Social Networks in Education of Health Professionals in Bosnia and Herzegovina – the Role of Pubmed/Medline in Improvement of Medical Sciences

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SUMMARY

Introduction: Social network is a social structure made up of individuals and organizations that represent “nodes”, and they are associated with one or more types of interdependency; such as: friendship, common interests, work, knowledge, prestige and many other interests. Beginning with the late twentieth and early twenty-first century, the Internet was a significant additional tool in the education of teenagers. Later, it takes more and more significant role in educating students and professionals. **Goal:** The aim of this paper is to investigate, to what extent and how effectively the Internet is used today. In addition, more specifically, this paper will research the implications of the well-known social networks in education of students and health professionals in Bosnia and Herzegovina (B&H). **Material and methods:** We compared the ratio of using Medline, as the largest biomedical data base system for spreading medical information, as basics for health education at biomedical faculties at five universities in B&H. **Results and discussion:** According to data from the CRA (i.e. Communications Regulatory Agency) in B&H, in 2010, there

were 522,364 internet access accounts, with about 2 million Internet users, representing about 52% of the total population. The Internet users' preference is dominated by the users of fast broadband access (e.g. xDSL) with 42.8%, and elsewhere, still with dial-up access, with 25.2%. The results showed that only 11.6% of professors use Facebook type of social network, 49.3% of them have a profile on BiomedExperts scientific social network and 79% have available articles in the largest biomedical literature database MEDLINE. Students are also frequent users of general social networks and educational clips from You Tube, which they prefer to utilize considerably more than the other types of professionals. Students rarely use the facilities of professional social networks, because they contain mainly data and information needed for further, postgraduate professional education. In our research, we analyzed cited published papers in the journal Medical Archives, the oldest medical journal in B&H (established in 1947) of randomly included 151 full and part time professors, authors from five medical faculties in B&H and B&H authors who currently work in the EU and USA.. ANOVA showed that there was no significant difference in the number of

articles published between the Universities in Bosnia, but there was significant difference in the number of articles published on MEDLINE, between all faculties in B&H and a group of scientists who work around the world. Students' tests showed that there was a statistically significant difference in the average number of papers published on Medline, between groups of part-time and full time professors. However, there were no statistically significant differences, between the professors for preclinical and clinical subjects. **Conclusion:** In B&H there are decent conditions for the use of online social networks in the education of health professionals. While students enthusiastically embraced these opportunities, this is not so much a case with health care professionals in practice; while scientific health care workers have not shown greater interest in the use of social networks, both for purposes of scientific research and in terms of self-education and training of students. There is much more use of the advantages offered by online social networks, both in education and in support of the scientific research.

Key words: Social networks, education, health professionals, students, Bosnia and Herzegovina.

1. INTRODUCTION

Social network is a social structure made up of individuals and organizations that represent “nodes”, and they are associated with one or more types of interdependency; such as: friendship, common interests, work, knowledge, prestige and many other interests. So, social networking is the networking of indi-

viduals or small groups in certain groups. Such networks can operate on many levels, from the family level and specific interest groups, (e.g. pupils or students), progressing to the levels of specific population groups to the level of the non-professional, common people. They can play a key role in the individual problem solving, as well as by initi-

ating joint actions (1, 2, 3, 4, 5).

While social networks were previously organized through various forums, citizens' associations or other forms of formal or informal associations, (i.e. where members were in direct physical interaction) (6, 7), today that is not necessary. Development of modern information and telecommunication technologies has enabled

large social networking capabilities. Members of the network no longer have to be in a physical contact; they may be on another continent and can exchange information, at any time of day (8, 9, 10, 11, 12, 13, 14, 15).

During the late twentieth and early twenty-first century the Internet became a significant additional tool in the education of teenagers (2). Later, it took more and more significant role in educating students and professionals. Strong development of ICT (e.g. Information Communication Technology) enabled Web 2.0 environment, which is the modus operandi of today's social networks on the Internet. It allows for a more personalized and communicative form of the Web, which emphasizes interactive connectivity, by actively creating and sharing ideas and knowledge among users (3).

Such Internet possibilities are used in different ways, during the undergraduate and graduate education of health workers. At undergraduate level, the students often use global social networks (i.e. Facebook, Twitter, You Tube ...) or some specific health social networks, such as various forums with health issues (e.g. Health Care Forum). They rarely use the health science social networking (i.e. Medline, BioMedExperts, WebMD), as opposed to other professionals in the graduate education (1).

In the undergraduate studies, the exchanged information is usually needed for the education, training and the acquisition of certain skills. Often, these elements represent non-critical information, which is sometimes inappropriately labeled as the ethics and deontology of health care workers (4). In a graduate study, the commonly exchanged scientific information is used to advance the cooperation in the scientific research projects.

2. THE AIM OF THE RESEARCH

The aim of this paper is to investigate, to what extent and how effectively the Internet is used. The special emphasis is given to the well-known social networks in the edu-

age group		No. of respondents	% internet access	% internet use in education	% Facebook profile	% Facebook users in professional purposes	% use of YouTube content in profession purposes	% use of professional health networks content	% use of illegally available content (warez) in professional purposes
Students	19–21 y.	100	72%	68%	72%	68%	37%	3%	23%
	22–24 y.	100	79%	79%	74%	74%	54%	12%	58%
Students total		200	76%	74%	73%	71%	46%	8%	41%
Health professionals	25–29 y.	30	84%	43%	77%	21%	9%	33%	38%
	30–34 y.	30	89%	52%	82%	20%	13%	46%	35%
	35–39 y.	30	92%	61%	73%	14%	8%	42%	27%
	40–44 y.	30	91%	53%	41%	4%	3%	39%	25%
	45–49 y.	30	73%	28%	21%	3%	1%	12%	18%
	50–54 y.	30	64%	21%	7%	1%	0	13%	5%
	older than 55 y.	30	32%	7%	3%	1%	0	4%	2%
Health professionals total		210	75%	38%	43%	9%	5%	28%	22%
Total (all)		410	75%	55%	58%	37%	25%	18%	31%

Table 1. Using the Internet and social networking in the professional training of students and health professionals by age groups

cation of students and health professionals in Bosnia and Herzegovina. Also, we compared the ratio of using PubMed/Medline, as the largest biomedical data base system for spreading medical information, as basics for health education at biomedical faculties at five universities in Bosnia and Herzegovina utilized by full and part time professors in Bosnia and Herzegovina and worldwide.

3. RESEARCH METHOD

The research was conducted by surveying 200 students of the Health Faculty of the University of Zenica, the Faculty of Medicine, University of Sarajevo and 210 health professionals (i.e. doctors and medical technicians) in Zenica-Doboj Canton. The criteria by which the students were sorted were first three and second three study years. Health workers were grouped into the age groups, for five years, by 25 years

of age. Its goal was to identify differences in the use of IT by the age groups. In particular, the researchers interviewed 151 health workers; from Tuzla, Foca, Banja Luka, Mostar and Sarajevo Medical Faculty, regarding the use of certain content to the global, professional and scientific social networks. In that sense they searched their personal profiles, as well as their indexed bibliography available on the Internet. Scientific workers were classified in pre-clinical and clinical group of scientific disciplines, as well as in a group of visiting and full-time university professors. Their work was also compared with a group of 11 prominent medical scholars; originating from our area of expertise who still work and produce around the world. In the study, we also used the CRA data (i.e. Communications Regulatory Agency) in B&H and the GfK (e.g. Gesellschaft für

Konsumforschung–Association for Consumer Research).

4. RESULTS

According to data from the CRA (Communications Regulatory Agency) in B&H, in 2010, there were 522,364 internet access accounts, with about 2 million Internet users, representing about 52% of the total population. The Internet market was dominated by the users of fast broadband access (xDSL) with 42.8%, and elsewhere, still, with di-

by the previously presented results from the CRA and GfK (9, 10, 11).

Research of internet and social networks' use in the process of education and self-education among professors at five medical faculties in Bosnia and Herzegovina. Note: our scientific research was performed on a sample consisting of 151 professors.

The results showed that only 14.6% of professors use Facebook, 47.7% of them have a profile on BioMedExperts scientific social net-

former teachers who were engaged in lecturing assignments around the world, we found that 90.9% of them had a profile on BioMedExperts scientific social network, 54.5% used Facebook and all of their published articles were available on Medline.

X^2 test showed a significant difference in the use of BiomedExpert scientific social network, among universities tested ($X^2_{(5)} = 63.595$ for which the $p < 0.05$), while there were no statistically significant differences, among groups of teachers, at achieved level positions (i.e. $X^2_{(1)} = 4.528$, for which $p < 0.05$). In conclusion, there were no statistically significant differences among the groups of subjects they taught (e.g. $X^2_{(1)} = 0.336$, for which $p > 0.05$).

ANOVA showed that there were no statistically significant differences in the average number of associates, in the research work when compared to all faculties in B&H, but there was a significant difference between the B&H School and group of scientists working around the world. ANOVA showed that there was no significant difference in the number of articles published between the Universities in B&H, but there was significant difference in the number of articles published on MEDLINE between all faculties in B&H and a group of scientists who work around the world.

Students' tests showed that there was a statistically significant difference, in the average number of papers published on Medline, between groups of part-time and full time professors (i.e. the difference was in favor of the ordinary professors 23.171, $t = 3.873$, for which $p < 0.05$). However, there were no statistically significant differences, be-

		Faculty name						Total
		MF B. Luka	MF Foca	MF Mostar	MF Sarajevo	MF Tuzla	MF worldwide	
Professor title	part-time	20	7	5	9	8	11	60
	full time	25	4	7	15	40	0	91
Subjects groups	preclinical	20	6	4	4	13	4	51
	clinical	25	5	8	20	35	7	100
Total		45	11	12	24	48	11	151

Table 2. Distribution of teachers depending on their positions and subjects

		Profile at BioMedExperts		Total
		yes	no	
Faculty name	MF B.Luka	11.1%	88.9%	45
	MF Foca	9.1%	90.9%	11
	MF Mostar	41.7%	58.3%	12
	MF Sarajevo	95.8%	4.2%	24
	MF Tuzla	58.3%	41.7%	48
	MF worldwide	90.9%	9.1%	11
Total		72	79	151

Table 3. Distribution of professors, users of scientific social network BioMedExperts at 4 medical faculties in B&H in 2011.

al-up access, with 25.2% (5). According to data from the Association for Consumer Research in B&H, conducted in 2009, the Internet use was usually more readily and broadly accepted by the younger generation (7). According to the same source, in 2009, the 46% of domestic Internet users had their own profile on Facebook and the predominant group using this social network was in the age group between 15 and 24 years, while implying that they represented 60% of all Facebook users in B&H (8).

The research we conducted, was from the sample among 200 medical students of the medical faculties and 210 health workers, in using the Internet and social networking in professional health education

work and 92% have available articles in the largest biomedical literature database called MEDLINE. Out of those who have profiles on Facebook, 13 are part-time professors and 16 are professors in the clinical disciplines.

Analyzing data for 11 of our

Faculty name	Mean	N	Minimum	Maximum	Std. Deviation
MF B.Luka	0.89	45	0	23	3.737
MF Foca	0.64	11	0	7	2.111
MF Mostar	2.83	12	0	10	4.239
MF Sarajevo	16.71	24	0	79	16.588
MF Tuzla	8.83	48	0	49	11.887
MF worldwide	55.18	11	0	223	74.738
Total	10.02	151	0	223	25.639

Table 4. The average number of associates in the first line of the research work (BiomedExpert) 2011

(I) Faculty name	(J) Faculty name	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MF B. Luka	MF Foca	0.253	7.374	1.000	-21.04	21.55
MF B. Luka	MF Mostar	-1.944	7.122	1.000	-22.52	18.63
MF B. Luka	MF Sarajevo	-15.819	5.541	0.055	-31.82	0.18
MF B. Luka	MF Tuzla	-7.944	4.549	0.504	-21.08	5.19
MF B. Luka	MF worldwide	-54.293*	7.374	0.000	-75.59	-33.00
MF Foca	MF Mostar	-2.197	9.151	1.000	-28.63	24.23
MF Foca	MF Sarajevo	-16.072	7.982	0.340	-39.13	6.98
MF Foca	MF Tuzla	-8.197	7.328	0.873	-29.36	12.97
MF Foca	MF worldwide	-54.545*	9.348	0.000	-81.54	-27.55
MF Mostar	MF Sarajevo	-13.875	7.751	0.475	-36.26	8.51
MF Mostar	MF Tuzla	-6.000	7.075	0.958	-26.43	14.43
MF Mostar	MF worldwide	-52.348*	9.151	0.000	-78.78	-25.92
MF Sarajevo	MF Tuzla	7.875	5.481	0.704	-7.95	23.70
MF Sarajevo	MF worldwide	-38.473*	7.982	0.000	-61.53	-15.42
MF Tuzla	MF worldwide	-46.348*	7.328	0.000	-67.51	-25.18

Table 5. ANOVA–Tukey HSD procedure for determining the significance of differences in the mean number of associates in scientific research, until 2011

Faculty name	Mean	N	Minimum	Maximum	Std. Deviation
MF B. Luka	9.44	45	0	85	15.979
MF Foca	21.45	11	0	69	22.814
MF Mostar	24.08	12	1	122	31.434
MF Sarajevo	28.46	24	2	181	33.953
MF Tuzla	15.33	48	1	71	13.455
MF worldwide	87.36	11	12	189	62.690
Total	22.05	151	0	189	32.549

Table 6. Average of published papers on MEDLINE, by faculties:

tween the professors for preclinical and clinical subjects (i.e. $t = 1.001$ and $p > 0.05$).

Analyzed were three B&H journals, indexed in a MEDLINE database: Medical Archives (Medicinski Arhiv), Bosnian Journal of Basic Medical Sciences and Medical Gazette (Medicinski Glasnik) in 2010, as shown in Figure 1, the largest number of original papers was published in the Medical Archives (i.e. $X^2_{(10)} = 130.646$, significance level $p < 0.05$, contingency coefficient–0.728) (17, 18). In addition, there was a statistically significant difference in the number of papers published by the local authors, in relation to the international journals, in favor of the Medical Archives (i.e. $X^2_{(2)} = 11.644$, Significance level $p < 0.05$, Contingency coefficient–0.226). We must also mention that it was true, that the BJBMS Journal did not categorize

the articles and therefore, we could not make the initially planned and desired comparisons. Medical Archives and BJBMS journals, published in percentages, the largest number of articles by authors from Sarajevo and Tuzla. These two universities are the two oldest and largest university medical centers in B&H. The authors believe that it is necessary to make a qualitative changes in the reception and reviewing of papers for publication in B&H medical journals. The creation and implementation of these changes should be the responsibility of the separate scientific authority/committee, which is to be composed from medical experts, at the state level (17).

In our research we analyzed cited published papers in the journal Medical Archives, oldest medical journal in B&H (established in 1947) of randomly included 151 full and part time professors (searched on PubMed in July 2011), authors from five medical faculties in B&H and from B&H authors who currently work in the EU and USA. Results are shown in Table 8.

5. DISCUSSION

Great impact on social events, depending on their presence, high

(I) Faculty name	(J) Faculty name	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MF B. Luka	MF Foca	-12.010	8.905	0.757	-37.73	13.71
MF B. Luka	MF Mostar	-14.639	8.601	0.533	-39.48	10.20
MF B. Luka	MF Sarajevo	-19.014	6.692	0.057	-38.34	0.31
MF B. Luka	MF Tuzla	-5.889	5.493	0.892	-21.76	9.98
MF B. Luka	MF worldwide	-77.919*	8.905	0.000	-103.64	-52.20
MF Foca	MF Mostar	-2.629	11.051	1.000	-34.55	29.29
MF Foca	MF Sarajevo	-7.004	9.640	0.978	-34.85	20.84
MF Foca	MF Tuzla	6.121	8.850	0.983	-19.44	31.68
MF Foca	MF worldwide	-65.909*	11.289	0.000	-98.51	-33.30
MF Mostar	MF Sarajevo	-4.375	9.360	0.997	-31.41	22.66
MF Mostar	MF Tuzla	8.750	8.545	0.909	-15.93	33.43
MF Mostar	MF worldwide	-63.280*	11.051	0.000	-95.20	-31.36
MF Sarajevo	MF Tuzla	13.125	6.619	0.357	-5.99	32.24
MF Sarajevo	MF worldwide	-58.905*	9.640	0.000	-86.75	-31.06
MF Tuzla	MF worldwide	-72.030*	8.850	0.000	-97.59	-46.47

Table 7. ANOVA–Tukey HSD procedure for determining the significance of differences in the mean number of papers in MEDLINE by faculty, until 2011:

Faculty of medicine in city	No. of observed professors	Cited published papers in Medline(total)	Published papers in Med Arh (total)	% of published papers in Med Arh	Published papers in Med Arh as author	Published papers in Med Arh as co-author
Banja Luka	45	425	19	4,47	6	13
Foca	11	236	4	1,69	2	2
Mostar	12	289	72	24,91	47	25
Sarajevo	24	683	491	71,89	236	255
Tuzla	48	736	332	45,11	85	247
EU(USA)*	11	961	25	2,60	14	11
Total	151	3330	943	28,32	390	553

Table 8. The ratio of cited papers published in the journal Medical Archives in our sample * Full and part time professors who work in EU and USA (graduated in B&H)

productivity and new achievements have contributed to the wide availability of ICT. Their penetration into the society can no longer be stopped, neither by the poverty of that society, nor by the ignorance of its users, because they are so infiltrated into daily life, in so far that without them, the present form of human life will be impossible.

Because of these needs, our relatively poor, disorganized and corrupt society is not lagging behind in implementing the common environment of ICT. According to data published on the web page, Internet World Stats (9), the Internet penetration in the European population was 58.3% in 2011, while the CRA data for 2010 Internet access, among the population of B&H, was 52% (5). According to data published on the website Internet World Stats (10), the largest increase in the Internet use, since 2000, until 2011, in the European countries was in Albania (51900.0 %) and then in B&H (20485.7 %).

The new possibilities offered by ICT and Web 2.0 environment allow a very intense interactive, social network, where communication takes place dynamically in a real time, with virtually no spatial and temporal constraints. This positive development made them very attractive in many aspects of social activities. It is important to mention, that in January 2011, the most popular online social network, Facebook had approximately 600 million users. According to data published on the web page, Internet World Stats,

1.032 million Internet users in B&H have a profile on Facebook (11). According to data from GfK, the most present group of Facebook users are young people between 15 and 24 years of age.

Public social networks, based on the Internet, enable communication, collaboration and information gathering in the field of health care. More than half (55%) of Americans who are investigating health problems in the Internet age, research the data about the therapy or condition via the Internet, while, a third of them use the social networks. About 60% of doctors in the U.S.A. use social networks for professional purposes (12, 13). To a large extent, social networks can be used in un-

dergraduate and graduate education of health professionals.

Our study showed similar results about the medical professionals, who belong into the category of population, who more often have access to the Internet and are using social networks (Figure 2). This is shown by the results in Table 2., where we see that the most common Internet access category, belongs to the category of health workers from 35-44 years of age. This is the group of health workers who can afford Internet access and computer, and who are sufficiently educated in its use. Older categories of health workers did not have organized training for the use of ICT. This is not just our problem, this problem, also plagues many developed countries (14). Categories of health workers from 35-44 years of age most commonly used internet in the professional education. Facebook users, who utilized ICT, as a medium for exchange of medical education content, through the network, were slightly younger (25-39 years).

Students were also frequent users of general social networks, and educational clips from YouTube, considerably more than other professionals. That fact actually determined the possible data and infor-

Figure 1. Distribution of teachers depending on their positions and subjects

Figure 2. Percentage ratio of Internet users in B&H by age groups according to the GfK survey in 2009 (7)

mation that they exchange (15). Usually, the exchanged content was related to a process of mastering of certain skills necessary to a graduate education. However, there were no critical reviews of the content, that was often found to be unprofessional and unethical, on the general social networks like Facebook, Twitter and You Tube (4). Students rarely used the facilities of professional social networks, because they mainly contained data and information needed for further, graduate and/or professional education. Unlike the use of professional social networks, students often use illegal educational material on the site that offers it (e.g. warez and other portals). In that way, they get the reference literature, but harm the authors by disrespecting copyrights. Health professionals often use the professional social networking. There are either, looking for, or are sharing the reference information they need in practice, or are using it for a further professional advancement. It is also important to note that they also use the general social networks, but considerably less than the students. There is no serious use of general social networks there, although they provide a significant on opportunities, from education to the creation of the health policy (16).

Social networks, especially scientific social expert's network provide significant opportunities to researchers, scholars and professors in medical faculties. Although the scientists are, by nature, not inclined to a social interaction, and they usually, rather hide in their labs trying to find some next great discovery,

there are numerous scientific social networks. Some of them are specific to the biomedical sciences and the most famous, among them is BioMedExperts. BioMedExperts is an online community of biomedical scientists, which shows the essential features related to their work and it cooperates on projects and areas of interest. It is these characteristics that are of great help to analyze the use of social networks by biomedical scientists, with four medical schools in B&H, and their comparison with a group of eminent scientists from our region who are now working around the world. The study group included 151 part-time and regular teachers. We have sought the Facebook profiles of teachers and found that only 14.6% of domestic scientists use Facebook, while this percentage is significantly higher for those who work outside of B&H (54.5%). Profiles of scientific workers in B&H are generally not public and they are only available to the certain members of the network. They do not use them for training or are present in groups dealing with a specific health issues on Facebook, as opposed to a group of scientists who work outside of B&H.

On BioMedExperts, 72 scientists (47,7%) have a profile and there is a significant difference among the faculties. Most of them who have the profile are from the Medical Faculty in Sarajevo and the least number from the Medical Faculty in Banja Luka. The specificity of this scientific social network is that it provides a number of collaborators on the research presented and the

number of research areas that deal with the scientists. Average values of these parameters showed no significant differences among the faculties. On average, the least number of associates on research projects were utilized by the professors from Banja Luka, and the largest numbers of associates were utilized by the professors from Sarajevo. It should be noted, that, in all faculties, there were professors who did not utilize the associates in the creation of the published research projects, but there were rare cases that they even had 79 associates. Unlike professors who work in Bosnia, a group of scientists who work outside the B&H are significantly more likely to use scientific social network(s). In 90.9% of cases, they had their profile on the BioMedExperts network, had, on average considerably more associates working on the research projects (55.18) and published on average, significantly more papers on Medline (83.36). Number of published papers of scientists working in B&H, indexed in the greatest international database of biomedical literature, Medline shows no significant differences among the faculties (17, 18). The least average number of papers is published by the Banja Luka University and most from the Sarajevo Medical Faculty. We should emphasize here that all faculties have laid down rules for the promotion of professors on the required number of papers that have to be published in the indexed, academic and peer-reviewed databases. But looking at the relevant bibliography, 32% of professors do not meet these criteria. The vast majority of them is from the Medical Faculty in Banja Luka, but some are also present at all other faculties (17, 18).

By taking the opportunities given by the social networks we also have to mention that publishing of private data (i.e. personal information, hobbies, pictures, etc.) is always bound to a significant loss of privacy and can lead to unwanted personal disadvantages. These can arise when social network providers are confronted with security related issues and cyber criminals

steal private data. Social networks also provide the best source for human resources managers when investigating the habits of job candidates. Business models of social networks often include commercial use of user data and due to possibility of automatic analysis a huge number of potential customers can be identified easily. Generally we can say that users can never be sure who is having access to their private data and do not know what third parties have received their data from the social network providers.

6. CONCLUSION

We can conclude that in B&H there are decent conditions for the use of online social networks in the education of health professionals. While students are enthusiastically embracing these opportunities, they are somewhat less embraced by the health care professionals in practice. Scientific health care workers have not shown greater interest in the use of social networks, both for purposes of scientific research and in terms of self-education and training of students. Unlike these scholars, the scholars with similar “background” working outside the B&H use much more the advantages offered by the online social networks, both in education and in support of the scientific research.

Oldest medical journal in B&H – Medical Archives, plays the great role in spreading scientific and research experiences of the authors, physicians and other medical professionals from Bosnia and Herze-

govina supported by PubMed/Medline databases.

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