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Evaluation of online biostatistics education for doctors during the pandemic period

Pandemi döneminde doktorlara yönelik uzaktan biyoistatistik eğitiminin değerlendirilmesi

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Abstract

Background: This research evaluates the results of a distance biostatistics training for physicians during the COVID-19 pandemic.

Materials and Method: Online basic-level biostatistics training consisting of six courses was conducted between 21 October-30 December 2020. At the beginning and after the training, the structured Biostatistics Basic Knowledge Questionnaire consisting of 20 questions developed by the researchers was applied to the physicians who took the training.

Results: A total of 198 medical doctors participated. At the end of the training, 21 of those who participated in the research at the beginning attended more than half of the courses, 45 of them attended less than half of the courses, and 132 physicians did not attend any of the courses. 80.8% of the participants stated that they took the training to make their statistics in their scientific research. After the training, regardless of their professional title and department, the score change was not significant for those who did not attend the classes at all, ($p=0.306$), while it was found that the score increased significantly for those who attended less than half and those who attended more than half of them ($p<0.001$ for both).

Conclusion: The high achievement of even those who attended only some of the courses after the training shows that such distance education models should be developed and widely extended.

Keywords: Pandemic, Biostatistics, Distance education

ÖZ

Amaç: Pandemi döneminde hekimlere yönelik uzaktan eğitim ile biyoistatistik dersi verilerek etkisi incelenmiştir.

Gereç ve Yöntem: 21 Ekim- 30 Aralık 2020 arasında toplam altı dersten oluşan online temel düzey biyoistatistik eğitimi gerçekleştirilmiştir. Eğitim başlangıcında ve sonrasında araştırmacılar tarafından geliştirilen 20 soruluk 'Biyoistatistik Temel Bilgi Düzeyi Anketi' uygulanmıştır.

Bulgular:Toplam 198 hekim katılmıştır. Eğitimler sonunda başlangıçta araştırmaya katılanların 21'i derslerin yarısından fazlasına, 45'i derslerin yarısından azına katılırken, 132 hekim ise hiçbir derse katılmamıştır. Katılımcıların %80,8'i bilimsel araştırmalarda kendi istatistiklerini yapabilmek için katıldığı beyan ederken, eğitim beklentisi ise %79,3'ünde yüksek ya da çok yüksektir. Eğitimi sonrasında mesleki unvan ve bölümden bağımsız olarak derslere hiç katılım göstermeyenlerin skor değişimi anlamlı olmazken ($p=0,306$), yarıdan azına katılanlar ve yarıdan fazlasına katılanlarda anlamlı olarak skorun arttığı saptanmıştır (her ikisi için $p<0,001$).

Sonuç: Eğitimlerin sonrasında derslerin bir kısmına katılanlarda dahi yüksek başarı elde edilmesi bu tür eğitim modellerinin geliştirilmesini gerektiğini önemini göstermektedir.

Anahtar Kelimeler: Pandemi, Biyoistatistik, Uzaktan eğitim

Highlights

- Physicians made efforts to participate in academic trainings even during the pandemic period
- Distance education models should be developed and widely extended.

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Introduction

After the announcement of the COVID-19 (Coronavirus Disease-19) pandemic made by the World Health Organization (WHO) in March 2020, some distance education models (internet applications, television, radio, home packages, etc.) started to be implemented in 73% of 127 countries with the closure of schools (1). In Turkey, education was suspended at many education levels, including higher education. As of March 23, the distance education model was switched to all over the country and continued in 2021 (2). In distance education models, information is delivered to distant people with the help of tools such as satellite, video, audio, graphics and computers, and education can be provided for people in different places at the same or different times (3,4). Thus, we have entered a period in which many online platforms are widely used in education in our country and in the world (5). The impact of this mandatory change is discussed in many studies. Lack of internet and technological devices are characterized as possible negativities. The sense of security created by distance education during the spread of the SARS-CoV-2 virus, the flexibility of learning, and the ability to provide a learning environment similar to face-to-face education with the advancement of technology are expressed as positive aspects of this education model (6,7).

As in all fields of science, people trained in the field of medicine are expected to keep pace with important developments. In order to evaluate and contribute to the scientific literature as part of evidence-based practices, researchers should be competent in areas such as biostatistics, computers and epidemiology, and for this, courses in these areas should be included at various levels of education, including medical faculties (8-10). However, among the courses taken until graduation from medical faculties, there are no courses that will contribute to scientific studies except Biostatistics and Public Health courses. As a matter of fact, in a study conducted with specialist physicians in Turkey, 87% of the participants stated that the statistical courses they took in undergraduate and 84% in specialty education were insufficient during scientific studies. In the same study, 90.6% of the participants stated that they received help in statistics for their studies during specialty training (8).

In the evaluations, it is pointed out that there are inaccuracies in the design and findings of most published studies (11). In a multicenter cross-sectional study, it was reported that participants in medical specialty training could not correctly interpret commonly used important statistical concepts. It was stated that this may affect clinical judgment and medical decision-making processes as well as following and contributing to the scientific literature (12). In a study involving the opinions of specialist physicians regarding statistics education, it was suggested that statistics education should be included in specialty education, that education should be supported by courses or certificate programs, and that there should be research consultancy and training centers that can provide services for employees in health institutions (8). In studies, it is emphasized that it is important for physicians to make a special effort to improve themselves in the field of statistics and/or research in their busy working life after undergraduate or specialty education, to have accessible training opportunities such as online trainings suitable for limited time and to evaluate the effectiveness of these trainings (13).

This study was conducted to evaluate the achievement of the goal of increasing the competence of physicians in the field of biostatistics by distance biostatistics training for the members of an educational foundation established by physicians, to define the participation and attendance status of the training, and to determine the relationship between participation status and training success.

Materials and Methods

Study design

This study, which conducted between October 21, 2020 and December 30, 2020, has an observational descriptive type. It was prepared with 283 people who were members of an educational foundation established by physicians and participated in biostatistics training. Only 33.3% of the participants (21 people attended 4-6 courses and 45 people attended 1-3 courses). Therefore, among those who did not attend any course, two people were matched according to age (±5 years) and gender for each person who attended. Duplicate respondents and participants other than those matched were excluded from the study. Accordingly, a total of 198 people were included in the analyses, 132 of whom did not attend the courses and 66 of whom attended the courses. Sample selection is detailed in Figure 1.

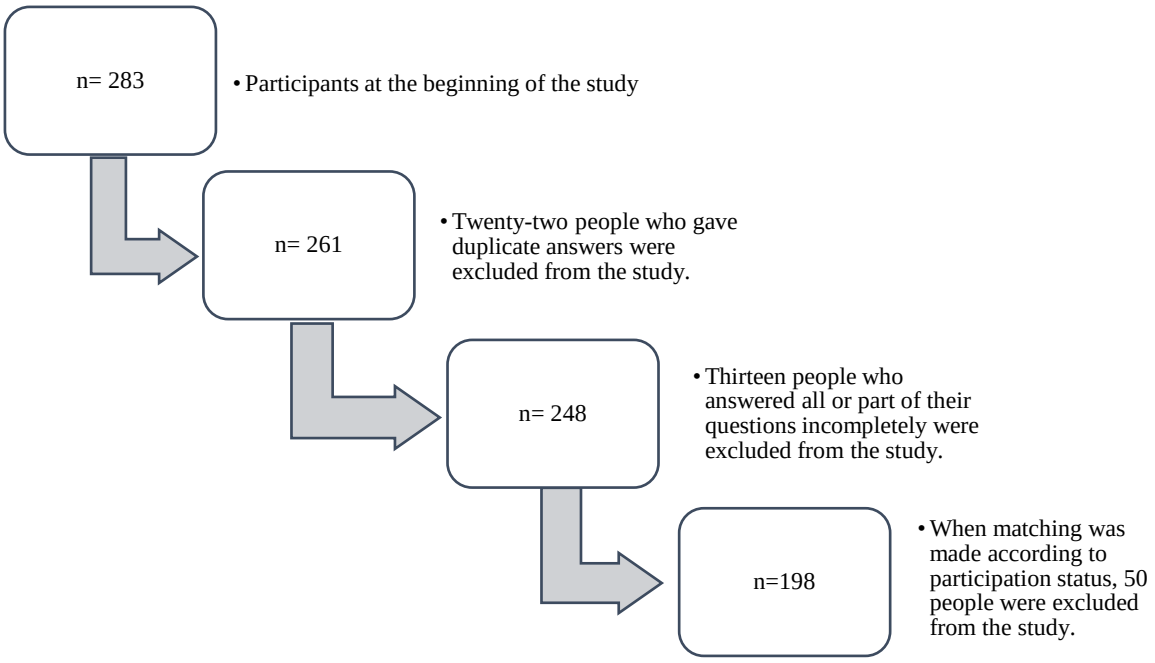

Figure 1. Sample selection of the study

The course consisted of a total of 6 lectures (1-2 hours in duration) on evidence-based medicine, research methods, theoretical basic biostatistics and applied biostatistics, one week apart. The training was delivered online via "Zoom Video Communications". Participation status of the persons to the training was recorded and tracked according to the time they appeared online on the system. The trainer (MO) was an experienced biostatistician and a specialist physician who is an associate professor of public health. The online courses were recorded and made available to the participants for 6 months. In order to ensure instructor-participant interaction in online education, complementary practices were conducted immediately after the theoretical information in the lessons. No homework was assigned and no interim assessment was made. Although preliminary work was done to avoid technical problems during the training, it was not possible to participate in the lessons from Apple/Mac operating systems, and the training could only be carried out on Windows operating systems. Participants were administered the 'Biostatistics Basic Knowledge Level Questionnaire' consisting of 20 questions developed by the researchers before starting the training (first test) and at the end of the training (post-test). While the questionnaire was being developed, it was piloted by a group of 10 doctors consisting of Public Health Specialists. As a result of the pilot application, the questions that were not understood or thought to be far from measuring information were revised and the questionnaire was finalized. There are technical questions in the questionnaire that measure knowledge about biostatistics. For example, 'Cox regression analysis is a univariate analysis'. The answers that the participants can give to these questions are "yes, no and don't know". The minimum score was set as '0' and the maximum score was set as '20', with the correct answer scoring '1' and incorrect and don't know answers scoring '0'. Cronbach's alpha test was used to evaluate the internal consistency of the questionnaire and a satisfactory result was obtained (Cronbach's Alpha = 0.83).

Statistical Analysis

The research data were collected in the virtual (online) environment with the help of "Google Survey" and transferred to IBM SPSS (Version 23.0) program in computer environment with MS Office programs and analyzed. The conformity of the variables to normal distribution was examined by histogram plots and Kolmogorov-Smirnov test. Mean±standard deviation and percentage values were used to present descriptive analyses. Analysis of covariance (ANCOVA) analysis was used to compare the scores obtained from the Biostatistics Basic Knowledge Level Questionnaire. The results were evaluated with 95% confidence interval and margin of error $p<0.05$.

Ethical Consideration

The online written informed consent of all participants included in the study and the permission of Osmaniye Korkut Ata University Scientific Research and Publication Ethics Committee (Decision No: 2021/4/4) were obtained. No fee was charged by the trainers or the foundation for the training (course).

Results

A total of 198 physicians, 92.9% of whom were women, participated in the study. The mean age of the subjects was 37.7±5.7 years (min-max 27-59). Their average professional experience was 13.4±5.6 years. 67.7% of the participants worked in internal sciences, 63.6% were consultants and 24.2% were academicians. As can be seen in Table 1, 77.8% of the participants were married.

Table 1. Demographic characteristics of the participants

Demographic characteristics		n	%
Gender	Male	14	7.1
	Female	184	92.9
Marital Status	Single	36	18.2
	Divorced/spouse deceased	8	4.0
	Married	154	77.8
Professional Title	Academician	48	24.3
	Research Assistant	24	12.1
	Specialist Doctor	126	63.6
Department	Internal Departments	134	67.7
	Surgical Departments	48	24.2
	Basic Science Departments	16	8.1

Among the participants, 80.8% stated that they attended the training in order to be able to do their own statistics in scientific research. While 5.6% of the participants stated that they would like to receive advanced statistics training, 5.1% stated that they would like to reach basic statistical knowledge. Expectation from the training is high or very high in 79.3% of the respondents. When the scientific publication status of the participants in the study presented in Table 2 is analyzed, it is seen that those with ULAKBIM/TR Indexed or International indexed publications are above 60% in both categories. However, only 19.7% of the participants had received biostatistics education outside the medical faculty.

Table 2. Participants' opinions on education and scientific publication status

		n	%
Reason for attending the training	To study advanced statistics	11	5.5
	To learn enough to make your own statistics	160	80.8
	To understand the statistics made in the articles	17	8.6
	To reach a basic level of statistical knowledge	10	5.1
Expectation level from education	Low	2	1.0
	Moderate	39	19.7
	High	88	44.5
	Very high	69	34.8
ULAKBIM/ TR indexed scientific publications		127	64.1
International indexed (ESCI, SCI-E, etc.) publications		120	60.6
Those who have any prior statistics education (other than medical faculty)		39	19.7

When the competencies required to conduct a scientific research were examined, 54% of the participants had no experience in sample analysis, 32.3% had experience in preparing ethics committee documents, 28.8% had experience in preparing institutional permission documents and 28.3% had moderate experience in data entry into SPSS. For basic statistical analysis, 40.4% of the participants had no experience, while 34.3% had little experience (Table 3).

In the present study. after the online biostatistics training. regardless of professional title and department. the score change was not significant in those who did not attend the courses at all ($p=0.306$). while the score increased significantly in those who attended less than half and more than half of the courses ($p<0.001$ for both) **(Table 4 and Figure 1).**

Table 3. Participants' level of experience in some areas necessary for scientific publication

	Level of Experience									
	None		Less		Moderate		High		Very High	
	n	%	n	%	n	%	n	%	n	%
Sample analysis	107	54.0	55	27.8	27	13.6	8	4.0	1	0.5
To be able to prepare an ethics committee application form	11	5.6	32	16.2	64	32.3	63	31.8	28	14.1
To be able to prepare institution permit documents	28	14.1	39	19.7	57	28.8	45	22.7	29	14.6
To be able to enter data to SPSS	43	21.7	40	20.2	56	28.3	41	20.7	18	9.1
To be able to perform basic statistical analysis	80	40.4	68	34.3	36	18.2	11	5.6	3	1.5
To be able to use bibliography programs	97	49.0	44	22.2	27	13.6	22	11.1	8	4.0
Ability to upload articles to the journal	54	27.3	36	18.2	48	24.2	38	19.2	22	11.1

% Percentage of row

Tablo 4. The relationship between participation in training and "Biostatistics Basic Knowledge Level Questionnaire" score

Training attendance status		Mean	Std. Error	%95 Confidence Interval		p
				Lower CI	Upper CI	
Never Participated	Post-before training	0.108[a]	0.221	-0.327	0.543	0.306
≤50% of participation[1]	Post-before training	3.291[a]	0.382	2.538	4.045	<0.001
>50% of participation[2]	Post-before training	9.234[a]	0.553	8.142	10.325	<0.001

a: The covariates in the model are Professional Title = 3.041 and Department = 1.396. 11-3 courses. 2 4-6 courses

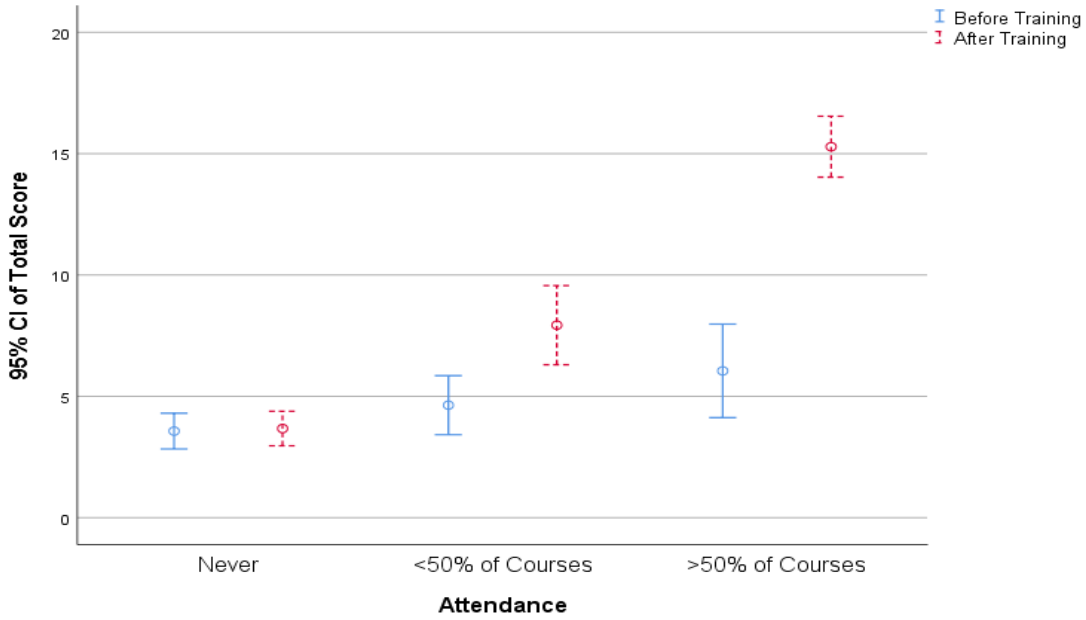

Figure 2. The relationship between participation in training and "Biostatistics Basic Knowledge Level Questionnaire" score

Discussion

In this study, we evaluated the results of online biostatistics training provided to physicians under COVID-19 pandemic conditions. A total of 198 physicians, the majority of whom were women, with an average age of 37.7 years, 63.6% from internal medicine sciences and 67.7% specialists participated in the study. In distance education models, it is recommended that the target group should be suitable for this education model for the effectiveness of education (14). Considering the age and education level of the participants, it is understood that they can adapt to the distance education model. In order to provide effective online education in large groups,

it is recommended to use a suitable online platform, to develop strategies to maintain the attention of the participants, to have people with different abilities in the group, and to support learning with practice. Although biostatistics education is a suitable field for online education due to the nature of the field, health professional groups also constitute a suitable audience for such education (8).

It is seen that 80.3% of the participants did not have a biostatistics education (except for the biostatistics education received at the faculty of medicine) and 80.8% of them participated in the training in order to make their own statistics in scientific research. In a study conducted among specialist physicians in Turkey, 86.3% of the participants stated that they received a training on biostatistics during their specialty training, but 87.2% of them stated that the biostatistics training received during undergraduate and 84.6% during specialty training was insufficient (8). In a study conducted among pathologists, 18 statistical tests used in the field of pathology were determined and the level of knowledge of the participants was questioned, and the level of knowledge for these statistical tests was associated with having received additional statistical training before (15). It is seen that the training provided at the level of medical faculty and specialty education on biostatistics is insufficient and additional training is needed.

After the online biostatistics training, the score changes of those who did not attend the courses at all was not significant regardless of professional title and department. When the adjusted score differences of the participants according to their professional titles and departments were examined, it was determined that those who attended more than half of the trainings had the highest score differences. Those who participated in less than half of the trainings also had a significant score difference compared to those who did not participate at all. These results show that the effectiveness of the trainings is related to the level of participation in the training. Although 66.6% of the participants enrolled in the courses, they never attended the courses. In an evaluation conducted during the COVID-19 pandemic, it was stated that distance education may reduce student attendance and motivation, and that formative assessment that can provide rapid feedback to students in online courses is important for the success of education (16). In the same study, it was stated that the previous use of technology in education was one of the main factors determining the success of education in the early 2000s when online education was just beginning to be implemented (16). In other studies, it has been stated that flexible learning conditions and recording of courses will play an important role in increasing educational success (17,18). In this study. the trainings were recorded and it was tried to provide the opportunity to benefit from the training at flexible hours for the groups who could not participate in class hours.

Limitations

One of the limitations of the study is that the reasons why these people did not continue the training were not questioned. The fact that those who used Mac operating systems during the training could not participate in the training may have caused more or less than expected differences between the groups. Since the operating system used by those who did not participate in the training was not questioned and therefore the characteristics of this group were not known. the situation could not be checked during the analysis. For similar future studies aiming to increase scientific literacy in health research. it would be useful to question the participants' previous online training experiences. to continue biostatistics support to the participants in the long term. to conduct interim evaluations and to evaluate the participants together with their publication outputs.

Possible reasons for course non-attendance leading to failure to achieve the desired success, which have been shown in the literature, may be connection problems, previous experiences, inexperience in the use of technology. The fact that the trainings can only be attended through the Windows operating system may have affected course absenteeism. In addition, the majority of the participants were married, working female physicians with an average age of 38. Although the participants were not questioned about having children and the number of children, considering the effect of the closure of schools and kindergartens during the pandemic on the care of children, women's invisible housework load (secondary shift) may have caused them not to spare time for trainings.

The people included in the study are a group who voluntarily want to receive biostatistics training and are not a representative sample of all physicians; therefore, the results of the study should be evaluated without generalization. It will only be possible to determine whether the goal of learning enough biostatistics to be able to perform their own statistics, which is included in the individual goals of the participants in the study, has been achieved by evaluating the results of the study in the longer term. No additional interviews were conducted with those who did not continue the training and no intervention was made to increase motivation.

Situations that affect the gathering of people such as epidemics also affect education and training activities, and distance education models emerge as a solution. However, considering that "lifelong learning" has become a necessity, it is important to increase post-graduate continuing education opportunities and to ensure that it is

accessible to everyone. In this study, although participation was not compulsory, a general analysis of the relationship between participation in the training and course success is presented. The high success rate after the training, even for those who attended only a part of the courses, shows that such training models should be developed. Despite its limitations, this study suggests that online biostatistics trainings can be effective for improving the concept of biostatistics literacy. but additional studies are needed to increase attendance to the courses.

Conclusion

It has been observed that physicians made efforts to participate in academic trainings even during the pandemic period. Distance education models can create equality of opportunity, enhance the learning experience, support development and overcome geographical limitations, especially for those living outside metropolitan areas.

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Ethical Approval: *This study was approved by Osmaniye Korkut Ata University Scientific Research and Publication Ethics Committee (Decision No: 2021/4/4).*

Author Contributions: *Concept: MÖ, AS. Literature Review: GDT. Design: MÖ, AS. Data acquisition: MÖ, EK. Analysis and interpretation: MÖ, AS, DB. Writing manuscript: MÖ, AS, DB. Critical revision of manuscript: OÖ.*

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