MD (HOM) PART I

PAPER II: RESEARCH METHODOLOGY AND BIOSTATISTICS

Syllabus:

Introduction:

The Purpose of the subject of Research Methodology and Biostatistics:

Evidence based medicine is the need and the principle of today's medical practice. PG students are expected to practice homoeopathy based on this principle. Learning the basics of research methodology and biostatistics will help them grasp this concept in a proper way. Dissertation is the first research project the student undertakes during the course of PG. Students should be able to apply the learning immediately in their dissertation. After mastering the subject of research methodology and biostatistics the students will be able to undertake research study and help in the scientific development of homoeopathy.

Competencies:

At the end of studying this subject the postgraduate student should possess the following competencies and thus should be able to

1. Understand the importance of Research methodology and Biostatistics in general and specifically for Homoeopathic science
2. Know the various types of research pertaining to homoeopathy.
3. Explain the process of conducting research knowing the importance of each step
4. Learn to identify and develop "researchable problem"
5. Formulate the appropriate hypothesis for testing
6. Know the concept, scope and limitation of research designs applicable to Homoeopathic research
7. Write a scientifically and ethically sound research proposal safeguarding homoeopathic principles
8. Know various types of statistics (morbidity, mortality, vital, etc.)
9. Know the need of various sampling techniques to acquire the needed sample
10. Enlist the variables in a proposed research study
11. Learn the method of data collection and summarization by classifying in various categories
12. Represent data in tabular and graphical formats
13. Understand the significance, application and interpretation of results of various statistical tests useful for conducting homoeopathic research.
14. Understand various ethical issues in the formulation of various research designs and publications safeguarding the interest of science and participants.
15. Learn to write a scientific paper and the principles of paper presentation

Syllabus:

1. Research Methodology -

a. Foundation of Research :

- Introduction, Meaning, Definition and need of Research
- Purpose of conducting Research
- Research in Biomedicine
- Utility of research in medical science and in Homoeopathy
- Logic in research
- Evidence based practice
- Ethics in research and Ethical issues in Biomedical research
- Ethical Committee
- Need of research and research challenges in Homoeopathy

b. Types of Research :

- Classification of Research
- Cross sectional / Longitudinal
- Pure and Applied
- Explorative or Formulative
- Descriptive
- Epidemiological
- Analytical /Relational / Causal
- Diagnostic Research/Study
- Basic / Fundamental
- Action Research
- Experimental
- Historical
- Quantitative
- Qualitative

c. Planning of Research Studies :

Research Formulation:

- Research planning Process
- Formulation of Aims and Objectives
- Selection of a research Topic / Question / Problem for Research
- Formulation of the selected research questions / problems
- Hypothesis Formation -Techniques
- Types and qualities of Hypothesis – Null and Alternative
- Hypothesis testing
- Writing study protocol
- Biases in research
- Variables – Definition & types
- Identifying variables in a study

d. Research Study Designs:

- Research Design: Concept and Importance in Research

- Selecting suitable Research design for homoeopathic research – advantage, limitation and utility and application
- Descriptive research design – Survey, Case Studies, Case Reports
- Observational research design – Cohort, Case Control design
- Experimental research design
- Design and Conduct of Clinical Trials
- Questionnaire Design
- Evaluation of Diagnostic Tests

e. Qualitative Research in Homoeopathy :

- Concepts and Methods
- Measurements
- Generalisation

f. Review of Literature:

- Need and purpose of Review of literature
- Sources of Literature
- Bibliography & References – methods
- Critical Evaluation of Journal / Research Article
- Recent advances / studies in homoeopathic research

g. Epidemiology, Population and Sampling Methods :

- Concept and definition of Population, Sampling frame, Sample
- Characteristics of a good sample
- Sampling Types, Methods and Techniques and Size
- Probability sampling methods (Simple random, Systemic random, Stratified random, Multiphase, Multistage, Cluster, Replicate)
- Non probability sampling methods (Quota, Purposive, Accidental, Snow ball)
- Sampling and non sampling errors
- Demography Statistics & Measures of population: Vital, Morbidity, Mortality, Hospital & life table

2. <u>Biostatistics -</u>

a. General Concepts :

- Introduction to Biostatistics: definition and scope in clinical research
- Variability – meaning, types
- Measurements: Concept & level (Nominal, Ordinal, Interval, Ratio)
- Clinical significance
- Validity and Reliability
- Specificity and Sensitivity

b. Data Collection and Data Management :

- Meaning and importance of Data
- Sources of data
- Type of data – Primary and Secondary / Qualitative and Quantitative data
- Variables and Attributes
- Data Editing / Reduction / Summerization

- Construction of Questionnaire

c. Data Analysis and Outcome Assessment :

- Methods of Data Preparation – Univariate and Bivariate analysis (Frequency table & cross tabulation)
- Planning for Statistical Analysis
- Descriptive Statistics - Measures of Central Tendency (Mean, Median, Mode,SD & Varience, etc.) & Location (Percentile)
- Measures of Dispersion (range, Quartile, Semi quartile, interquartile, range, Mean Deviation, Standard Deviation, Coefficient of Variation)
- Normal distribution & estimations
- Confidence Interval
- Level of Significance
- Tail of Tests
- Type I & Type II errors
- Analysis of variance: coefficient of variance
- Probability
- Poisson and Binomial distribution
- Parametric test (SEM, Z test, t test – Pair, unpaired, F test, ANOVA, SEP)
- Non Parametric Test (Chi-square test, The Mann-Whitney U test, Wilcoxon matched pair test)
- Method based on Rank order (Spearman's rank correlation, Kendall's rank correlated coefficients)
- Correlation analysis
- Regression analysis
- Odds ratio, Risk ratio, Likelihood ratio
- Interpretation of statistical test results
- Measures of Morbidity and Mortality
- Conclusion

d. Use of Softwares:

- Statistical analysis software like – MS office – Excel, SPSS, Epi – info, online softwares
- Management Software like Zotero/Mendeley

e. Report, Protocol (Synopsis) and Dissertation Writing:

- Principles of scientific writing and components of Dissertation.
- Data presentation (Tabular: Frequency distribution & Graphical: Histogram, Frequency polygon, frequency curve, line diagram, Scatter plot diagram, Types of Bar graph, types of Pie graph, Pictogram, Map diagram, Box plot graph)
- Plagiarism
- Assessing and Reporting adverse events
- Writing and Publishing research studies.

Work assignments (Journal):

To ensure that the students are regularly studying the subject, they should be given work assignments. The assignments should be maintained in a separate journal. The topics for assignment are the following:

- Central idea of Synopsis: Write the central idea for topic selection
- Developing the topic for the synopsis: Write the 3 topics and then narrow down to the single topic giving reasons
- Case Study: Formulation/ answering 3 case studies pertaining to research design/biostatistics/ethical issues with appropriate answers
- Statistical analysis plan: Develop a statistical analysis plan for one project
- Data presentation: Demonstrate 5 tabular and graphical ways of data presentations
- Example of various types of researches (one example of each).
- 2 examples of Data analysis
- 2 examples of application of statistical tests
- 2 examples of framing aim, Objectives, Hypothesis and research questions.
- 1 Critical review of Journal / Research Article.

Assessment:

Assessment should be done in theory paper as per the competency expected to be achieved by the student. Students should be assessed for conceptual understanding and factual knowledge of the specified areas in the syllabus. Their ability to apply knowledge in a given problem / scenario should be tested. Assessment is done for ability to formulate a research proposal, method of data collection, planning of statistical analysis, use of appropriate statistical tests and interpretation from the results. The actual statistical calculation will not be a part of assessment. The approximate distribution will be – Research Methodology 60% and Biostatistics 40%

The format of the question paper

1. Long question – Research methodology (20 marks)
2. Long question – Research methodology (20 marks)
3. Long question – Application based (20 marks)
4. Short questions
    a. Short question - Case based (10 marks)
    b. Short question - Case based (10 marks)
5. Short notes – 4 out of 5 – each of 5 marks (20 marks)