academicJournals

Vol. 7(7), pp. 113-118, July 2015
DOI: 10.5897/JDOH2015. 0161
Article Number: 11410A453923
ISSN: 2141-2472

http://www.academicjournals.org/JDOH

Journal of Dentistry and Oral Hygiene

Full Length Research Paper

Dental professionals' attitude towards biostatistics

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Received 7 June, 2015; Accepted 26 June, 2015

The aim of this study was to evaluate the attitude of dental professionals towards biostatistics. A cross-sectional questionnaire survey was conducted among all the faculty members and postgraduate students of dentistry at Riyadh Colleges of Dentistry and Pharmacy, Kingdom of Saudi Arabia. Descriptive analysis was undertaken and differences between groups were examined using Chi-square test. A response rate of 53.7% (n = 102) was achieved. Biostatistics was believed to be a difficult subject by 57.8% (n=59) of the respondents. Only 28.4% (n=29) respondents were confident that they can conduct their own statistical analyses with confidence. Majority of the respondents reported a positive attitude to the questions concerning perceptions of biostatistics and its relationship to research and evidence based dentistry. Dental professionals showed a low perceived knowledge of biostatistical concepts despite a clear recognition of the importance of these issues. There is a need of changing the training pattern of biostatistics for dental professionals. An integrated approach to teaching biostatistics with clinical relevance would make them confident enough to apply biostatistics in their clinical practice.

Key words: Dental, professionals, attitude, biostatistics, perception.

INTRODUCTION

Biostatistics is an integral part of medical/dental research and an important element of evidence based practice in dentistry. The analysis of data from any research project seeks to answer the research question which was set at the beginning of the study (Williams et al., 2004). Dental professionals are expected to read dental journals and participate in postgraduate training in order to keep updated of new developments. It is therefore important that they are able to assess reports of original research. Clinicians and academicians review articles frequently on patient care, research, and education. Most of the articles are accompanied by statistics to either validate or question the findings/conclusions of the investigations. An attitude towards statistics is a measure of positive and negative feelings toward the subject in terms of relevance and value, difficulty and self-efficacy, and general impression toward the subject (Evans, 2007).

A recent study in India reported a lack of command over the subject of biostatistics among dental professionals, although they were aware of its importance in dentistry (Batra et al., 2014). Studies on postgraduate dental students showed a high level of attitude towards

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biostatistics (Kumar et al., 2014; Wadhwa et al., 2015). A study on medical professionals reported low perceived knowledge of biostatistics despite a clear recognition of the importance of these issues (West and Ficalora, 2007). Irish and Chinese postgraduate medical students reported positive attitudes about their interest towards statistics, but they tended to view statistics as difficult (Hannigan et al., 2014; Zhang et al., 2012). Medical residents lacked the knowledge in biostatistics needed to interpret results in published clinical research (Windish et al., 2007).

Statistical knowledge can lead to the attitude of dental professionals towards the subject. Positive attitudes contribute to a better use of statistical knowledge and improvement of positive attitudes towards statistics is a critical goal in statistics education (Pimenta et al., 2010). Rationale of this study includes, need to effectively interpret results for patients as clinical decisions become more complex and limited access to statistical experts when required. Understanding current perceptions of dentists regarding biostatistics and its role in both research and clinical practice may be helpful in improving teaching on this subject. Moreover, the perception concerning this subject has not been thoroughly assessed among the dental professionals. The aim of this survey was to evaluate the attitude and to assess fundamentals and training of dental professionals towards biostatistics in Riyadh Colleges of Dentistry and Pharmacy (RCsDP), Kingdom of Saudi Arabia (KSA).

METHODOLOGY

An anonymous cross-sectional questionnaire survey was conducted among all the faculty members and postgraduate students of dentistry in RCsDP. Questions using five-point Likert scales which were adapted from validated existing surveys that addressed medical clinicians' attitudes toward biostatistics (West and Ficalora, 2007) were used. Questions from the validated questionnaire were taken directly with slight modifications being made to match it for the dental professionals. The questionnaire was piloted on a representative sample of faculty and postgraduates who were not part of the study population. Final questionnaire was administered to each of the eligible members through e-mail. The purpose of the study was explained in an accompanying letter. Two weeks time was given to all the participants to complete the questionnaire and in between two reminders was sent. Closed questions were utilised permitting respondents to scale responses from 1 ("strongly agree") to 5 ("strongly disagree") on a five-point Likert scale across eighteen items to assess the attitude about biostatistics.

The questionnaire had sections examining attitude and demographic details of the participants. Questions addressed perceptions regarding biostatistics in general, statistical knowledge and training, the role of biostatistics in clinical research, and links between biostatistics and evidence based dentistry (EBD). Demographic details included gender, years of experience, department, academic position, and career focus. Participants were informed that completion and return of the questionnaire implied consent to participate in the study. The questionnaire took approximately 10 min to complete. To make the Chi-square test valid, strongly agree and agree response were merged for some questions. Data was analysed using SPSS version 18 for Windows. Associations between responses to certain questions and demographic factors was analysed with the Chi-square test; level of statistical significance was set at $p \leq 0.05$. This study was approved by the ethical committee of RCsDP.

RESULTS

The survey response rate was 53.7% (102/190). Response rates differed by academic position, with a significantly lower response rate among postgraduate students (40.8 versus 74.3% among teaching faculty; $p<0.05$). 58.8% (n=60) were male and 41.2% (n=42) were female. Out of the total respondents, 52% (n=53) were faculty members and 48% (n=49) were postgraduate students. Most of the study participants (67.6%, n=69) focused on academic clinical careers and had ≤15 years experience (74.5%, n=76) (Table 1). Responses to each of the individual survey questions are presented in Table 2.

General perceptions

Biostatistics was believed to be a difficult subject by 57.8% (n=59). Respondents with >15 years experience (p=.017) and faculty members were more likely to disagree (p=0.033). 49.8% (n=51) disagreed that biostatistics is more difficult than other subjects in dentistry; respondents from OMFS and diagnostic science department were more likely to agree than others (p=0.037). Most of the respondents (69.6%, n=71) believed that it would be helpful for them if the teachers/consultant biostatisticians whom they are consulting for statistical help have some knowledge of dentistry so that they could understand their needs. 86.2% (n=88) respondents agreed that knowing biostatistics will benefit their career and 57.9% (n=59) agreed that biostatisticians have high status within the dental field.

Perceptions of knowledge and training

52% (n=53) of respondents reported that their training in biostatistics was adequate for their needs. 37.2% (n=38) felt that their current level of training in biostatistics in dentistry is adequate and postgraduates were more likely to agree than faculty members (p=0.001). 50% (n=51) thought their previous biostatistics coursework had been taught effectively and females were more likely to agree than males (p=0.028). A total of 52% (n=53) of respondents agreed that they could identify when correct statistical methods had been applied in a study, 41.5%

Table 1. Demographic data of the respondents.

Demographic	Number (%) of respondents
Gender	
Male	60 (58.8)
Female	42 (41.2)
Years of experience	
≤15 years	76 (74.5)
>15 years	26 (25.5)
Academic position	
Faculty member	53 (52.0)
Postgraduate student	49 (48.0)
Department	
OMFS and diagnostic sciences	17 (16.7)
Preventive dentistry	36 (35.3)
Prosthodontics	17 (16.7)
Restorative dentistry	32 (31.4)
Career focus	
Clinical (academic)	69 (67.6)
Clinical (nonacademic)	19 (18.6)
Research	14 (13.7)

(n=46) of the respondents believed they could design their own research projects with confidence, and only 28.4% (n=29) respondents were confident that they can conduct their own statistical analyses with confidence. Females, respondents with ≤15 years of experience, faculty members, respondents from preventive dentistry and restorative dentistry department, and clinical academic career focused respondents were more confident in conducting their own statistical analysis and design their own research projects in comparison to others. None of the knowledge perception questions were statistically significant by gender, years of experience, academic position, department, or career focus ($p>0.05$) (Table 3).

Perceptions of biostatistics and research

95.1% (n=97) of respondents agreed that biostatistics should be an integral part of research. Majority of the respondents (73.5%, n=75) thought that a biostatistician should be centrally involved in most research. A total of 93.2% (n=94) of respondents agreed that knowledge of biostatistics is necessary for a clinician involved in research. Opinion was less strong regarding the necessity of biostatistical knowledge for clinicians not involved in research (45.1%, n=46).

Perceptions of biostatistics and evidence based dentistry

Questions concerning perceptions of biostatistics and its relationship to EBD revealed that 93.2% (n=95) of respondents believed that biostatistics is an important part of EBD and 95.1% (n=97) believed that knowledge of biostatistics is necessary when evaluating dental literature. Majority of the respondents (93.1%, n=95) thought that EBD is important for clinical practice.

DISCUSSION

The results of our study showed significantly lower response rate of postgraduate students in comparison with the faculty members. Majority of the respondents focused on academic clinical career. Approximately half the respondents believed that biostatistics is a difficult subject and more difficult than other subjects in dentistry. Majority agreed that knowing biostatistics will benefit their career. Half the respondents reported that their training in biostatistics was adequate for their needs and that their

Table 2. Response regarding dental professionals' attitude towards biostatistics.

Question	Number (%)					
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Median (1-5)
General perceptions						
Biostatistics is a difficult subject	13 (12.7)	46 (45.1)	17 (16.7)	23 (22.5)	5 (2.9)	2
Biostatistics is more difficult than any other subject in dental training	6 (5.9)	29 (28.4)	16 (15.7)	41 (40.0)	10 (9.8)	3.5
Biostatistics would be more helpful for teachers and consultants if they understood dentistry	31 (30.4)	40 (39.2)	17 (16.7)	12 (11.8)	2 (2.0)	2
Within the dental field, biostatisticians have high status	22 (21.6)	37 (36.3)	29 (28.4)	11 (10.8)	3 (2.9)	2
It would benefit my career to better understand biostatistics	44 (43.1)	44 (43.1)	7 (6.9)	6 (5.9)	1 (1.0)	2
Perceptions of knowledge and training						
My training in biostatistics is adequate for my needs	17 (16.7)	36 (35.3)	22 (21.6)	27 (26.5)	0 (0)	2
The current level of training in biostatistics in dentistry is adequate	9 (8.8)	29 (28.4)	27 (26.5)	32 (31.4)	5 (4.9)	3
My previous biostatistics course work was taught effectively	17 (16.7)	34 (33.3)	25 (24.5)	21 (20.6)	5 (4.9)	2.5
I am able to tell when the correct statistical method has been applied in my study	12 (11.8)	41 (40.2)	30 (29.4)	16 (15.7)	3 (2.9)	2
I am able to design my own research projects with confidence	15 (14.7)	31 (30.4)	31 (30.4)	18 (17.6)	7 (6.9)	3
I am able to conduct my own statistical analyses with confidence	9 (8.8)	20 (19.6)	41 (40.2)	23 (22.5)	9 (8.8)	3
Perceptions of biostatistics and research						
Biostatistics should be an integral part of most research	56 (54.9)	41 (40.2)	4 (3.9)	1 (1.0)	0 (0)	1
Biostatistics is a necessary skill for a clinician involved in research	52 (51)	43 (42.2)	6 (5.9)	1 (1.0)	0 (0)	1
Biostatistics is a necessary skill for a clinician not involved in research	16 (15.7)	30 (29.4)	31 (30.4)	19 (18.6)	6 (5.9)	3
Biostatisticians are not necessary for most research	5 (4.9)	7 (6.9)	15 (14.7)	36 (35.3)	39 (38.2)	4
Perceptions of biostatistics and evidence based dentistry						
Biostatistics is an important part of evidence based dentistry	68 (66.7)	27 (26.5)	5 (4.9)	1 (1.0)	1 (1.0)	1
Knowledge of biostatistics is necessary when evaluating dental literature	60 (58.8)	37 (36.3)	4 (3.9)	1 (1.0)	0 (0)	1
Evidence based dentistry is important for clinical practice	60 (58.8)	35 (34.3)	6 (5.9)	1 (1.0)	0 (0)	1

previous biostatistics coursework had been taught effectively. However, only just over a quarter of respondents were confident of conducting statistical analysis on their own. Majority agreed that biostatistics should be an integral part of research and knowledge of biostatistics is necessary for a clinician involved in research and had a positive attitude towards perceptions of biostatistics and EBD.

Most of the respondents in this study believed biostatistics to be a difficult subject similar to the findings of the previous studies (Hannigan et al., 2014; Kumar et al., 2014; Zhang et al., 2012). However, majority disagreed that it is more difficult than any other subject in dental training.

Table 3. Analysis of perception of knowledge by gender, years of experience, academic position, department, and career focus.

Variable	Respondents who agree or strongly agree, Number (%)					
	I am able to tell when the correct statistical method has been applied in my study	p-value	I am able to design my own research projects with confidence	p-value	I am able to conduct my own statistical analyses with confidence	p-value
Gender						
Male	30 (50.0)	0.641	27 (45.0)	0.923	15 (25.0)	0.279
Female	23 (54.8)		19 (45.2)		14 (33.3)	
Years of experience						
≤15 years	41 (53.9)	0.758	37 (48.7)	0.432	23 (30.3)	0.776
More than 15 years	12 (46.2%)		9 (34.6)		6 (23.1)	
Academic position						
Faculty	27 (50.9)	0.799	29 (54.7)	0.083	16 (30.2)	0.915
Postgraduate student	26 (53.1)		17 (34.7)		13 (26.5)	
Department						
OMFS and diagnostic sciences	9 (52.9)	0.369	7 (41.2)	0.773	4 (23.5)	0.537
Preventive dentistry	21 (58.3)		17 (47.2)		12 (33.3)	
Prosthodontics	5 (29.4)		6 (35.3)		3 (17.6)	
Restorative dentistry	18 (56.3)		16 (50.0)		10 (31.3)	
Career focus						
Clinical (academic)	38 (55.1)	0.711	32 (46.4)	0.987	20 (29.0)	0.221
Clinical (nonacademic)	10 (52.6)		8 (42.1)		4 (21.1)	
Research and others	5 (35.7)		6 (42.9)		5 (35.7)	

Respondents in the current study reported a neutral to positive attitude on questions related to knowledge and training in biostatistics. This could be due to the extensive research activities among faculty members and postgraduates in RCsDP. Although this finding differed from the studies in India and United States (Batra et al., 2014; West and Ficalora, 2007) which reported a negative attitude; the finding from the present study indicates that the commonly held belief that dental professionals have negative attitudes toward statistics may in fact not be true. Interestingly, more females than males in this study reported that they are confident in conducting their own statistical analysis. A meta-analysis of recent studies of gender and mathematics performance reported that females have reached parity with males (Lindberg et al., 2010).

An improved understanding of biostatistics is necessary for dental professionals. The current study shows that there is lack of command over the subject of biostatistics among dental professionals in agreement with the past studies (Polychronopoulou et al., 2011; Windish et al.,

2007). However, they were aware of its importance in dentistry and reported a neutral to positive attitude. The fact that only 28.4% respondents were confident that they could conduct their own statistical analyses with confidence suggests that there is a need for changing the training pattern of biostatistics for dental professionals which would make them confident enough to apply biostatistics in their clinical practice. Biostatistics is perceived as an important element of EBD and successful efforts to teach biostatistics may benefit from incorporating biostatistical concepts into EBD teaching.

Results from this study could be affected by response bias as the demographic data was not available for non-respondents. Another limitation was that the survey has been limited to a single private dental institution in KSA, so it cannot be generalized as there would be variations in responses of government institutions. Moreover, the responses reported in this study are best interpreted as perceptions of the respondents based on their own definition of biostatistics. The survey was also brief, thus limiting the ability to assess understanding of all biostatistical concepts. Further research should consider developing and testing interventions to develop positive attitude towards biostatistics and to identify effective methods that will transform their perceptions towards the subject. Qualitative study will be more informative and accurate in understanding the attitude of dental professionals towards biostatistics.

Conflict of Interest

The authors have not declared any conflict of interest.

ACKNOWLEDGEMENT

The authors would like to thank the faculty members and postgraduate students for participating in the study.

Abbreviations: EBD, Evidence based dentistry; **RCsDP,** Riyadh Colleges of Dentistry and Pharmacy; **KSA,** Kingdom of Saudi Arabia.

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