 2006; 16(9): 720–725, doi: 10.1016/j.annepidem.2005.12.007, indexed in Pubmed: 16581265.
26. Luksamijarulkul P, Pipitsangjan S, Vatanasomboon P. Occupational risk towards blood-borne infections among ambulance personnel in a provincial hospital network in Thailand. Southeast Asian J Trop Med Public Health. Southeast Asian J Trop Med Public Health. 20154; 45(4): 940–948.
27. Szarpak Ł. Knowledge of aseptics and antisepsis and following their rules as elements of infection prevention in the work of paramedics [in Polish]. Med Pr. 2013; 64(2): 239–243, doi: 10.13075/mp.5893/2013/0020.
28. Garus-Pakowska A, Górajski M, Szatko F. Awareness of the risk of exposure to infectious material and the behaviors of Polish paramedics with respect to the hazards from blood-borne pathogens-a nationwide study. Int J Environ Res Public Health. 2017; 14(8): 843, doi: 10.3390/ijerph14080843, indexed in Pubmed: 28749410.
29. Butsashvili M, Kamkamidze G, Kajaia M, et al. Occupational exposure to body fluids among health care workers in Georgia. Occup Med (Lond). 2012; 62(8): 620–626, doi: 10.1093/occmed/kqs121, indexed in Pubmed: 22869786.
30. Coppola N, De Pascalis S, Onorato L, et al. Hepatitis B virus and hepatitis C virus infection in healthcare workers. World J Hepatol. 2016; 8(5): 273–281, doi: 10.4254/wjh.v8.i5.273, indexed in Pubmed: 26925201.
31. Jacob ST, Crozier I, Fischer WA, et al. Viral Hemorrhagic Fever Consortium. Priorities for Ebola virus disease response in west Africa. Lancet. 2014; 384(9957): 1843, doi: 10.1016/S0140-6736(14)61609-3, indexed in Pubmed: 25262343.
32. Lee JH, Cho J, Kim YJ, et al. Occupational blood exposures in health care workers: incidence, characteristics, and transmission of bloodborne pathogens in South Korea. BMC Public Health. 2017; 17(1): 827, doi: 10.1186/s12889-017-4844-0, indexed in Pubmed: 29047340.
33. Nemr N, Kishk R, Mandour M, et al. Occupational risk of hepatitis B virus exposure: overview and recommendations. Suez Canal University Medical Journal. 2018; 21(2): 59–70, doi: 10.21608/scumj.2018.42461.
34. Garus-Pakowska A, Górajski M. Behaviors and attitudes of Polish health care workers with respect to the hazards from blood-borne pathogens: a questionnaire-based study. Int J Environ Res Public Health. 2019; 16(5): 891, doi: 10.3390/ijerph16050891, indexed in Pubmed: 30870976.
35. Fedorczuk W, Pawlas K. Occupational risk factors of a medical rescue worker [in Polish]. Hygeia Public Health. 2011; 46(4): 437–441.
36. Parekh B, Ou CY, Fonjungo P, et al. Diagnosis of human immunodeficiency virus infection. Clin Microbiol Rev. 2018; 32(1): e00064-18, doi: 10.1128/cmr.00064-18, indexed in Pubmed: 30487166.
37. Yazie TD, Sharew GB, Abebe W. Knowledge, attitude, and practice of healthcare professionals regarding infection prevention at Gondar University referral hospital, northwest Ethiopia: a cross-sectional study. BMC Res Notes. 2019; 12(1): 563, doi: 10.1186/s13104-019-4605-5, indexed in Pubmed: 31500659.
38. Trzcińska A. Occupational exposure — the problem still valid [in Polish]. Renal Disease and Transplantation Forum. 2016; 9(1): 66–71.
39. Gańczak M, Topczewska K. Risk of occupational exposure to blood-borne pathogens in paramedics [in Polish]. Med Pr. 2018; 69(6): 685–694, doi: 10.13075/mp.5893.00741, indexed in Pubmed: 30245520.
40. Polskie Towarzystwo Pielęgniarek Anestezjologicznych i Intensywnej Opieki. Implementacja Dyrektywy Rady 2010/32/UE/w polskich szpitalach. Raport z badania/Polish Society of Anaesthesiological and Intensive Care Nurses. Implementation of Council Directive 2010/32/EU in Polish hospitals. Report from the survey, Warszawa, 2019. https://pspe.pl/wp-content/uploads/2019/04/RAPORT-BADA%C5%83-O-ZAK%C5%81UCIACH_PTPAiIO.pdf (2021-11-08).
41. Ebisz M, Król K, Lar K, et al. The health risk due to exposure to bioaerosol occurring in health care institutions [in Polish]. Med Srod. 2016; 19(2): 55–62.
42. Koch A, Mizrahi V. Mycobacterium tuberculosis. Trends Microbiol. 2018; 26(6): 555–556, doi: 10.1016/j.tim.2018.02.012, indexed in Pubmed: 29580884.
43. Vaz LE. Meningococcal Disease. Pediatr Rev. 2017; 38(4): 158–169, doi: 10.1542/pir.2016-0131, indexed in Pubmed: 28364047.
44. de Wit E, van Doremalen N, Falzarano D, et al. SARS and MERS: recent insights into emerging coronaviruses. Nat Rev Microbiol. 2016; 14(8): 523–534, doi: 10.1038/nrmicro.2016.81, indexed in Pubmed: 27344959.
45. Kirtipal N, Bharadwaj S, Kang SGu. From SARS to SARS-CoV-2, insights on structure, pathogenicity and immunity aspects of pandemic human coronaviruses. Infect Genet Evol. 2020; 85: 104502, doi: 10.1016/j.meegid.2020.104502, indexed in Pubmed: 32798769.
46. Wang MY, Zhao R, Gao LJ, et al. SARS-CoV-2: structure, biology, and structure-based therapeutics development. Front Cell Infect Microbiol. 2020; 10: 587269, doi: 10.3389/fcimb.2020.587269, indexed in Pubmed: 33324574.
47. Ustawa z dnia 5 grudnia 2008 r. o zapobieganiu oraz zwalczaniu zakażeń i chorób zakaźnych u ludzi/Act of December 5, 2008 on prevention and control of infections and infectious diseases in humans (tekst jedn. Dz.U. z 2017 poz. 151). https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20082341570 (2021-11-08).
48. Rozporządzenie Ministra Zdrowia z dnia 18 sierpnia 2011 r. w sprawie obowiązkowych szczepień ochronnych/Ordinance of the Minister of Health of 18 August 2011 on mandatory preventive vaccinations (tekst jedn. Dz.U. z 2018 poz. 753). https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20111821086 (2021-11-08).

49. Rozporządzenie Rady Ministrów z dnia 3 stycznia 2012 r. w sprawie wykazu rodzajów czynności zawodowych oraz zalecanych szczepień ochronnych wymaganych u pracowników, funkcjonariuszy, żołnierzy lub podwładnych podejmujących pracę, zatrudnionych lub wyznaczonych do wykonywania tych czynności/Ordinance of the Council of Ministers of 3 January 2012 on the list of types of professional activities and recommended preventive vaccinations required for employees, officers, soldiers or subordinates undertaking work, employed or appointed to perform such activities (Dz.U. z 2012 poz.40). https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20120000040/O/D20120040.pdf (2021-11-08).
50. Dutkiewicz J, Śpiewak R, Jabłoński L, Szymańska J. Biologiczne czynniki zagrożenia zawodowego. Klasyfikacja, narażone grupy zawodowe, pomiary, profilaktyka/Biological occupational hazard factors. Classification, exposed occupational groups, measurement, prevention. [in Polish]. Ad Punctum, Lublin 2007.

VIA MEDICA

LETTER TO THE EDITOR

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 204–205
DOI: 10.5603/DEMJ.a2021.0023

ISSN 2451–4691, e-ISSN 2543–5957

SARS-COV-2 VIRUS MUTATION AND LOSS OF TREATMENT AND PREVENTIVE MEASURES AS WE KNOW IT NOW

Francesco Chirico[1, 2], Dorota Sagan[3], Anna Markiewicz[3], Julia Popieluch[3], Michal Pruc[4], Karol Bielski[4], Maciej Cyran[3, 4]

[1]Post-graduate School of Occupational Health, Università Cattolica del Sacro Cuore, Rome, Italy
[2]Health Service Department, Italian State Police, Milan, Italy
[3]Maria Sklodowska-Curie Medical Academy, Warsaw, Poland
[4]Research Unit, Polish Society of Disaster Medicine, Warsaw, Poland

KEY WORDS: SARS-CoV-2, COVID-19, mutation, pandemic, prevention

Disaster Emerg Med J 2021; 6(4): 204–205

To the Editor,

in the current epidemiological situation, while the infectivity of the delta variant of the SARS-CoV-2 coronavirus has become so high compared to the variants known to us, amounting to almost twice as much, there is more concern about the existing preventive measures, which are known to us in the form of vaccines and treatment of patients hospitalized in connection with a pandemic. Such a rapid spread of the virus in society will mainly affect people who have not been vaccinated so far, but indirectly there are also discussions about the effectiveness of vaccines themselves, which, although they are effective and protect against severe disease related to the new variant, their effectiveness is reduced — adjusted effectiveness measured as protection from contracting COVID-19 decreased from 91.7% to 79.8% and the adjusted efficacy measured as protection against COVID-19 hospitalization remained relatively unchanged — a decrease from 95% to 92% [1]. It should also be pointed out that the vaccination rate is inversely correlated with the mutation rate of the Delta SARS-CoV-2 variant in 16 countries (R^2 = 0.878), which strongly suggests that full SARS-CoV-2 vaccination is necessary to inhibit subsequent mutations, and the number of unvaccinated people around the world is still very large and they will be responsible for the emergence of further new mutations. The SARS-CoV-2 virus mutates incredibly quickly, as exemplified by variants such as delta or lambda [2]. The mild and asymptomatic delta course, especially among vaccinated persons, where new studies report up to 68% of positive test cases in the vaccinated population, will spread the disease very rapidly in both vaccinated and unvaccinated persons, possibly leading to the emergence of new variants which may eventually prove refractory to both the vaccination and the current treatment as we know it, even though we know it ourselves. The cure for COVID-19 disease remains unknown to us so far [3]. It is imperative that the entire population be vaccinated as soon as possible, even under the condition of compulsory vaccination, as the current COVID-19 variants in the vaccinated population are passing through very gently compared to unvaccinated people. This will reduce the number of hospitalizations and mortality, and will significantly reduce the risk of mutations and the emergence of new mutations that may turn out to be insensitive to vaccinations and known drugs, which can occur very quickly, looking at the number of varieties and sub-varieties of individual variants known to us so far.

ADDRESS FOR CORRESPONDENCE:
Michal Pruc, Polish Society of Disaster Medicine
e-mail: m.pruc@ptmk.org

Conflict of interest

All authors declare no conflict of interest.

REFERENCES

1. Rosenberg ES, Holtgrave DR, Dorabawila V, et al. New COVID-19 Cases and Hospitalizations Among Adults, by Vaccination Status - New York, May 3-July 25, 2021. MMWR Morb Mortal Wkly Rep. 2021; 70(37): 1306–1311, doi: 10.15585/mmwr.mm7037a7, indexed in Pubmed: 34529645.
2. Yeh TY, Contreras G. Full vaccination against COVID-19 suppresses SARS-CoV-2 delta variant and spike gene mutation frequencies and generates purifying selection pressure. , doi: 10.1101/2021.08.08.21261768.
3. Riemersma K, Grogan B, Kita-Yarbro A, et al. Shedding of Infectious SARS-CoV-2 Despite Vaccination. , doi: 10.1101/2021.07.31.21261387.

VIA MEDICA

LETTER TO THE EDITOR

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 206–207
DOI: 10.5603/DEMJ.a2021.0026

ISSN 2451–4691, e-ISSN 2543–5957

RISK OF SPREADING DELTA CORONAVIRUS TO OPERATING ROOM PERSONNEL AFTER COVID-19 VACCINATION

Amirmohammad Merajikhah[1], Atefeh Beigi-Khoozani[2], Mahdieh Soleimani[3]

[1]Department of Operating Room, Sabzevar University of Medical Sciences, Razavi Khorasan, Iran
[2]Department of Operating Room, Iran University of Medical Sciences, Tehran, Iran
[3]Department of Operating Room, Maragheh University of Medical Science, East Azerbaijan, Iran

KEY WORDS: deltacoronavirus, perioperative team, operation room, vaccination

Disaster Emerg Med J 2021; 6(4): 206–207

Dear Editor,

porcine Delta Coronavirus (PDCoV), is a virus of the corona family of porcine enteropathogenic virus that was recently discovered and has a global pandemic. Therefore, effective strategies to prevent or treat infection remain unattainable [1]. It should be noted that the delta virus can increase the risk of admission to the hospital [2] and it seems that the rate of hospitalization due to this infection is up to twice as much as the previous infection [2] and increasing the hospital admission rate increases the pressure on the already exhausted health system and can put pressure on it [3]. Even a small increase in admissions affects admission capacity and can jeopardize efforts to improve. Admission of patients infected with delta coronavirus in hospitals is currently increasing, and this has affected the capacity of hospitals [2], which subsequently increases the admission of patients in the operating rooms. The importance of this issue becomes clear when patients with delta coronavirus admitted to operating rooms may be identified if they are candidates for elective surgery; however, emergency patients admitted to operating rooms can be infected with the delta variant of the coronavirus and can easily transmit this dangerous variant of the coronavirus to operating room staff.

Another concern is that COVID-19 vaccines are ineffective against the delta variant, especially after a single dose; For example, the Pfizer vaccine is 88% effective and the Oxford AstraZeneca vaccine is 60% effective against the delta type two weeks after the second dose [4]. Therefore, it can be acknowledged that even the psychological effects of COVID-19 vaccination can be altered and that stress from the delta coronavirus epidemic can reduce the performance of COVID-19 vaccines, leaving operating room staff at greater risk of infection of delta coronavirus. Current data suggest that the virus is highly targeted to human airway cells, meaning that it increases the production of the virus in the infected person, and therefore patients may transmit more virus into the air [2]. Therefore, during admission as well as intubation, operating room personnel are more likely to be contaminated by the Delta variant. According to the available evidence, the coronavirus delta variant has the potential to spread more and increase the admission of patients in hospitals, and on the other hand, the probability of admitting carriers to emergency surgeries in operating rooms increases. Therefore, more preventive strategies should be adopted in the operating rooms despite vaccination for COVID-19.

ADDRESS FOR CORRESPONDENCE:
Atefeh Beigi-Khoozani, Department of Operating Room, Iran University of Medical Sciences, Tehran, Iran
e-mail: ati.bgi2016@gmail.com

Conflict of interest

All authors declare no conflict of interest.

REFERENCES

1. Duan C, Wang J, Liu Yi, et al. Antiviral effects of ergosterol peroxide in a pig model of porcine deltacoronavirus (PDCoV) infection involves modulation of apoptosis and tight junction in the small intestine. Vet Res. 2021; 52(1): 86, doi: 10.1186/s13567-021-00955-5, indexed in Pubmed: 34127062.
2. Mahase E. Delta variant: What is happening with transmission, hospital admissions, and restrictions? BMJ. 2021; 373: n1513, doi: 10.1136/bmj.n1513, indexed in Pubmed: 34130949.
3. Mahase E. Covid-19: Is it safe to lift all restrictions in England from 21 June? BMJ. 2021: n1399, doi: 10.1136/bmj.n1399.
4. Iacobucci G. Covid-19: Single vaccine dose is 33% effective against variant from India, data show. BMJ. 2021; 373: n1346, doi: 10.1136/bmj.n1346, indexed in Pubmed: 34035039.

VIA MEDICA

LETTER TO THE EDITOR

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 208–209
DOI: 10.5603/DEMJ.a2021.0027

ISSN 2451–4691, e-ISSN 2543–5957

COVID-19 VACCINE — THIRD DOSE, BOOSTER DOSE? WHAT IS IT AND IS IT NECESSARY?

Anatolyi Gozhenko[1], Lukasz Szarpak[2, 3, 4], Milosz J. Jaguszewski[5], Beata Dey[2], Julia Popieluch[2], Michal Pruc[3], Gabriela Borkowska[6], Krzysztof J. Filipiak[2]

[1]International European University, Kiev, Ukraine
[2]Institute of Outcomes Research, Maria Sklodowska-Curie Medical Academy, Warsaw, Poland
[3]Research Unit, Polish Society of Disaster Medicine, Warsaw, Poland
[4]Research Unit, Maria Sklodowska-Curie Bialystok Oncology Center, Bialystok, Poland
[5]First Department of Cardiology, Medical University of Gdansk, Poland
[6]Faculty of Medicine, Collegium Medicum, Cardinal Stefan Wyszynski University, Warsaw, Poland

KEY WORDS: SARS-CoV-2, COVID-19, vaccine, epidemiology, outcome

Disaster Emerg Med J 2021; 6(4): 208–209

To the Editor,

let us start with what the third doses of the vaccine are and what are the so-called booster doses. The doses are the same, and yet the difference in terms is very significant. This term is very important because of who receives such a preparation, namely booster doses are offered to people who have received the full course of vaccinations and initially developed a proper reaction to them, but over time this reaction disappeared (see the loss of antibodies), but the third doses are given people whose immune system has not been able to fully respond to the initial full course of immunizations. An increasing number of affluent countries are reaching for the third dose of the COVID-19 vaccine, although the World Health Organization does not recommend such a procedure, further pointing out that 58% of citizens have been vaccinated in wealthy countries, and only 1.3% in the lowest-income countries, which is significant an aspect indicating the very meaning of postponing vaccination, with many experts further pointing to the lack of medical indications for vaccination of the entire population with the third dose, although booster vaccinations are well known to us for other diseases such as whooping cough. Vaccinations are effective in preventing the severe course of COVID-19 in those infected, but their lack of availability in poorer regions of the world will further fuel the emergence of new mutations to which these vaccinations may prove insensitive. However, there are groups where this approach is recommended, including people receiving cancer treatment for HIV-infected tumors or blood cancers, people who have received an organ transplant or are taking immunosuppressants, patients with moderate to severe primary immunodeficiency (DiGeorge or Wiskott-Aldrich syndrome), or people who are taking high doses of corticosteroids or other medications that can suppress the immune system. Examples of the need for a third dose of vaccine in these groups are the transplant study in whom, following the entire course of COVID-19 immunization, 46% have not developed adequate antibody titers (importantly, the study also showed that the antibodies were not produced in 39% of people participating in the study after one dose of the vaccine, but after the second dose of the vaccine, they were already produced and only 17% produced detectable antibodies against the SARS-CoV-2 virus after the first dose) [1]. Among immunocompromised people there is a significantly greater likelihood of breakthrough infection (40–44% of hospitalized breakthrough cases are immunocompromised people) [2,3], unfortunately, they also have lower vaccine efficacy (59–72% of vaccine efficacy among immunocompromised people compared to 90–94% of immunodeficient patients after the second dose) [4–6]. This evidence shows that these groups are particularly vulnerable and should be vac-

ADDRESS FOR CORRESPONDENCE:
Michal Pruc, Polish Society of Disaster Medicine
e-mail: m.pruc@ptmk.org

cinated with a third dose of the vaccine as soon as possible to protect them from severe disease and to develop antibodies against them.

In mid-July, Israel was the first country to start administering the third dose of the Pfizer-BioNTech vaccine to immunocompromised adults, including those suffering from certain cancers — now Belgium and Ecuador have also implemented this procedure. In addition, additional vaccination doses may be necessary if inactivated vaccines such as Sinopharm and Sinovac have been previously used due to the lack of antibody production, as shown by studies showing that 25% of people over 60 years of age vaccinated with Sinopharm did not develop antibodies [7]. In many countries, decisions have already been made to vaccinate for the third time people who have received Sinovak before, and Sinopharm includes Indonesia (Moderna), Cambodia, Chile, and the Dominican Republic (AstraZeneca), Turkey, Uruguay, and Bahrain (Pfizer-BioNTech). In the United Arab Emirates, those vaccinated six months earlier with any vaccine can take a third dose of any preparation — Sinopharm or Pfizer-BioNTech. A similar policy was applied by Hungary, where all those vaccinated with the third dose are willing. Due to the declining effectiveness of the Pfizer-BioNTech vaccine due to the delta variant, Israel decided to vaccinate all citizens with a third dose — as a result, more than 14% of citizens have already received a booster injection. In Germany, they will be intended for elderly people who have been vaccinated with AstraZeneca and J&J, and booster doses will only be given with mRNA preparations. A similar situation exists in the UK, France, Austria, Sweden and Canada, Brazil, Switzerland, South Korea, Singapore, and the Philippines. From September 20, all Americans who took Moderna or Pfizer-BioNTech eight months earlier will be given a booster vaccination, which has been widely criticized by many scientists because 2 doses of the vaccine still protect citizens without immunodeficiency from severe disease. Pfizer-BioNTech released data showing that the efficacy of the vaccine against symptomatic COVID-19 decreased from 96% to 83.7% after 6 months. However, this still does not apply to the severe course of the disease. Studies confirm the high effectiveness of the Pfizer-BioNTech vaccine against COVID-19 in the context of protection against hospitalization within 6 months of full vaccination (73% in the context of protection against SARS-CoV-2 infection and 90% in the context of protection against hospital due to COVID-19), also against the delta variant of the novel coronavirus [from 93% (one month after the person was fully vaccinated) to 53% (≥ 4 months after the person was fully vaccinated)]. The reduction in the effectiveness of Pfizer-BioNTech against COVID-19 is most likely due to weakening of the strength of the immune response (humoral/antibody-dependent) over time [8]. Vaccinations play a huge role in preventing the severe course of COVID-19, but highly developed countries should not forget about those poor, who will mutate the virus due to the lack of any vaccinations. Continuing evidence suggests that everyone will receive a booster dose, however, due to the demand and supply of vaccines on the market and the lack of their availability in many regions of the world, the decision should be made — when.

Conflict of interest

All authors declare no conflict of interest.

REFERENCES

1. Boyarsky BJ, Werbel WA, Avery RK, et al. Antibody Response to 2-Dose SARS-CoV-2 mRNA Vaccine Series in Solid Organ Transplant Recipients. JAMA. 2021; 325(21): 2204–2206, doi: 10.1001/jama.2021.7489, indexed in Pubmed: 33950155.
2. Tenforde MW, Patel MM, Ginde AA, et al. Influenza and Other Viruses in the Acutely Ill (IVY) Network. Effectiveness of SARS-CoV-2 mRNA Vaccines for Preventing Covid-19 Hospitalizations in the United States. Clin Infect Dis. 2021 [Epub ahead of print], doi: 10.1093/cid/ciab687, indexed in Pubmed: 34358310.
3. Brosh-Nissimov T, Orenbuch-Harroch E, Chowers M, et al. BNT162b2 vaccine breakthrough: clinical characteristics of 152 fully vaccinated hospitalized COVID-19 patients in Israel. Clin Microbiol Infect. 2021 [Epub ahead of print], doi: 10.1016/j.cmi.2021.06.036, indexed in Pubmed: 34245907.
4. Chodick G, Tene L, Rotem RS, et al. The effectiveness of the TWO-DOSE BNT162b2 vaccine: analysis of real-world data. Clin Infect Dis. 2021 [Epub ahead of print], doi: 10.1093/cid/ciab438, indexed in Pubmed: 33999127.
5. Khan N, Mahmud N. Effectiveness of SARS-CoV-2 Vaccination in a Veterans Affairs Cohort of Patients With Inflammatory Bowel Disease With Diverse Exposure to Immunosuppressive Medications. Gastroenterology. 2021; 161(3): 827–836, doi: 10.1053/j.gastro.2021.05.044, indexed in Pubmed: 34048782.
6. Chemaitelly H, AlMukdad S, Joy J, et al. SARS-CoV-2 vaccine effectiveness in immunosuppressed kidney transplant recipients. , doi: 10.1101/2021.08.07.21261578.
7. Ferenci T, Sarkadi B. Virus neutralizing antibody responses after two doses of BBIBP-CorV (Sinopharm, Beijing CNBG) vaccine. , doi: 10.1101/2021.07.15.21260362.
8. Tartof S, Slezak J, Fischer H, et al. Six-Month Effectiveness of BNT162B2 mRNA COVID-19 Vaccine in a Large US Integrated Health System: A Retrospective Cohort Study. SSRN Electronic Journal. , doi: 10.2139/ssrn.3909743.

VIA MEDICA

LETTER TO THE EDITOR

Disaster and Emergency Medicine Journal
2021, Vol. 6, No. 4, 210–212
DOI: 10.5603/DEMJ.a2021.0031

ISSN 2451–4691, e-ISSN 2543–5957

COMMUNITY RISK PERCEPTION IN COVID-19: A NEGLECTED ISSUE IN PUBLIC HEALTH

Hamid Safarpour[1,2], Mohammad Esmaeil Motlagh[3], Moslem Sarani[4, 5], Davoud Pirani[4], Mehdi Safari[4], Meysam Safi-Keykaleh[6]

[1]Non-Communicable Diseases Research Center, Ilam University of Medical Sciences, Ilam, Iran
[2]Department of Nursing, School of Nursing and Midwifery, Ilam University of Medical Sciences, Ilam, Iran
[3]Department of Pediatrics, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[4]Department of Health in Disasters and Emergencies, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]Health management and Social Development Research Center, Golestan University of Medical Sciences, Gorgan, Iran
[6]Nahavand School of Allied Medical Sciences, Hamadan University of Medical Sciences, Hamadan, Iran

KEY WORDS: risk perception, COVID-19, coronaviruses, community health, disaster, infectious disease

Disaster Emerg Med J 2021; 6(4): 210–212

To the Editor,

people's perception of epidemic risk significantly depends on the differences in their awareness level [1]. Risk perception is an important determinant of behavior against risks [1], and depends on factors, including cost-benefit of risk, the role of officials' authorities, socio-economic and political context, ideology, trust, and individual interests and awareness [2–4]. Monitoring of the people's risk perceptions is part of emergency management in major public health disasters and emergencies [5]. In the initial phase of the outbreak of a disease, the communities' risk perception, especially in an emerging disease where resources for prevention, diagnosis, and treatment are limited and there is a delay in active intervention, is important [6]. Furthermore, the communities' responses are essential in early-stage of all epidemics, because non-pharmacological interventions and prevention are the major options in this stage [7].

Compared to other hazards, such as environmental hazards, it is less well known how people perceive the risks associated with emerging infectious diseases [8] such as COVID-19. In late December 2019, the outbreak of the new coronavirus (COVID-19) began in Wuhan, China, and quickly spread to other parts of the world. However, the high rate of transmission and spread of the virus poses serious challenges to controlling the spread of the disease. To deal with such problems, it is necessary to take non-medical measures such as improving personal protection equipment, imposing travel restrictions, and maintaining a social distancing that to achieve such measures, the will of the people plays an important and decisive role [2]. The efficacy and effectiveness of preventive and control measures depend on the level of participation of people with precautionary measures such as wearing a face mask and hand hygiene, considering the physical distance, and following instructions and health regulations [7]. However, encouraging people to adhere to the recommended precautions is still a health problem. Whether people act voluntarily on health and precautionary principles depends on their risk perception of unhealthy threats. In fact, risk perception is one of the main issues in theories of healthy behaviors, including the health belief model and the protection motivation to protect theory [7].

The results of a study showed that there is a high level of risk perception towards COVID-19 and it was impacted by the demographic characteristics of the population [5]. Furthermore, the results of a study on the factors affecting the risk perception of Iranians in COVID-19 showed that religious-cultural, political, cognitive, social, and emotional factors are effective in the risk perception of Iranians in COVID-19 [3]. The results of this study also showed that beliefs

ADDRESS FOR CORRESPONDENCE:
Meysam Safi-Keykaleh, Nahavand School of Nursing and Midwifery, Hamadan University of Medical Sciences, Hamadan, Iran
e-mail: meysam.safi@yahoo.com

and culture had the most positive correlation and emotions had the most negative correlation with Iranians' risk perception of the COVID-19 disease [3]. In addition, The new study found that risk perception of COVID-19 is consistently associated with a number of experiential, social, and cultural factors across countries [8]. Despite the variety of cultures, individualistic worldviews, personal experiences, social values, and social reinforcement through friends and family were important determinants of risk perception. Risk perception is significantly associated with the acceptance of health prevention behaviors [8].

Until November 28, 2021, the total number of COVID-19 patients in Iran reached 6 108 882 and the total number of deaths from this disease reached 129 629. Furthermore, until November 28, 2021, a total of 57 408 046 people received the first dose of the COVID-19 vaccine. Also, 46 510 395 people have received the second dose of the vaccine. In addition, 967 931 people received the third dose of the vaccine. Taking into account this numbers, the total dose of vaccines injected in Iran reached 104 886 372 [9].

To control epidemics such as COVID-19, people's participation in preventive measures is critical. People's participation depends on their perception of the risk of the disease and is achieved by raising awareness, sensitizing, and providing trust in them [2]. Trust is one of the effective factors in shaping risk perception [2]. Trust in government's protocols, news, and safety measures against hazards, lead to increased community preparedness [2, 10, 11]. In contrast, a lack of trust in the authorities' warnings leads to a lack of attention to prevention protocols and so a reduction in social activities [2]. To increase people's risk perception of epidemics, it is necessary to take effective measures, given the cultural context of society. Successful risk management of epidemics such as COVID-19 requires a comprehensive perception of the risk and its elements. Increasing real perception of potential risks needs to identify effective ways to influence people, and thus change their attitudes and performance. As changes in the attitude and performance need to change in knowledge, training and exercise are the most important prerequisites for proper risk perception. Different groups of society need different methods and tools to train and risk perception [1], the need for training in this matter is quite felt. Media information sources, including community media platforms and community workers, may increase public perception of risk. It is also useful to assess the psychological and behavioral status of the community to be aware of subsequent interventions and risk communication strategies as the epidemic progresses. Therefore, risk assessment can be an essential step in managing disease epidemic risk. Since a correct and timely assessment of community risk perception can help to effective risk communication management, risk assessment should be performed immediately to reduce the impact of all epidemics, including COVID-19. What is clear is that the community risk perception in COVID-19 is a neglected issue in communicable disease prevention. Not only the knowledge of people's perceptions of risk, but also the empirical, social, cultural, and political factors and their role in creating preventive health behaviors resulting from risk perception of COVID-19 are need to develop, and implement risk-based communication strategies.

Acknowledgements

we would like to thank all those people who have helped in the writing of this study.

Authors' contributions

all authors contributed equally. All authors read and approved the final manuscript.

Conflict of interest

the authors have declared that no competing interests exist.

REFERENCES

1. Safi-Keykaleh M, Zavareh DK, Safarpour H, et al. Different perception, different behavior, necessity of consensus over "risk" term. Health in Emergencies and Disasters Quarterly. 2018; 3(3): 121–122, doi: 10.29252/nrip.hdq.3.3.121.
2. Khosravi M. Perceived risk of COVID-19 pandemic: the role of public worry and trust. Electron J Gen Med. 2020; 17(4): em203, doi: 10.29333/ejgm/7856.
3. Samadipour E, Ghardashi F. Factors influencing Iranians' risk perception of COVID-19. J Mil Med. 2020; 22(2): 122–129.
4. Wachinger G, Renn O, Begg C, et al. The risk perception paradox — implications for governance and communication of natural hazards. Risk Anal. 2013; 33(6): 1049–1065, doi: 10.1111/j.1539-6924.2012.01942.x, indexed in Pubmed: 23278120.
5. He S, Chen S, Kong L, et al. Analysis of risk perceptions and related factors concerning COVID-19 epidemic in Chongqing, China. J Community Health. 2021; 46(2): 278–285, doi: 10.1007/s10900-020-00870-4, indexed in Pubmed: 32592160.

6. World Health Organization Outbreak Communication Planning Guide. Geneva, 2008.
7. Kwok KO, Li KK, Chan HH, et al. Community responses during early phase of COVID-19 epidemic, Hong Kong. Emerg Infect Dis. 2020; 26(7): 1575–1579, doi: 10.3201/eid2607.200500, indexed in Pubmed: 32298227.
8. Dryhurst S, Schneider C, Kerr J, et al. Risk perceptions of COVID-19 around the world. Journal of Risk Research. 2020; 23(7-8): 994–1006, doi: 10.1080/13669877.2020.1758193.
9. Iran's Ministry of Health and Medical Education. 2021. https://behdasht.gov.ir/ (2021-11-28).
10. Bradford RA, O'Sullivan JJ, Craats IM, et al. Risk perception — issues for flood management in Europe. Nat Hazards Earth Syst Sci. 2012; 12(7): 2299–2309, doi: 10.5194/nhess-12-2299-2012.
11. Cori L, Bianchi F, Cadum E, et al. Risk perception and COVID-19. Int J Environ Res Public Health. 2020; 17(9): 3114, doi: 10.3390/ijerph17093114, indexed in Pubmed: 32365710.