The views of Academic Staff on Biostatistics Education in Health Sciences

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Abstract:

Objective: The aim of this study was to assess the level of importance, adequacy and need of biostatistics and biostatistics education regarding health sciences in Turkey.

Methodology: Within the scope of the study a survey (questionnaire) was applied to a total of 237 academicians (academicians holding various titles employed by different departments) officiating at medical, veterinary medicine and health sciences faculties of six universities (Afyon Kocatepe, Gazi, Ankara, Hacettepe, Marmara ve Düzce) in Turkey. With this survey were taken views of academics on the status of the training they had received regarding biostatistics, their need for biostatistics education, the importance of biostatistics education and its level of adequacy, the source and adequacy of current information on biostatistics, the solutions to meet biostatistics needs and the statistical techniques which were required.

Results: According to the results, 27.8% of the participants have not received biostatistics education. It was determined that the importance of biostatistics education was emphasized as "very and exactly important" by 88.19% of the participants. 14.35% of the participants reported that biostatistics education was far from adequate for post graduate. They needed biostatistics knowledge mainly in the analysis of researches data ($\overline{X}$=4.01). On the other hand, they met biostatistics knowledge needs mostly by "help from friends".

Conclusions: The study revealed that most of the academicians found biostatistics education important but claimed it had been inadequate. They emphasized the need for the organization of courses, seminars, etc. regarding biostatistics at sufficient intervals. As a consequence of that, this study reveals the importance of biostatistics and biostatistics education once again in the data analysis process in health sciences.

Key Words: Biostatistics, Biostatistics education, Health sciences

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Introduction

The contribution of research which defines the process of generating scientific knowledge to the world of science is directly related to the quality of the researchers in terms of realizing the phases forming the process. In order to enable the selection of the right techniques to be used for statistics during the data analysis phase which is an important step in the scientific research process it is necessary to be knowledgeable about statistics. The results achieved by exploiting the statistical techniques in a way that is appropriate with the purpose of the research are relevant to the validity of the research. The significant of statistics and biostatistics education is revealed within this framework consisting of the process of statistics which can be defined as collecting, regulating, analyzing data relevant to a given subject and interpreting the achieved results as well as applying statistical techniques in the field of health sciences research and developing new techniques as well as being relevant to practically all disciplines.

Biostatistics is a branch of applied statistics is a science consisting of statistical techniques and methods used in the field of health sciences. For this reason the role of the principles and methods of biostatistics has continued to gain in importance to date in terms of scientific studies carried out in the fields such as medicine, veterinary medicine, pharmaceutics and biology. Day by day doctors and other researchers working in the field of health sciences become more aware of their needs for the principles and methods of biostatistics. As a result of the need for biostatistics the importance of biostatistics education in the field of health sciences has increased and biostatistics lessons have been placed into the curriculums of both undergraduate and post graduate programs and in addition courses in biostatistics are being arranged for researchers on a more frequent basis. Regardless of the growing awareness on the importance of biostatistics education in the field of health sciences and the increase of new arrangements, many scientific researches [1-6] reveal that the knowledge and attitudes regarding biostatistics among those working in this field show minimal change.

Particularly experts working on assessing data obtained from clinical research and dealing with evidence based medicine currently feel a greater need for epidemiological and statistical principles and techniques. [7] Nevertheless, studies regarding the adequacy of biostatics education portray that clinicians are not equipped with commensurate knowledge in statistics. [7-12]

In short the reasons behind the inadequacy of biostatistics knowledge specified above can be summarized as the perception of biostatistics as a difficult field, lack of sufficiently understanding the importance of biostatics, inadequate biostatistics lessons in the curricula, minimal interest or desire to learn about biostatistics, inability to foresee the absolute need for biostatistics in studies to be executed and/or realizing its importance after the education process and the insufficiencies of problem based approach [5,13-16] applications during the education process.

The aim of this study was to assess the level of importance, adequacy and need of biostatistics and biostatistics education in health sciences by taking the views of academicians in Turkey.

Methods:

The study which bears a descriptive quality was executed by sending a questionnaire to a total of 237 academicians (academicians holding various titles employed by different departments) officiating at Afyon Kocatepe University Medical School and Faculty of Veterinary Medicine, Gazi University Medical School and Faculty of Health Sciences, Ankara Medical School and Faculty of Veterinary Medicine, Hacettepe University Medical School and Faculty of Health Sciences, Marmara Medical School and Düzce University Medical School. The academicians working at the relevant units of the universities were determined with the convenience sampling method [17,18] in which those who are willing can participate in the sampling.

The survey was directed at seeking the views of the academicians on the status of the training they had received regarding biostatistics, their need for biostatistics education, the importance of biostatistics

education and its level of adequacy, the source and adequacy of current information about biostatistics, the level in which biostatistics needs were met and particularly on the statistical techniques which were required. The level of importance, adequacy, need and agreement concerning biostatistics education determined by the participants was given a scale according to the five point Likert [19] scale (between most negative=1; most positive=5).

SPSS for Windows software program was used to analyze the data in the study and the views of the sampling group consisting of academic staff regarding biostatistics and biostatistics education were described with frequency and percentage distributions in addition to calculating the mean and standard deviation values of the articles scored with a five point Likert scale.

Results:

The professional titles of the academic staff forming the sampling group and the distribution of the universities and faculties are presented in Table 1. The assessments (views) of the academic staff participating in the study regarding biostatistics and biostatistics education are given in Table 2-8. According to this assessment 27.80% (f=66) of the participants claim that they have not received biostatistics education while 72.20 % (f=171) claim to have received biostatistics education at a course or seminar or within the scope of either the undergraduate, post graduate or doctorate process (Table 2). 11% of the participants claimed that they did not feel the need for biostatistics education while 89% indicated that they felt the need for education either through lessons, a course, seminar or web based education (Table 2).

Table 1. Distribution of participants by academic title, university and faculty (n=237)

Variable	Groups	f	%
Professional title	Prof. Dr.	49	20.68
	Assoc. Prof. Dr.	66	27.85
	Asst. Prof. Dr.	69	29.11
	Other (research assist., teaching assist., lecturer, ect.)	53	22.36
University	Kocatepe University	59	24.89
	Gazi University	55	23.21
	Ankara University	42	17.72
	Hacettepe University	32	13.50
	Marmara University	30	12.66
	Düzce University	19	8.02
Faculty	Faculty of Medicine	112	47.26
	Faculty of Veterinary Medicine	86	36.29
	Faculty of Health Sciences	39	16.46

Table 2. Distribution of participants by biostatistics education and need status

Education status	f	%	Need status	f	%
No	66	27.80	No	26	11.00
Yes (undergraduate, post graduate, doctorate, course, seminar, etc.)	171	72.20	Yes (Lessons, course, seminar, web based training, etc.)	211	89.00

An examination of the results regarding the existing biostatistics knowledge source for the sample group consisting of academic staff (Table 3) it was deducted that the primary knowledge source was from "lessons during the educational process (undergraduate-postgraduate) (62.9%)", "personal –individual-efforts (54.0%)" ranked second while "knowledgeable friend(s) (46.0%)" were the third most likely source.

Table 3. The sources of current biostatistics knowledge of the participants

Information source	f	%
Lessons received during the education process (undergraduate-post graduate)	149	62.90
Personal (individual) efforts	128	54.00
Friends who are knowledgeable on the subject	109	46.00
Courses-seminars etc. given by private and/or public experts	40	16.90
Scientific meetings (congress, symposium etc.)	29	12.20
Other	2	0.80

f is the number of answers (not participants) because the answers given by the participants is more than one

A majority of the participants marked biostatistics education during formal education process (doctorate, post graduate, undergraduate) as average and over in importance (Table 4) while the importance of biostatistics education was emphasized as "very important" and "exactly important" by 88.19% of the participants for doctorate studies ($\overline{X}$=4.36). In addition 10.13% and 14.35% of the participants indicated that biostatistics education was far from adequate for undergraduate and post graduate studies respectfully (Table 5).

Table 4. The level of importance of biostatistics education in the formal education process

Education process		The level of importance (1-5)					$\overline{X}$	s.d.
		Any	Little	Middle	Very	Exactly		
Doctorate	f	0	3	25	93	116	4.36	0.71
	%	0.00	1.27	10.55	39.24	48.95		
Post graduate	f	0	4	46	106	81	4.11	0.76
	%	0.00	1.69	19.41	44.73	34.18		
Undergraduate	f	18	45	108	47	19	3.02	0.98
	%	7.59	19.00	45.57	19.83	8.02		

Table 5. The level of adequacy of biostatistics education in the formal education process

Education process		The level of adequacy (1-5)					$\bar{X}$	s.d.
		Any	Little	Middle	Very	Exactly		
Undergraduate	f	24	87	93	14	19	2.65	1.02
	%	10.13	36.71	39.24	5.91	8.02		
Post graduate and doctorate	f	34	77	78	31	17	2.66	1.08
	%	14.35	32.49	32.91	13.08	7.12		

While the academic staff participating in the study indicated that they needed biostatistics knowledge during their professional activities mainly "in the analysis of researches data ($\bar{X}$=4.01)", secondly "in the assessment of academic studies (as reader, editor, judge, jury, etc.) ($\bar{X}$=3.78)" and "following work related publications (literature) ($\bar{X}$=3.62)" in the field of study ranked third (Table 6). On the other hand the participants indicated that they met their needs for biostatistics knowledge mostly by "help from friends whose field are not biostatistics ($\bar{X}$=3.35)" while the second most popular source of knowledge was "previous academic publications ($\bar{X}$=3.17)" and "help from academicians in the field of statistics ($\bar{X}$=3.13)" ranked as a third option (Table 7).

Table 6. The level of need of biostatistics knowledge in professional activities

Activity		The level of need (1-5)					$\bar{X}$	s.d.
		Any	Little	Middle	Very	Exactly		
In the analysis of researches data	f	2	19	30	109	77	4.01	0.92
	%	0.84	8.02	12.66	45.99	32.49		
In the assessment of academic studies (reader, editor, judge, jury, etc.).	f	5	17	57	103	55	3.78	0.92
	%	2.11	7.17	24.05	43.46	23.21		
Following work related publications (literature)	f	3	24	70	102	38	3.62	0.93
	%	1.27	10.1	29.54	43.04	16.03		
Teaching-learning activities (lessons, thesis-project execution or consulting etc.)	f	6	27	75	77	52	3.60	1.06
	%	2.53	11.4	31.65	32.49	21.94		
Scientific meetings (congresses, symposiums, seminars, etc.)	f	2	42	64	90	39	3.51	0.98
	%	0.84	17.7	27	37.97	16.46		
Applications (in the area)	f	22	24	78	59	54	3.42	1.22
	%	9.28	10.1	32.91	24.89	22.78		

Table 7. How are the biostatistics needs met in academic studies?

Items		The level of frequency (1-5)					$\bar{X}$	s.d.
		Never	Rarely	Sometimes	Generally	Always		
Help from friends whose field are not biostatistics	f	11	23	99	79	25	3.35	0.92
	%	4.64	9.71	41.77	33.33	10.55		
Help from biostatisticians	f	44	23	59	80	31	3.13	1.31
	%	18.57	9.71	24.89	33.76	13.08		
Academic publications	f	12	54	79	66	26	3.17	1.04
	%	5.06	22.78	33.33	27.85	10.97		
On my own	f	27	76	38	57	39	3.02	1.28
	%	11.39	32.07	16.03	24.05	16.46		
Professional statistics consultants (i.e. companies)	f	86	54	35	32	30	2.43	1.46
	%	36.29	22.78	14.77	13.50	12.66		

While 50.21 % of the participants selected the option of "very agree" and 31.22% selected "exactly agree" option for the proposal of "organizing courses, seminars etc. regarding biostatistics at adequate intervals ($\bar{X}$=4.09)" as a solution to meet the current need for biostatistics, 71.73% also indicated a positive view ("very agree"+" exactly agree") for the necessity of "providing web based training containing all relevant information ($\bar{X}$=3.97)". The option for "academicians should use their own initiative to learn about relevant statistics methods ($\bar{X}$=2.17)" was not very popular (Table 8).

Table 8. The solutions to meet biostatistics needs

Solutions		The level of agreement (1-5)					$\bar{X}$	s.d.
		Any	Little	Middle	Very	Exactly		
Organizing courses, seminars, etc. regarding biostatistics at adequate intervals	f	0	8	36	119	74	4.09	0.76
	%	0	3.38	15.19	50.21	31.22		
Providing web based training containing all relevant information	f	4	16	47	86	84	3.97	0.98
	%	1.69	6.75	19.83	36.29	35.44		
Academicians should use their own initiative to learn about relevant statistics methods	f	75	84	52	15	11	2.17	1.06
	%	31.65	35.44	21.94	6.33	4.64		

The questionnaire which was used as a data collection method for the study also contained an open ended question in addition to the questions indicated above and an effort was made to determine what information particularly in terms of statistical techniques did academicians require. Accordingly, the academic staff participating in the study reported that they most frequently used parametric and non-parametric tests, correlation and regression analyses, ROC curve, time series, validity-reliability and multivariate statistics in their studies and emphasized the need for information on these subjects.

Discussion:

This study which had the overall aim of evaluating biostatistics and biostatistics education in Turkey emphasized the importance of biostatistics and biostatistics education in the formal education process in the field of health sciences as well as present and future studies however a critical approach was directed at the adequacy of the relevant education.

In a study carried out by Ercan et al [6] endeavoring to determine the knowledge of medical faculty students and doctors regarding biostatistics the importance of biostatistics education was emphasized in terms of the validity and reliability of medical research results and for the analytical thinking process of doctors and students. Cheatham [3] indicated that doctors had not received the necessary training to establish a work pattern for an efficient application as well as theoretical statistics and a search revealed that only 33% of 62 surgical residency program curricula featured formal statistical education. Sahai and Ojeda[1] reported that medical students could not fully comprehend the importance of biostatistics education due to their inadequacy regarding career development planning. In a study carried out by Bekiroğlu, [20] a questionnaire was given out to 147 Marmara University Medical School academic and non-academic staff (doctorate, residency and master of sciences students). It was observed that 59.2% of the participants were not interested in biostatistics courses during their education, and their major reason was that participants could not provide the fundamental concepts and techniques of statistics with an understanding of the terms used in experimental and clinical studies. Teaching statistical concepts using computers was the answer most chosen answer, and the most common answers for determining why knowledge of statistics, was needed in their researches were analyzing data, inferring and interpreting the results and modeling. Similarly many research results [11,21-23] regarding the inadequate knowledge of biostatistics of the employed individuals emphasized the importance of the consequences which could take place in the assessment of data acquired from clinical studies and in the decision making process in the field of health sciences, particularly medicine. On the other hand Sami [24] reported that the fundamental reasons for the inadequacy of the biostatistics education of Pakistani medical students was that the students focused more on medicine and fundamental sciences and had very little desire to learn about biostatistics as well as the lack of a problem based approach and insufficient time allocated to biostatistics education.

Conclusion:

In this study the academic staff who answered the survey emphasized their own efforts as a source of biostatistics related information in addition to the lessons received during their education process (undergraduate-postgraduate). In addition it was indicated that biostatistics knowledge is mostly needed in the analysis of study data, in the assessment of academic studies and in following discipline related publications and that the biostatistics needs were mainly met by consulting with friends who were knowledgeable on the subject, from previously published academic publications and help from academicians in the field of statistics. The organization of courses, seminars etc. in biostatistics at sufficient intervals was presented as the most significant solution in meeting current biostatistics needs while a web based education program containing all relevant information was assessed as another alternative.

The study results revealed the importance of the data analysis process which is the most important step in applied quantitative research in the field of health sciences hence the importance of biostatistics and biostatistics education was manifested once again.

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