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Original Article

Awareness and attitude towards applications of biostatistics by the healthcare professionals in their decision making in north Karnataka, India

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ABSTRACT

Background & Aim: The objective of our study was to find out the awareness, inclination and desire to apply the biostatistics as a tool in their areas of work by healthcare professionals.
Methods & Materials: A cross-sectional study was done using self-administered, validated questionnaire, among the faculty, resident doctors and internees of medical college, physiotherapy college, dental college and nursing college. Study was done in North Karnataka, India, during 2012-13.
Results: Out of a total of 500 questionnaires that were distributed among participants, only 460 questionnaires were received with a dropout rate of 8%. The response rate was 92%. Most of the respondents believed that the biostatistics is more difficult than other subjects of medical sciences. The total mean perception of knowledge scores was 21.2 ± 4.26 and total mean attitude scores was 33.4 ± 6.78 and were statistically significant ($P < 0.05$).
Conclusion: The study has brought out the fact that "biostatistics" is a difficult subject, more of mathematics and is best left to experts. However the respondents have felt "biostatistics" an important part of evidence based medicine and a necessary skill for healthcare professional.

Introduction

The healthcare professionals make many decisions every day. These decisions may be for diagnostic, laboratory tests, interpretation of test results, prescription of drugs and evaluating the outcome; all in the interest of the patient. In most of the times such decisions (1, 2) are made with the information gathered from the patient, information accrued with the clinician over the years and sure varies with different clinicians. It is well known that medical field is full of uncertainties and there is full scope for probabilities (3). In such a scenario, is there any place for biostatistics to improve such decisions? Will statistical sense give additional edge to healthcare professionals in managing their patients? Knowledge of biostatistics helps clinicians in drawing inference. Without this a health professional may draw disastrous conclusions from clinical experience because, has no concept of appropriate scientific method (4).

Ongoing advances in knowledge and technology in healthcare has offered new and better ways to solve the key health problems. With the increasing volume and diversity of information, controversies, and complexities, particularly with the increasing cost of medical care, a tool or application is necessary to make proper decisions about the care of individual patients or the delivery of health services. Perhaps biostatistics fulfills this vacuum.

Health professionals should understand the results of research and to make decisions after critically reviewing the evidence (5, 6); they need to be equipped with good knowledge and understanding of concept and applications of biostatistics. This can improve the clinical

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decision-making, program assessment and biomedical research; essentially used to verify the clinicians and researchers' findings and feelings, and gives scientific validity for their inferences (7, 8).

Besides, every day good number of healthcare professionals come to us. They need our assistance in working out sample size, data compilation and data analysis as fulfillment of a part their study. Once their work is over perhaps it is their last visit to the statistician and we also forget them.

However, studies conducted towards the perception of knowledge and attitude of healthcare professionals towards biostatistics in India are scarce. Understanding the current level of awareness, attitude of healthcare professionals towards biostatistics may help to revise the curriculum, teaching methods and continuing education programs, by incorporating this important field of research and data management. Therefore, one such study in north Karnataka, India, was necessary.

Methods

It is a cross-sectional study among the faculty, postgraduate students and internees in healthcare sciences colleges in north Karnataka, India. A questionnaire was developed to acquire the information related to the aim of the study. The perception of knowledge questionnaire contained 18 questions on 5-point Likert scales of 'strongly agree' to 'strongly disagree' a phrased in the negative direction with 'strongly agree' was coded as '1' and 'strongly disagree' as '5' adapted from validated existing questionnaire. However, the attitude questionnaire contained 27 questions on 5-point Likert scales of 'strongly agree' to 'strongly disagree' a phrased in the positive direction with 'strongly agree' was coded as '5' and 'strongly disagree' as '1' adapted from validated existing surveys that address attitudes toward statistics. Demographic variables considered were gender, level of education, specialty, and department.

The questionnaires were distributed among the respondents in June 2012, after getting proper permission from the competent authority and written consent. Before start of the actual study, the reliability of the questionnaire was performed with a convenient sample of 45 students and the split half reliability coefficient was 0.91 and internal consistency (i.e. Cronbach alpha) ranged from 0.26 to 0.54.

Academic ranks were categorized into three broad categories namely-senior faculty (included assistant professors and higher ranks), resident doctors (included senior, junior, tutors) and internees. A one-way analysis of variance (ANOVA) was performed to test significant differences between these three different groups, with knowledge and attitude scores followed by Tukey's multiple post hoc procedures.

The data were analyzed descriptively using SPSS for Windows (version 15; SPSS Inc., Chicago, IL., USA). Chi-square test was used to determine the association between demographic variables (gender and academic ranks) and other responses. Statistical significance was set at 5% level ($P < 0.05$).

Results

There were 460 respondents (n = 460) in the study with 8% dropout rate. The total mean perception of knowledge scores was 21.2 ± 4.26 and total mean attitude scores was 33.4 ± 6.78 and were statistically significant ($P < 0.05$). Most of the respondents agreed that "biostatistics" is a difficult subject 58.1 ± 5.7 (Table 1).

Table 1. Comparison of interns, postgraduate students and faculty members with total knowledge and attitudes by one-way analysis of variance

Year of training	Knowledge scores Mean (SD)	Attitude scores Mean (SD)
Interns	20.1 (3.81)	31.7 (5.45)
PGs	21.7 (4.25)	34.3 (7.19)
Faculty	20.9 (4.47)	32.6 6.29 ()
Total	21.2 (4.26)	33.4 (6.73)
F-value	5.2126	6.2508
P-value	0.0058*	0.0021*
Pairwise comparisons by Tukey's multiple post hoc procedures (P-value)		
Interns vs. PGs	0.0048*	0.0029*
Interns vs. faculty	0.3764	0.5772
PGs vs. faculty	0.2420	0.0764

SD: Standard deviation; PGs: postgraduate students
* $P < 0.05$

Faculty experience: Difficulty in writing their statistics section in their articles was 50.5 ± 9.5 ($P < 0.05$). It takes them long time to understand statistical concepts (50.5 ± 3.8). Dealing with numbers made them uneasy (53.3 ± 5.7). They believed biostatistics is an important part of evidence based medicine (54.3 ± 22.9; $P < 0.05$; Tables 2 and 3)

Resident doctors: They believed knowledge of biostatistics would improve their career (43.6 ± 10.9; $P < 0.05$). Only a moderate number (24.1 ± 8.2) were able to analysis/design their projects (42.8 ± 23.0). Statistical thinking was seen as an important skill (47.5 ± 14.4; $P < 0.05$). They believed biostatistics is really useful (49.0 ± 21.8; $P < 0.05$) and training in biostatistics will make them a better professional (39.7 ± 14; $P < 0.05$; Tables 2 and 3)

Internee believed biostatistics is a necessary skill for a clinician (36.1 ± 10.3; $P < 0.05$).

Discussion

Our study involves healthcare professionals from medicine and allied health sciences. We have put them broadly into three major groups as faculty, resident doctors and internees irrespective of their specialty. We were able to achieve our objectives of study.

The results of our study revealed that there is a low level of knowledge and attitude towards biostatistics. Most of the respondents agreed that biostatistics is a difficult subject. These findings are indicative of a more pragmatic and integrated approach towards teaching of biostatistics highlighting how "patient care decisions" can be improved (9). We are aware of the fact that pure statistics needs harmonious transformation into analytic inferences in biological processes (10).

The faculty have strongly brought out the importance of biostatistics in evidence based medicine, voiced their difficulty, uneasiness and shortcomings in writing their articles. Faculty with extensive research experience and advanced statistical training thought they had a notable lack of competence. One obvious gap here was biostatistics which was more emphasized for epidemiological purpose than evidence based medicine (11, 12).

Table 2. Item wise responses of respondents

Items	SD	D	N	A	SA
Biostatistics is more difficult than other subjects of medical training	2.6	13.5	22.4	52.5	8.9
Within the medical field biostatisticians have high status	2.2	12.0	23.3	46.6	15.9
It would benefit my career to better understand biostatistics	4.8	23.7	24.6	39.0	7.8
The current level of training in biostatistics in medicine is adequate	8.9	32.7	28.3	27.5	2.6
I am able to design my own research projects with confidence	10.5	35.5	23.3	24.4	6.3
I am able to conduct my own statistical analyses with confidence	4.6	16.3	17.6	39.0	22.4
Biostatistics is a necessary skill for a clinician involved in research	18.3	23.1	16.3	28.3	13.9
Biostatistics is an important part of evidence-based medicine	3.1	8.1	18.3	49.7	20.9
Knowledge of biostatistics is necessary when evaluating medical literature	1.5	7.0	17.2	51.9	22.4
Biostatistics is really useful	2.6	9.6	24.0	48.6	15.3
Biostatistics is too mathematical oriented	3.1	15.5	24.6	41.6	15.3
Biostatistics is best left to the 'experts'	3.5	12.9	22.4	49.0	12.2
Training in biostatistics will make me a better professional	5.2	17.4	27.2	39.4	10.7
Biostatistics is very mysterious to me	3.7	29.4	24.4	30.5	12.0
Biostatistics is too complicate for me	6.5	25.5	26.1	32.5	9.4
Dealing with numbers makes me feel uneasy	5.2	17.2	26.1	40.3	11.1
I am excited about actually using biostatistics in my job	5.0	11.6	25.1	44.5	13.8
Bio-statistical thinking is an important characteristic of good research	3.7	13.7	26.6	44.7	11.3
Biostatistics become more understandable and useful in my career	5.4	16.1	33.6	37.7	7.2
It took me a long time to understand statistical concepts	3.3	20.0	25.5	41.0	10.2
It is difficult to expect the average professional to master and apply	2.6	21.1	27.9	38.3	10.0
You should be good in mathematics before attempting biostatistics	2.2	19.4	23.7	43.6	11.1
I feel difficult to write the statistical section of my articles.	2.8	17.0	27.9	40.7	11.5

SD: Strongly disagree, D: Disagree, N: Null, A: Agree, SA: Strongly agree

Table 3. Comparison of interns, PGs and faculty members

	Interns					Resident doctors					Faculty					Chi-square	P-value
Items	**SD**	**D**	**N**	**A**	**SA**	**SD**	**D**	**N**	**A**	**SA**	**SD**	**D**	**N**	**A**	**SA**		
Biostatistics is more difficult than other subjects of medical training	4.1	6.2	33.0	51.5	5.2	1.9	16.7	19.1	50.6	11.7	2.9	12.4	21.0	58.1	5.7	0.7620	0.6830
Within the medical field biostatisticians have high status	1.0	12.4	38.1	36.1	12.4	3.1	11.7	19.8	46.3	19.1	1.0	12.4	18.1	57.1	11.4	5.7230	0.0570
It would benefit my career to better understand biostatistics	5.2	26.8	30.9	36.1	1.0	4.7	20.2	20.6	43.6	10.9	4.8	29.5	28.6	30.5	6.7	12.5630	0.0020*
The current level of training in biostatistics in medicine is adequate	7.2	34.0	37.1	20.6	1.0	8.6	30.7	26.8	31.5	2.3	11.4	36.2	23.8	23.8	4.8	2.4580	0.2930
I am able to design my own research projects with confidence	13.4	36.1	25.8	21.6	3.1	10.1	33.5	24.1	24.1	8.2	8.6	40.0	19.0	27.6	4.8	2.3480	0.3090
I am able to conduct my own statistical analyses with confidence	3.1	21.6	28.9	27.8	18.6	4.7	15.2	14.4	42.8	23.0	5.7	14.3	15.2	40.0	24.8	5.6720	0.0590
Biostatistics is a necessary skill for a clinician involved in research	5.2	25.8	22.7	36.1	10.3	21.0	20.6	14.4	27.2	16.7	23.8	26.7	15.2	23.8	10.5	6.9350	0.0310*
Biostatistics is an important part of evidence-based medicine	2.1	8.2	33.0	46.4	10.3	3.1	8.2	15.6	49.0	24.1	3.8	7.6	11.4	54.3	22.9	11.8570	0.0030*
Knowledge of biostatistics is necessary when evaluating medical literature	1.0	10.3	21.6	57.7	9.3	1.6	6.6	16.3	49.0	26.5	1.9	4.8	15.2	53.3	24.8	10.4380	0.0050*
Biostatistics is really useful	2.1	17.5	34.0	43.3	3.1	3.1	7.0	19.1	49.0	21.8	1.9	8.6	26.7	52.4	10.5	26.4520	0.0001*
Biostatistics is too mathematical oriented	1.0	15.5	26.8	47.4	9.3	2.3	16.0	22.6	40.9	18.3	6.7	14.3	27.6	38.1	13.3	2.5830	0.2750
Biostatistics is best left to the 'experts'	0.0	16.5	33.0	40.2	10.3	3.9	11.7	17.9	52.9	13.6	5.7	12.4	23.8	47.6	10.5	5.0740	0.0790
Training in biostatistics will make me a better professional	3.1	15.5	28.9	48.5	4.1	6.6	14.0	25.7	39.7	14.0	3.8	27.6	29.5	30.5	8.6	6.8280	0.0330*
Biostatistics is very mysterious to me	2.1	29.9	32.0	29.9	6.2	4.7	27.2	21.8	30.4	16.0	2.9	34.3	23.8	31.4	7.6	3.1940	0.2030
Biostatistics is too complicate for me	7.2	19.6	39.2	28.9	5.2	7.0	25.7	23.0	31.9	12.5	4.8	30.5	21.9	37.1	5.7	1.0330	0.5970
Dealing with numbers makes me feel uneasy	3.1	17.5	39.2	33.0	7.2	6.2	16.0	25.3	37.7	14.8	4.8	20.0	16.2	53.3	5.7	2.7400	0.2540
I am excited about actually using biostatistics in my job	3.1	15.5	30.9	40.2	10.3	6.6	7.8	23.8	46.1	15.6	2.9	17.1	22.9	44.8	12.4	3.5840	0.1670
Bio-statistical thinking is an important characteristic of good research	3.1	19.6	38.1	36.1	3.1	4.3	11.7	22.2	47.5	14.4	2.9	13.3	26.7	45.7	11.4	14.9430	0.0010*
Biostatistics become more understandable and useful in my career	3.1	15.5	44.3	35.1	2.1	7.8	15.2	30.4	37.0	9.7	1.9	19.0	31.4	41.9	5.7	1.4160	0.4930
It took me a long time to understand statistical concepts	0.0	20.6	39.2	32.0	8.2	4.7	17.1	24.1	40.5	13.6	2.9	26.7	16.2	50.5	3.8	3.2050	0.2010
It is difficult to expect the average professional to master and apply	2.1	22.7	32.0	35.1	8.2	2.7	18.3	27.6	39.3	12.1	2.9	26.7	24.8	39.0	6.7	3.5710	0.1680
You should be good in mathematics before attempting biostatistics	3.1	19.6	29.9	38.1	9.3	2.7	15.6	24.5	45.1	12.1	0.0	28.6	16.2	44.8	10.5	2.6820	0.2620
I feel difficult to write the statistical section of my articles.	1.0	23.7	39.2	25.8	10.3	4.7	12.8	27.2	42.4	12.8	0.0	21.0	19.0	50.5	9.5	7.5710	0.0230*

SD: Strongly disagree, D: Disagree, N: Null, A: Agree, SA: Strongly agree

* $P < 0.05$

The resident doctors agreed to the role, usefulness, skill and training of biostatistics in their career; however, only few of them are able to design project or analyze their data. Being resident doctors they are focused on completing the postgraduate study, project work, and dissertation which are obligatory and hence can better appreciate the application of biostatistics.

The last group "internees" were just fresh professionals yet to get the grasp of making clinical decisions on their own. However, they agreed that "biostatistics" is a difficult subject and biostatistics is a necessary skill for a clinician. The cited studies all have a similar observation.

Considering the "biostatistics" from the frame of biostatistician and from the frame of healthcare professionals, it appears there is need for integrated approach, student centered teaching, and problem based learning and robust engagement of students in application of this knowledge.

This study shows the low level of awareness, attitude and application of biostatistics to decision making by the healthcare professionals although they were aware of its importance. There is need for integrated, problem based learning with active involvement of students and extending biostatistics principles to evidence based medicine.

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