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Opinions of Assistant Doctors in Süleyman Demirel University Medical Faculty About Statistical Knowledge*

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Abstract: In scientific investigations; statistical knowledge is essential for collection and analysis of data properly as well as correct interpretation of literature information. In this study that was made in March 1997, opinions of 46 assistant doctors in Süleyman Demirel University Medicine Faculty about statistical knowledge were investigated by a questionnaire. All respondents have agreed on the fact that comprehension of the statistical process in an article was necessary for throughout understanding. Besides, 43 of them (93.5%) admitted that their present statistical knowledge was few or absent at all. All assistant doctors stated that a statistical education program need to be carried out during specialization. According to the majority (66.7%), it had to be not less than ten hours. In addition, most widely defined and interpreted statistical tests among the respondents have turned out to be student's t test with 34.7% definition and 37.0% interpretation ratios, and chi-square with 26.1% definition and 32.6% interpretation ratios.

Key Words: Statistics, Statistical knowledge,

Introduction

Statistical knowledge is necessary for collection and analysis of data properly as well as correct interpretation of literature information in scientific investigations. All physicians have to evaluate and make use of current information during their entire practice. Statistical knowledge is an important tool to achieve this. Understanding of a statistical process in a study is crucial for a physician to rely on the literature information that have been emerged. In another word, nearly all readers of investigative literature find that their understanding of reported results depends on statistical considerations and how they have beeen addressed (1).

The term *statistics* derive from the Latin word *status* meaning *manner of standing* or *position*. Scientifically, it can be defined as collecting data -classifying and analyzing; if necessary- and interpreting the results in the extent of a previously constructed plan to solve a problem like enlightenment of causes of an event or some parts of a problem. Central measures (i.e., mean) and distribution measures (i.e., standard deviation) are called *descriptive statistics*. Analytic statistics have rather complicated mathematical functions and need some hypothesis; like comparing either the means, rates, generalizing or correlating processes (2-4).

Saunders & Trapp have divided medical statistics in two parts such as *evaluating the medical literature* and *applying the results to patient care* (2). Moreover they have classified the latter as interpreting vital statistics, understanding epidemiological problems, interpreting information about medication and equipment, using diagnostic procedures, evaluating study protocols and articles and participating or directing research projects.

Method

This study has been carried out in Süleyman Demirel University Medicine Faculty (SDUMF) in March 1997, for definition of statistical knowledge and skills of the assistant doctors in that faculty according to their expressions. This study was meant to be cross-sectional and to be carried out by interviewing. In the questionnaire that was used, definitive questions (age, sex, seniority in specialization, etc.) took the first place. Those came up next: Questions about statistical

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Table 1. Percentage responses of the study group relating to levelsof statistical knowledge.

Questions	Responses	n	%
What's your opinion, about importance of	Very important	27	58.7
understanding the statistical procedures used in	Important	19	41.3
an article to comprehensively read an article? [a]	Not very important	-	-
	Not important at all	-	-
What is your statistical knowledge level? [b]	Good	-	-
	Moderate	2	6.5
	Poor	28	60.9
	None	15	32.6
Is it necessary to carry out a statistical course	At least 10	30	66.7
during residency, how many hours? [c] , *	5-9	-	-
	3-4	13	28.9
	1	2	4.4
	Not necessary	-	-

* One resident did not answer this question.

	n	r**	p
(a-b)	46	0.31	0.038
(a-c)	45	0.34	0.023
(b-c)	45	-0.22	0.193

** Spearman correlation coefficients

knowledge, opinions about statistics as a necessity in examining literature, assessment of their own statistical background and opinions about the necessity of statistics as an educational course. Sequentially, two series of questions about student's t-test, chi square test, non-parametric tests, regression and correlation, sensitivity and specificity, analysis of variance, life table analysis and meta analysis followed as prototypes of variable statistical processes. The first series was consisted of questions about efficiency of subjects on defining the tests listed above, while the next one was involved in their interpretation rates. A questionnaire for examining statistical knowledge of surgery residents that was constructed by Reznick and colleagues (5) was used. Meta-analysis was added later on as it has become increasingly common in current literature as a survey concerning such surveys -in other words, *survey of surveys*- (2). Ultimately, questions on efficiency to use related software as MS-Excel, Microstat, Minitab and Epi were added. All data were evaluated by SPSS. Correlation between the data involving statistical knowledge was evaluated by the Spearman correlation coefficient.

Findings

In this study, from 60 assistant doctors in SDUMF, 46 of them (76.7%) responded the questionnaire and they were assigned as the Study Group (SG). Their seniority in specialization had been found averagely 1.80±0.83 year. The percentage of females in the SG was being 34.6%. As the males were averagely 29.03±1.94 years old and the females are 26.53±1.6, the sum was found to be 28.22±2.17 years old.

As seen in table 1, all subjects have agreed on the fact that comprehension of the statistical process in an article is crucial in examining literature. None of the subjects have claimed their statistical background to be *well*, while the great majority have admitted that their qualification about this subject was poor or none at all. Again, none of the subjects have neglected the need for an educational

Table 2. Percents responses of the study group in self-rating their abilities of definition and interpretation regarding some statistical processes

	Self-Rating (%), (n= 46)							
	Definition				Interpretation			
Statistical processes	Very well	Well	With difficult	Not at al	Very well	Well	With difficult	Not at al
t test	-	13.0	21.7	65.3	10.9	4.3	21.7	63.0
Chi- square	-	-	26.1	73.9	4.3	6.5	21.7	67.4
Sensivity and specificity	4.3	4.3	13.3	78.3	4.3	2.2	19.6	73.9
Regression & correlation	-	2.2	13.0	84.8	-	2.2	23.9	73.9
Non-parametric tests	-	2.2	13.0	84.8	-	2.2	23.9	73.9
Analysis of variance	-	-	17.4	82.6	-	-	19.6	80.4
Life table analysis	-	-	13.0	87.0	-	-	19.6	80.4
Meta-analysis	-	-	13.0	87.0	2.2	-2	13.0	84.8

program about statistics during their specialization periods. Moreover, 30 of them (%66.7) have stated that such a course ought to be at least 10 hours long. The rate of admittance of necessity of statistical background in examining literature was found to be associated with the levels of statistical knowledge (r=0.31, p=0.038). The same item was found associated with the rate of agreement to an educational program during residency (r=0.34, p=0.023).

As seen in table 2, definition ratios of certain statistical issues within the SG were evaluated. Regardless of whether being correct or with little error, the most commonly defined and interpreted statistical processes were found to be t-test and chi-square test. T-test have been defined with a ratio of 34.7% and interpreted with 37.0% by SG. Chi-square test has been defined with a ratio of 26.1% and 32.6% interpretation. The most scarcely defined processes were found to be meta-analysis and life table analysis (both 13%) with regression&correlation and non-parametric tests (both 15.2%). The lowest interpretation ratios that was observed within were meta-analysis (15.2%), analysis of variance and life table analysis (both 19.6%). Though statistically not significant, interpretation ratios of all methods were found to be lower than definition ratios (see figure).

According to the ability to use software products, the most common used program was turned out to be MS Excel (n=19, 41.3%) which followed by Microstat (8.7%) and SPSS (6.5%). Non of the subjects was found to be able to use Minitab and Epi programs.

Discussion and Conclusion

In a study that made by Reznick and colleagues among 91 surgical residents, majority of the subjects stated that comprehension of statistical procedures is important or very important to understand an article properly (5). In our study, not only all the respondents agreed about this statement, but also the vast majority of SG (93.5%) admitted that their statistical knowledge is only few or absent. This ratio is higher than that Reznick had reported (66.7%). Despite statistical procedures were being confronted more commonly than ever, the ratios that found both in our study and in Reznick's indicate that reviewers lack sufficient knowledge about it. Apparently, this was been noticed by many of the reviewers as 66.7% of SG have stated that at least ten hours of statistical education program was necessary during specialization.

In a study that made by Günay in Erciyes University Medical Faculty, 90% of educational staff and 75% of residents have reported that they needed biostatistical

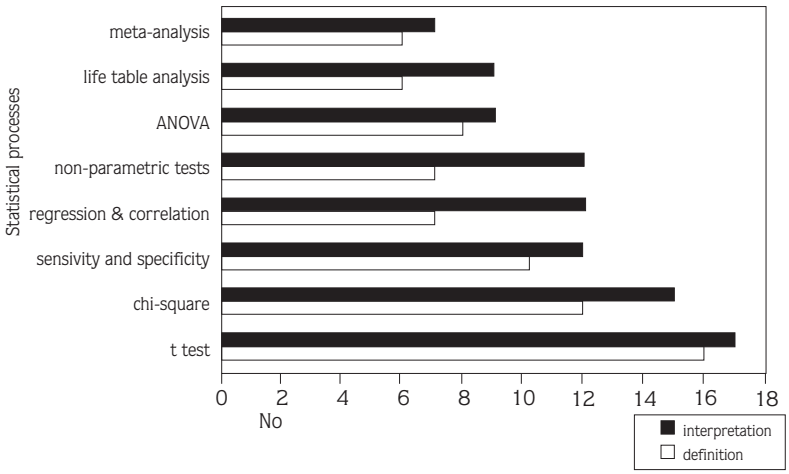

Figure. No of asistant doctors in the study group in self-rating their abilities regarding some statistical processes

methods in their research practice (6). Again in the same study, 81% of educational staff and 66% of residents have reported that biostatistical education ought to take place in post graduate programs.

Though the biostatistics courses have been held in all medical faculties of Turkey since 1982, the goal has not been achieved yet. This was also been established by a research that made by Turkish State Council (TBMM) among the medical students that to be graduated in 1990 (7). According to this study, the level of comprehension of biostatistics among subjects was not satisfactory: The great majority of 1498 medical students (85%) reported that their biostatistical knowledge level was "low to moderate".

The use of analytic statistical processes becomes increasingly common in medical literature. In a study, Altman carried out a survey of the statistical methods that been used in the first 100 original articles published in the *New England Journal Of Medicine* in 1990 (8). Than he compared his findings with those of Emerson and Colditz who had studied the same journal in 1978-79 (9). According to Altman's study, the proportion of articles that had been used analytic statistical methods has attained a level of 89% in 1990 while it was 73% in years' 1978-79. Notably, despite there have been no significant increase in simple statistical methods, linear regression and non-parametric methods have shown nearly doubled increases in addition to a dramatic surge in the use of more complex methods.

Altman also reported that in another article, all issues of the journal *Pediatrics* of 1952, 1962, 1972 and 1982 had been examined to see what sort of statistical methods had been used (10). In result, the proportion of articles that used analytic statistical methods was found to be 13%, 20%, 28% and 48%, respectively. In the same study the proportion of articles that used no statistical methods or only simple ones (measures of dispersion, t-test, χ^2 test, correlation) had decreased markedly as corresponding percentages were found to be 97%, 95%, 88% and 65%. Also in the same study, when the original articles were been considered exclusively, half of those which published in 1982 could not be properly understood by someone who is familiar with no more than simple statistical procedures.

Meta-analysis is one of the most striking advents of statistics in recent years. It is a synthesis consisting of discrete but resembling surveys. Though generally used in controlled clinical trials, this new approach is being used increasingly in epidemiological surveys (8). Among SG, this method has turned out to be one of the fewest defined and interpreted methods.

It worth emphasizing that in both Reznick's study and SG, complex analytic methods had been defined and interpreted less commonly than simple ones despite current increase in their availability in medical literature. Altman states that despite the current incline to use complex methods in medical statistics, this tendency could not be brought to use of medical students; furthermore, it had not taken place in post graduate programs (8).

Although there might be many reasons that account for the changes in statistical applications, the current availability of many software products is an important one. With these programs, increasingly complex statistical analyses could be bring around. According to the SG's percentages, these were found to be used very few, except Excel.

At last, one should consider that the faculty in which

this study has been carried out was so young; noticing the little amount (target population only 60 assistant doctors) and average seniority period (1,8 years) of residents.

Consequently; it could be stated that statistical education in medical faculties must be revised to comprise vastly emerging improvements that had been fostered by technologic facilities. Moreover, urgent needs of medical staff who are to follow and contribute to the improvements must be supplied by post graduate education programs.

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