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STUDY ON THE USE OF STATISTICAL TOOLS IN PHYSIOTHERAPY AND NURSING RESEARCHES - A CROSS SECTIONAL SURVEY

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ABSTRACT

Objective: There is widespread evidence of the extensive use of statistical methods in medical research. Just the same, standards are generally low and a growing body of literature points to statistical errors in most medical researches. However, there is no comprehensive study contrasting the medical researches for recent practice in their use of statistics. This study is aimed to analyze the usage of statistical tools in post graduate physiotherapy and nursing researches.

Method & Result: All ongoing post graduate physiotherapy and nursing dissertations from Dakshina Kannada district were screened for their statistical content. Types, frequencies, and complexity of applied statistical methods were systematically recorded and analyzed. There was inappropriate statistical tool selection in 44.6% of the dissertations out of the 148 screened researches and Statistical analysis was done manually in 65.6% of the researches.

Conclusion: As statistical errors seem to remain common in medical researches, closer attention to statistical methodology should be seriously considered to raise standards.

Key words: Physiotherapy, Nursing, Postgraduate Dissertation, Statistical Tools

INTRODUCTION

Medical research requires usage of biostatistical, epidemiological and logical ways of thinking. Over the past decades, a great increase in the use of statistical methods has been documented for a wide range of medical journals.^{1,2,3} Favored by the availability of multifaceted statistical

software packages, a trend toward the usage of more sophisticated techniques can be observed. Nevertheless there is also strong evidence that, in particular, simple methods such as *t* tests or chi-square tests remain in common usage.^{4,5,6,7,8,9}

The use of statistics in medical journals has been subjected to considerable debate in recent years and there is wide consensus that standards are generally low, as a high proportion of published medical research contains statistical errors.^{10,11,12,13,14,15,16,17,18}

The misuse of statistics in medical research has therefore been widely discussed, and it has been pointed out that it is both unethical and can have serious clinical consequences.^{19,20} As a result, there was respectable effort from many medical journals to enhance quality of statistics by adopting statistical guidelines and recommendations for authors or by sharpening the statistical review of incoming manuscripts.^{21,22,23,24,25,26} Nonetheless also very recent studies, although generally focused on specific statistical details, has statistical problems.^{17,18,27}

Although the statistical content of several medical journals has been reviewed over the past decades.^{1,2,3,5,6,19,27} There is no comprehensive evaluation of statistical methods used in medical researches which are carried out as part of curriculum fulfillment like post graduate Physiotherapy and Nursing researches. Questions regarding statistical tools and their recent use therefore remain largely unanswered.

Background of the Study

Physiotherapy and nursing are booming medical fields for past two decades. Evidence based medicine which is described at length by Rosenberg and Donald²⁸ as “attempts to fill the chasm by helping doctors find the information that will ensure they can provide optimum management for their patients”.

The practice of evidence based medicine seems to be able to halt the progressive deterioration in clinical

performance that is otherwise routine and which continuing medical education cannot stop. In earlier eras, limitations in our understanding of human biology and the absence of powerful clinical research methods meant that major advances were far less commonly than now.

In India, Medical research is carried out by all post graduate students and most of the entry levels too to fulfill the curriculum requirement, but most of the universities focus mainly on the research methodology and adequate attention is not paid to bio-statistics. Hence this study focuses on the awareness of correct/ optimal usage of statistical tools by Physiotherapy and nursing post graduate students for their research work.

Purpose of the Study

The first aim of the study was to investigate and to compare the statistical methods used in post graduate Physiotherapy and Nursing research studies and to assess complexity of statistical analyses.

The second was to evaluate the quantity and character of statistical use or misuse and statistical errors if any.

Scope of the study

Result of the study will be helpful to understand the statistical knowledge of the medical students and it may be helpful to re-design the curriculum for the same.

The results of the study will also allow for the ongoing monitoring of possible trends in statistics usage as well as for an up-to-date in-depth comparison

between Physiotherapy and Nursing researches which are closely linked to modern statistics and basic medical researches.

METHODOLOGY

Research Design: Cross Sectional Survey

Source of Data: Postgraduate Physiotherapy and Nursing Colleges in Dakshina Kannada District

Inclusion Criteria

All postgraduate dissertations of Physiotherapy and Nursing Students, studying in Dakshina Kannada district, Karnataka, done as part of their curriculum.

Exclusion Criteria

Dissertations of Students who were not willing to consent for the study.

Dissertations of Students without any statistical procedures in their study.

Sampling Technique & Sample Size

All post graduate research studies that fulfill the inclusion criteria were selected for the study which counts to a total of 148 researches.

Data Collection Method

Personal interview method by using questionnaire (vide Appendix-I) designed for this study and validated by post graduate physiotherapy and nursing research guides.

Analysis of Data

The collected data were analyzed by using percentage values for the accuracy and correctness of tool selection and usage of software packages.

Ethical Committee Clearance

Not applied for ethical clearance to any ethical committee since this survey

does not involve any intervention on human or animals.

Collection of Data

The Primary data required for the present study, related to Physiotherapy and Nursing Researches like topic, nature of outcome measure and statistical tools used were collected by conducting personal interviews by using questionnaire (vide appendix-I) from post graduate physiotherapy and nursing students who are studying in Dakshina Kannada district and willing to provide their dissertation for the study by signing an informed consent form (vide appendix-II).

There are ten post graduate physiotherapy and eleven post graduate nursing colleges in Dakshina Kannada District, Karnataka, India and all were included in the study.

All ongoing post graduate physiotherapy and nursing researches during March 2009 and fulfilling the inclusion criteria from the above mentioned colleges were included in the study which counts to one hundred and forty eight out of which eighty one belongs to physiotherapy and sixty seven belongs to nursing.

DATA ANALYSIS

The total colleges included in the study were twenty one out of which ten were physiotherapy and the remaining eleven were nursing colleges. There were 97 on going physiotherapy researches out of which only 81 were selected for the study and 16 were excluded since no statistical tools were used. Out of 123 nursing researches only 67 were included in the study and 56 were not

included because 17 nursing post graduate students were not interested to participate in the study and remaining 39 were excluded since no statistical tools were used.

Comparison and Findings

The data were analyzed from the physiotherapy and nursing researches in terms of usage of statistical packages and manual estimation, various levels of measurement tools and different statistical techniques used.

The physiotherapy researches analyzed in the study includes 81 among which forty nine (60.49%) used manual calculations and remaining thirty two (39.51%) used statistical packages. The nursing researches are 67 among which forty eight (71.64%) used manual calculations and remaining nineteen (28.36%) used statistical packages. Table-1 shows the usage of statistical software packages and its percentage in Physiotherapy and Nursing researches.

The level of measurement under Nominal, Ordinal, Interval and Ratio (NOIR) grading was analyzed between the physiotherapy and nursing researches. From the analysis, it is found that the ordinal scales were commonly used, the interval and ratio scales were least used in nursing researches. In behavioural sciences ordinal scales are most commonly used than any other levels, most of the nursing researches in this study were related to behaviour and 94% of the researches were using ordinal scales and it is 72.8% in physiotherapy researches. Table-2 shows the frequencies of level of measurement in

Physiotherapy and Nursing researches with their percentages.

The present study shows usage of nine different statistical tools for the analysis of data in physiotherapy researches and six different tools in nursing researches. The t-Test was most commonly used by both physiotherapy and nursing researches that is 58% and 55.2% respectively. Next are the Wilcoxon Signed Rank Test and Mann Whitney U Test with around 15% to 19% by both the Physiotherapy and Nursing researches. Correlational analysis and multi group researches were usually not preferred in nursing. The frequencies of usage of various statistical tools in physiotherapy and nursing researches were shown in table-3.

The statistical tools used by all 148 researches were checked for the correctness of usage of appropriate statistical tools based on Siegel S²⁹ and Reema Al-amoudi³⁰ suggestions. It was found (Table-4) that in physiotherapy researches 35.8% of the tool selection was inappropriate and 55.2% of the tool selection was inappropriate in nursing researches. The commonly noticed error in all the researches was usage of t-test and Karl Pearson Correlation Coefficient analyses in ordinal and nominal level of measurements.

Findings

In the present study it was found that most of the physiotherapy and nursing researches were using t-test manually irrespective of level of scales, may be because it is ease to use.

In the present study it was found that 65.54% of the researches were done by

manual statistical analysis and those using statistical software packages preferred only SPSS which might be due to its easy availability.

Suggestions from this study

The use of statistics in health science research may affect whether individuals live or die, whether their health is protected or jeopardized, and whether a health science advances or gets sidetracked. Therefore, all researchers, regardless of their training and occupation have a social and moral obligation to perform their work in a professional and ethical manner.

The awareness about usage of statistical software packages are less with postgraduate medical students, which can be improved by modifying their curriculum.

Knowledge about appropriate use of parametric and non-parametric statistical tools are less with post graduate medical students, which also needs modification of curriculum that focus on bio-statistics also.

Research Guides should concentrate and help their students in selecting appropriate statistical tools.

Suggestions for future studies

In future, studies can be conducted with inclusion of more health related thesis/ research from more colleges and/or universities, so that better comparisons and conclusions can be drawn.

CONCLUSION

The current practices regarding use of statistical tools in physiotherapy and nursing researches were reported in this

study, the awareness about appropriate use of bio-statistical tools and usage of statistical packages are less with postgraduate physiotherapy and nursing students. As statistical errors seem to remain common in medical researches, closer attention to statistical methodology should be seriously considered to raise standards.

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Table-1: Frequencies of Usage of Statistical Software Packages in Physiotherapy and Nursing Researches and its percentage

Manual/Package	n	%
Manual	97	65.54
Package	51	34.46
Total	148	100

Table-2: Frequencies of Level of Measurement in Physiotherapy and Nursing Researches with their Percentages

Level of Measurement	Physiotherapy		Nursing	
	n=81*	%	n=67*	%
Nominal	5	6.2	4	6.0
Ordinal	59	72.8	63	94.0
Interval	22	27.2	0	0
Ratio	5	6.2	1	1.4

(* - As many dissertations contained usage of more than one level of measurement listed, numbers presented do not add up to the whole of researches reviewed)

Table-3: Frequencies of Various Statistical Tools Used in Physiotherapy and Nursing Researches with Their Percentages

Statistical tools	Physiotherapy		Nursing	
	n=81*	%	n=67*	%
ANOVA	4	4.9	0	0
Chi -Square	4	4.9	8	11.9
Descriptive	2	2.4	1	1.4
Karl Pearson	5	6.2	1	1.4
Mann Whitney U Test	13	16.0	13	19.4
Mc Nemer	1	1.2	0	0
Rank correlation	2	2.4	0	0
t - Test	47	58.0	37	55.2
Wilcoxon Signed Rank Test	14	17.3	10	14.9

(* - As many papers contained usage of more than one category of statistical tools listed, numbers presented do not add up to the whole of researches reviewed.)

Table-4: Frequencies of Usage of Appropriate Statistical Tools in Physiotherapy and Nursing Researches with Their Percentages

Profession	Appropriate statistical tool		Inappropriate statistical tool	
	n	%	n	%
Physiotherapy	52	64.2	29	35.8
Nursing	30	44.8	37	55.2

Appendix – I
Data Collection Form

Name :
Faculty :
College :
Topic :
Research Design :
Level of Scale Used :
Statistical Tools Used :
Method of Analysis : Manual / Statistical Package
(If statistical software package give the name
_____)

Appendix – II
Consent Form

Principal Investigator: Dr. A. Jagatheesan
Associate Professor,
Alva's College of Physiotherapy.

Title of the study : A Study on The Use of Statistical Tools in Physiotherapy
and Nursing Researches - A Cross Sectional Survey.

This study has been explained to me by the investigator and I understand,
- what the study involves
- that participating in the study will not affect my study

I therefore agree to take part in this study.

Address:

Date : Signature of the Participant
Place :