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# Comprehension of Basic Epidemiology Concepts Among Supervisors of Postgraduate Medical Trainees

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## ABSTRACT

***Objective:*** To study the comprehension of basic epidemiological concepts among supervisors of postgraduate medical trainees
***Study Design:*** Cross-sectional Analytical study.
***Place and Duration of Study:*** College of Physicians and Surgeons Pakistan Regional Center, Islamabad Pakistan from Oct 2021 to Mar 2022.
***Methodology:*** To assess postgraduate trainee supervisors' comprehension of basic epidemiology in medical research. The supervisors of postgraduate trainees working in public and private tertiary care hospitals of Islamabad and Rawalpindi were enrolled in the study through consecutive non-probability sampling. A questionnaire comprising demographics and variables covering the concept of epidemiology from rationale writing to methodology was applied at the onset of the workshop. The total score was categorized into poor, average, and sound.
***Results:*** 260 supervisors were enrolled in the study, with a mean age of 28.2±2.5 years. Among the supervisors, 143(55%) were female, and 117(45%) were male. Regarding comprehension of epidemiology concepts, the majority of the supervisors, 201(77.3%), had average comprehension, 47(18.1%) had a good understanding, and 12(4.6%) had poor comprehension. The maximum number of supervisors correctly understood randomized controlled trials was 204 (78.5%). No statistically significant difference was observed between understanding of epidemiology with gender and specialty, *p*-value> 0.05.
***Conclusion:*** This study showed an average comprehension of epidemiology, which is not enough to train the postgraduate trainees in research and design quality studies sufficient to generate data at the local level for evidence-based practice.

**Keywords:** Epidemiology, Evidence-based Practice, Postgraduate trainees, Research, Supervisors.

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## INTRODUCTION

Epidemiology classifies as one of the crucial academic components not only in clinical decision-making but also in clinical research. It is a significant challenge for supervisors to teach these disciplines with a Bachelor's degree in medicine. Multiple studies have examined the beliefs of medical school graduates, who view statistics as an important but challenging topic, acknowledging their challenges in comprehending the language used and the statistical techniques most suitable for each type of study. Most of the respondents' use of statistics is inadequate when performing their research due to these bio-statistical knowledge gaps, which had a detrimental impact on the study's quality.[1] Teaching this discipline to undergraduates to procure the fundamental skills poses a critical test.[2] Authors have contended that epidemiology is a discipline that established the variations in society and the appearance of new diseases through research in varying domains.[3] Al-Doubi et al. explored the supervisor's opinions on supervision for undergraduate research proposals and analyzed the importance of previous experience in conducting research and methodology. According to CBME (competency-based medical education), the authors focus on the proficiencies of continuous research, epidemiology, health, and health organizations.[4,5] Research supervisors attain proficiency in supervision in two phases: engagement and maturation. The important key to the quality of the research proposal is the supervision of expert supervisors.[6,7] Literature in the past years on this field suggests that for supervision to be adequate, it requires varying and diverse approaches compared to a fixed, inflexible curriculum.[8]

Substantial research exists on what constitutes good quality, effective supervision. However, the supervisors of research projects, their training, and the development of teachers who supervise medical

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students are comparatively new and under-researched areas. There is even little evidence of how the supervisors develop their students' writing.[9]

A study on the practical knowledge of supervisors argued that teachers' knowledge depends on one's experiences and exposure to the content. To do justice to this regard of practical knowledge, it is significant to investigate the common as well as individual components of research.[10] Therefore, in this study, we aim to assess postgraduate trainee supervisors' comprehension in the domain of basic epidemiology in medical research.

## METHODOLOGY

The cross-sectional analytical study was conducted at the College of Physicians and Surgeons Pakistan regional center in Islamabad from October 2021 to March 2022 among supervisors of postgraduate trainees working in public and private tertiary care hospitals of Islamabad and Rawalpindi. Ethical approval was taken from institute ethical committee. (Reference number No.9-2021/REU/DME/CPSP approved on 30th Sept 2021). According to the World Health Organization (WHO) sample size calculator, the sample size calculated was 260, keeping the confidence level at 95%, the anticipated population proportion for good and average knowledge of epidemiology among medical doctors at 94.6%.[11] Informed consent was obtained from all the participants.

**Inclusion Criteria:** The supervisors of postgraduate trainees working in public and private tertiary care hospitals of Islamabad and Rawalpindi were included.

**Exclusion Criteria:** None

Consecutive non-probability sampling was used to select participants for the training workshops conducted at the College of Physicians and Surgeons Pakistan at the regional Centre, Islamabad. Between 1-2 workshops comprising 25-30 participants are conducted monthly depending on administrative and logistic reasons. Ten workshops were conducted in 6 months. Those Supervisors who completed the 4-day workshop on Evidence-based practice were enrolled in the study. This is the first workshop in the series of 4 mandatory workshops as a prerequisite to becoming a supervisor for a postgraduate trainee. Data was collected through a questionnaire on day 1 of the Research Methodology, Biostatistics, and Medical Writing (RMBMW) workshop in the first session.

A structured questionnaire with Cronbach's Alpha 0.87 was used for data collection. The first segment of the questionnaire obtained data related to the demographic characteristics of the participants, including age, gender, hospital, specialty, graduating college, and experience of conducting research. The second segment of the questionnaire included questions about the comprehension of epidemiology in terms of writing objectives, rationale, operational definitions, and sampling. The scores were categorized into ordinal variables: poor, average, and good. The scoring for the poor category was less than 7; for the average, the range was 8 to 14, whereas 15 to 20 scores were considered good. The participants took an average of 20 min to fill out the questionnaire.[11]

Statistical Package for the Social Sciences (SPSS) version 23.0 was used to analyze the data (IBM, Armonk, NY). Descriptive statistics were calculated. Qualitative variables like understanding different research domains, gender, hospital, specialty, and college graduation were evaluated as frequency and percentages. Quantitative variables like age were measured using the mean and standard deviation. The chi-square test was applied to measure the association between epidemiological understanding of different research domains with demographic and professional characteristics variables, keeping a *p*-value $\leq 0.05$ as significant.

## RESULTS

A total of 260 participants participated in the study. The mean age of the participants was 28.2±2.5 years. Most 143(55%) were female, while 117(45%) were males. The majority, 182(70%), worked in public hospitals, while 78(30%) were in private hospitals. Regarding graduation college, 156(60%) graduated from public medical colleges, while 104(40%) graduated from private medical colleges. Majority of the supervisors had specialized in Medicine 90(34.6%) and Surgery 70(26.9%), while 35(13.5%) were from Gynecology and Obstetrics, 32(12.3%) Pediatrics, 15(5.8%) Dentistry, 7(2.7%) Otolaryngology, 6(2.3%) Histopathology and 5(1.9%) Ophthalmology (Table-I). In terms of comprehension regarding epidemiology, the majority of the supervisors, 201(77.3%), had average comprehension, 47(18.1%) had good comprehension, and 12(4.6%) had poor comprehension, as presented in Figure- 1. We describe the frequency and the percentage of correct and incorrect answers regarding different research concepts. The concept of the rationale was correctly

**Table-I: Comparison of Knowledge of Study Objective and Study Rationale with Demographics and Professional Characteristics (n=260)**

| Variables | | Knowledge of study Objective | | *p*-value | Knowledge of study Rationale | | *p*-value |
|---|---|---|---|---|---|---|---|
| | | Correct (n=94) | Incorrect (n=166) | | Correct (n=173) | Incorrect (n=87) | |
| Gender | Male | 37(39.4%) | 80(48.2%) | 0.169 | 73(42.2%) | 44(50.6%) | 0.200 |
| | Female | 57(60.6%) | 86(51.8%) | | 100(57.8)% | 43(49.4%) | |
| Age | ≤34 | 93(98.9%) | 160(96.4%) | 0.222 | 168(97.1%) | 85(97.7%) | 0.781 |
| | ≥34 | 1(1.1%) | 6(3.6%) | | 5(2.9%) | 2(2.3%) | |
| Hospital they are engaged | Government | 64(68.1%) | 118(71.1%) | 0.612 | 115(66.5%) | 67(77.0%) | 0.080 |
| | Private | 30(31.9%) | 48(28.9%) | | 58(33.5%) | 20(23.0%) | |
| Specialization | Medicine | 31(33.0%) | 59(35.5%) | 0.264 | 54(31.2%) | 36(41.4%) | 0.265 |
| | Surgery | 20(21.3%) | 50(30.1%) | | 50(28.9%) | 20(23.0%) | |
| | Gynecology | 18(19.1%) | 17(10.2%) | | 22(12.7%) | 13(14.9%) | |
| | Peads | 10(10.6%) | 22(13.3%) | | 21(12.1%) | 11(12.6%) | |
| | Dentistry | 7(7.4%) | 8(4.8%) | | 11(6.4%) | 4(4.6%) | |
| | ENT | 4(4.3%) | 3(1.8%) | | 4(2.3%) | 3(3.4%) | |
| | Histopathology | 3(3.2%) | 3(1.8%) | | 6(3.5%) | 0(0.0%) | |
| | Ophthalmology | 1(1.1%) | 4(2.4%) | | 5(2.9%) | 0(0.0%) | |
| College of graduation | Government | 57(60.6%) | 99(59.6%) | 0.874 | 101(58.4%) | 55(63.2%) | 0.453 |
| | Private | 37(39.4%) | 67(40.4%) | | 72(41.6%) | 32(36.8%) | |

**Table-II: Comparison of knowledge of Operational Definition and Sampling Technique with Demographic and Professional Characteristics (n= 260)**

| Variables | | Knowledge of Operational definition | | *p*-value | Knowledge of Sampling technique | | *p*-value |
|---|---|---|---|---|---|---|---|
| | | Correct (n=133) | Incorrect (n=127) | | Correct (n=18) | Incorrect (n=242) | |
| Gender | Male | 55(41.4%) | 62(48.8%) | 0.226 | 12(66.7%) | 105(43.4%) | 0.05 |
| | Female | 78(58.6%) | 65(51.2%) | | 6(33.3%) | 137(56.6%) | |
| Age | ≤34 | 130(97.7%) | 123(96.9%) | 0.656 | 17(94.4%) | 236(97.5%) | 0.437 |
| | ≥34 | 3(2.3%) | 4(3.1%) | | 1(5.6%) | 6(2.5%) | |
| Hospital they are engaged | Government | 95(71.4%) | 87(68.5%) | 0.607 | 11(61.1%) | 171(70.7%) | 0.394 |
| | Private | 38(28.6%) | 40(31.5%) | | 7(38.9%) | 71(29.3%) | |
| Specialization | Medicine | 46(34.6%) | 44(34.6%) | 0.161 | 13(72.2%) | 77(31.8%) | 0.021 |
| | Surgery | 35(26.3%) | 35(27.6%) | | 4(22.2%) | 66(27.3%) | |
| | Gynecology | 23(17.3%) | 12(9.4%) | | 0(0.0%) | 35(14.5%) | |
| | Peads | 17(12.8%) | 15(11.8%) | | 0(0.0%) | 32(13.2%) | |
| | Dentistry | 4(3.0%) | 11(8.7%) | | 0(0.0%) | 15(6.2%) | |
| | ENT | 2(1.5%) | 5(3.9%) | | 0(0.0%) | 7(2.9%) | |
| | Histopathology | 2(1.5%) | 4(3.1%) | | 0(0.0%) | 6(2.5%) | |
| | Ophthalmology | 4(3.0%) | 1(0.8%) | | 1(5.6%) | 4(1.7%) | |
| College of graduation | Government | 76(57.1%) | 80(63.0%) | 0.336 | 8(44.4%) | 148(61.2%) | 0.163 |
| | Private | 57(42.9%) | 47(37.0%) | | 10(55.6%) | 94(38.8%) | |

answered by a maximum number of supervisors 173(66.5%), Objectives 94(36.2%), operational definition 133(51.2%), while sampling was correctly answered by 18(6.9%), and none of the supervisors correctly answered all the four variables related to overall study designs. When the understanding of each of the four epidemiological study designs was explored, it was found that a maximum number of supervisors correctly understood randomized controlled trials, 204(78.5%), 153(58.8%) cross-sectional, and 38(14.6%) cohorts. In contrast, the case-control study was at least 14(5.4%) (Figure-2). It was also noted that 94(36.2%) males and females had correct knowledge of objectives, while 166(63.8%) had inadequate knowledge about objectives. No statistically significant association was found when objective knowledge, Rationale, and operational definition were compared with gender, age groups, hospital they were engaged, college of graduation, and specialization tested (*p*-value ≥0.05) (Table-I). There

were significant associations when sampling knowledge was compared with gender and specialization (*p*-value ≤0.05), While it was insignificant when tested with age, the hospital they were engaged in, and college of graduation (*p*-value ≥0.05) (Table-II).

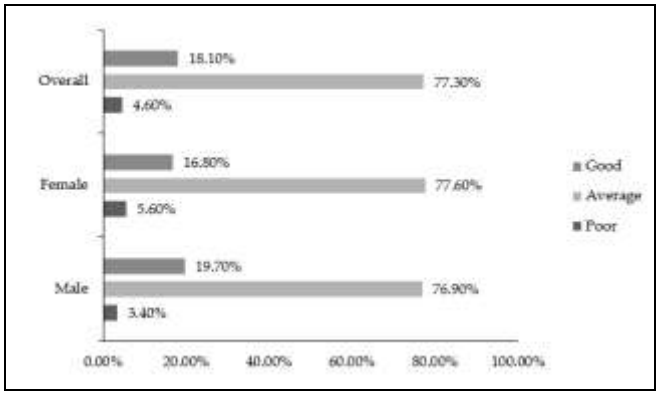


**Figure-1: Knowledge of Supervisors Regarding Epidemiology**

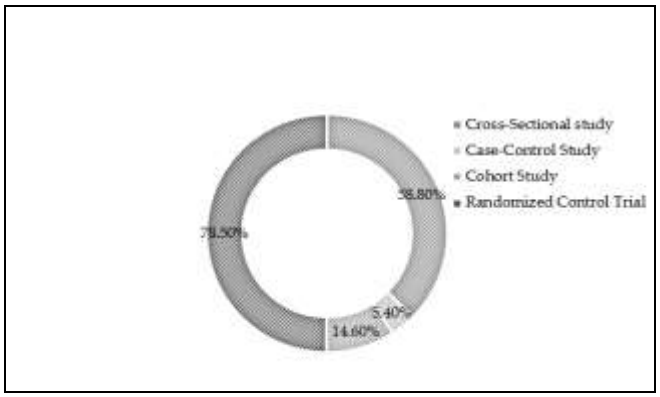


**Figure-2: Concept of Different Epidemiological Study Designs**

## DISCUSSION

Our study measured the comprehension regarding epidemiology and found that the majority of the supervisors, 201(77.3%), had average comprehension, 47 (18.1%) had good comprehension, and 12(4.6%) had poor comprehension. One study also supported our concept that supervisors' knowledge regarding research methodology helps the trainee design research proposals and questions and achieve awareness about research.[12] A similar study by Novack et al., showed that only 45.6% of doctors had good research knowledge.[13] Research methodology workshops can improve the concepts of research. This is supported by another study, which stated that students discover the research challenges using an Interactive Qualitative Analysis (IQA) design. It has three main points for the inferences: input of research education, sustenance, and personal participation.[14] In our study, the supervisor's concept of the rationale was correctly answered by 173(66.5%), objectives by 94(36.2%), and operational definition by 133(51.2%), while sampling was correctly answered by 18(6.9%), and none of the supervisors correctly answered all the four variables related to overall study designs. A study by Banks *et al*., also reported that statistical methods used in journals of medicine are a significant challenge to understand, and doctors lack knowledge of basic concepts of research methodology. Some barriers to conducting meaningful research include insufficient supervisors, work stress, lack of time and research training, and insufficient epidemiology and statistical workshops.[15] This is in line with our study findings, possibly related to the poor comprehension of these concepts at the undergraduate level, followed by limited application at the postgraduate level.

Our results show that supervisors did not correctly understand epidemiological study design concepts. The randomized controlled trial concept was correctly known by 204(78.5%), 153(58.8%) had a concept of cross-sectional, about cohort 38(14.6%), while about the case-control study was least 14(5.4%). Butt *et al*., explored the usefulness of the CPSP workshop according to the supervisors and trainees. In this study, 46% of supervisors and 54% of trainees participated. Among these, 75% admitted the importance of statistics, 57% preferred to learn epidemiological study design and statistics, 66% found that the workshop is important and fulfills their requirements, and 44% were ready for research design and analysis.[16]

According to Alghamdi *et al*., 84.7% of supervisors were lacking in research methodology concepts, which was one of the obstacles to doing research during medical school.[17] Thus, this limited the birth of Indigenous evidence-based data. Our study shares the same statistics as generated by the study conducted at CPSP on the postgraduate residents.[11]

Literature shows that students must understand epidemiology concepts, perform statistical tools, and interpret the results after completing the epidemiology and statistical analysis activity. The faculty should realize the significance of biostatistics in research, and knowledge and use of these applications should be improved to a higher level.[18-20] Our study findings align with this because research and supervision are

seen as components in the development of future health professionals.

One more study results demonstrated that 18.1 % of the supervisors had good knowledge of epidemiology. Utilizing a scope of instructing and evaluation techniques in the undergraduate epidemiology course can energize students with developing capabilities, thus helping them in the research process.[21] Another study showed that the students value the research knowledgeable training sessions because they offer a rich understanding of the subject material.[22] This would be beneficial only if the mentors were trained in this subject. Another study showed that 70.9% of the participants wanted to engage in research activities but could not pursue it because of a lack of training.[23,24]

We found that most of the supervisors had no previous experience conducting a research project; a similar study argued that experience greatly affected the capabilities of supervisors. Shanmukhappa *et al*., concluded that research interest and its impact and significance can be established and highlighted during training. Research environment, financial support of Institutions, and suitable mentorship are significant factors that motivate the doctors and prepare them to face the research challenges.[25] Experience in research as a mandatory requirement would undoubtedly improve the practice of research.

The author suggests that research methodology should be incorporated into the curriculum of undergraduate and postgraduate medical students. We recommend that periodic workshops on research methodology be carried out as mandatory activities to lay the foundation for understanding basic research concepts. These workshops are the only source of epidemiological knowledge improvements for our supervisors here in Pakistan. This study's results provided us with local statistics about epidemiological concepts among supervisors, thus generating evidence-based data as the preliminary step in exploring the level of interest among physicians in research projects.

## ACKNOWLEDGMENTS

The authors would like to thank all participants for providing relevant data, which helped raise the standard of research among the trainers.

## LIMITATIONS OF STUDY

This study explored a limited number of variables and was carried out at one center only. No long-term follow-ups were done to determine the understanding of epidemiological concepts and supervisors' perceptions.

## CONCLUSION

This study saw an average level of comprehension regarding epidemiology, which is not enough to train the postgraduate trainees in research and develop design quality studies sufficient to generate data at the local level for evidence-based practice. Understanding research methodology will not only enhance supervisors ' knowledge about research but also allow them to build a future research environment for their postgraduate trainees.

**Conflict of Interest:** None.

**Funding Source:** None.

**Authors Contribution**

Following authors have made substantial contributions to the manuscript as under:

TF & SS: Data acquisition, critical review, approval of the final version to be published.

AH & SO: Conception, study design, drafting the manuscript, approval of the final version to be published.

SN & SM: Data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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