According to the New NCISM Curriculum for BAMS 3rd Professional

Research Methodology & Medical Statistics

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ENGLISH EDITION

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Introduction to Research

CHAPTER OVERVIEW

Component	Details
Lecture Hours	1
NLHT	Nil
NLHP	Nil
Domain	Cognitive/Comprehension (CC)
Knowledge Level	Must Know (MK), Knows How (KH)
Teaching Method	Lecture with PowerPoint Presentation
Assessment	Theory Open Book Test, Quiz, Puzzles

LEARNING OBJECTIVES

By the end of this chapter, students should be able to:

1. Define research and explain its meaning in the context of medical sciences
2. List and explain the objectives of research
3. Describe the need for research in Ayurveda
4. Explain the scope of research in Ayurveda
5. Define Evidence-Based Medicine (EBM) and its components
6. Define Integrative Medicine and its relevance to Ayurveda
7. Differentiate between Evidence-Based Medicine and traditional practice

1.1 DEFINITION OF RESEARCH

What is Research?

The word **'Research'** is derived from the French word *'rechercher'* meaning "to search again" or 'to investigate thoroughly.'

Research is a systematic, scientific, and organized process of inquiry aimed at discovering, interpreting, and revising facts, events, behaviours, or theories.

Definitions by Scholars

Redman and Mory (1923):

"Research is a systematized effort to gain new knowledge."

Clifford Woody:

"Research comprises defining and redefining problems, formulating hypothesis or suggested solutions, collecting, organizing and evaluating data, making deductions and reaching conclusions."

Kerlinger (1986):

"Scientific research is a systematic, controlled, empirical and critical investigation of hypothetical propositions about presumed relationships among natural phenomena."

Research in Simple Terms

For a BAMS student, research can be understood as:

- A quest for knowledge through objective and systematic methods
- Finding solutions to problems through study
- A journey from known to unknown using scientific methods
- Asking questions and finding reliable answers

The Ayurveda Perspective

In Ayurveda, the concept of research aligns with **'Anusandhana'(अनुसन्धान)** which means:

- **Anu :** Following/After
- **Sandhana :** Investigation/Exploration

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Research Ethics

CHAPTER OVERVIEW

Component	Details
Lecture Hours (LH)	1
NLHT	1
NLHP	Nil
Domain	Affective/Valuing (AFT-VAL), Affective/ Responding (AFT-RES)
Knowledge Level	Must Know (MK), Desirable to Know (DK), Knows How (KH)
Teaching Method	Lecture with PPT, Group Discussion, Role Play, Case-Based Learning
Assessment	Theory Open Book Test, Case Study, Debate, Class Presentation

LEARNING OBJECTIVES

By the end of this chapter, students should be able to:

1. Explain the need and significance of ethics in research
2. Describe the four fundamental principles of research ethics (Autonomy, Beneficence, non-maleficence, and justice).
3. Explain the structure, composition, and functions of Institutional Human Ethics Committee (IHEC/IEC)

4. Describe the role and functioning of Institutional Animal Ethics Committee (IAEC)
5. Explain the concept of informed consent and its essential elements
6. Identify ethical issues in publication and understand publication ethics guidelines
7. Apply ethical principles to research scenarios in Ayurveda

4.1 NEED AND SIGNIFICANCE OF ETHICS IN RESEARCH

What is Research Ethics?

Research Ethics refers to the moral principles and standards that guide the conduct of research involving human participants, animals, or sensitive data. It ensures that research is conducted responsibly, honestly, and with respect for the rights and welfare of all involved.

Definition

"Research ethics encompasses the application of fundamental ethical principles to scientific research, involving human subjects, animals, environment, and society."

Why Is Ethics Important in Research?

1. Protection of Research Participants

- Ensures safety and welfare of human subjects and animals
- Prevents physical, psychological, social, or economic harm
- Protects vulnerable populations (children, elderly, mentally ill)

2. Maintenance of Scientific Integrity

- Ensures accurate and honest reporting of research findings
- Prevents fabrication, falsification, and plagiarism
- Maintains public trust in scientific research

3. Legal Compliance

- Adherence to national and international regulations
- Protection from legal liability for researchers and institutions
- Compliance with ethical guidelines (ICMR, WHO, WMA)

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Different Databases, Portals, and Artificial Intelligence

CHAPTER OVERVIEW

Component	Details
Lecture Hours (LH)	1
NLHT	3
NLHP	Nil
Domain	Cognitive/Comprehension (CC)
Knowledge Level	Must Know (MK), Desirable to Know (DK), Knows How (KH)
Teaching Method	Lecture with Video clips, Discussion, Workshop, Team-Based Learning
Assessment	Quiz, DOAP, Peer Assessment, Class Presentation

LEARNING OBJECTIVES

By the end of this chapter, students should be able to:

1. Define research databases and explain their importance in scientific research
2. Navigate and effectively use PubMed for literature searches
3. Describe SCOPUS and Web of Science and their features

4. Explain the UGC-CARE list and its significance for Indian publications
5. Describe AYUSH-specific research portals (DHARA, AYUSH Research Portal, NAMASTE)
6. Explain the applications of Artificial Intelligence in medical research
7. Demonstrate practical skills in using databases and AI tools for research
8. Apply Boolean operators and advanced search strategies for effective literature retrieval

7.1 INTRODUCTION TO RESEARCH DATABASES

What is a Research Database?

A Research Database is an organized, searchable collection of scholarly literature including journal articles, conference proceedings, books, theses, and other academic publications. These databases enable researchers to discover, access, and retrieve relevant scientific information efficiently.

Definition

"A research database is a structured repository of bibliographic records and/or full-text documents that allows systematic searching and retrieval of scholarly literature using standardized indexing and metadata."

Why Are Research Databases Important?

- Comprehensive Coverage: Access to millions of peer-reviewed articles
- Quality Assurance: Indexed content is typically peer-reviewed and validated
- Efficient Searching: Advanced search features save time compared to manual searching
- Citation Tracking: Track how research has been cited and its impact
- Current Awareness: Stay updated with latest publications in your field
- Evidence Synthesis: Essential for systematic reviews and meta-analyses

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Intellectual Property Rights (IPR)/ Patent/TKDL

CHAPTER OVERVIEW

Component	Details
Lecture Hours (LH)	1
NLHT	Nil
NLHP	Nil
Domain	Affective/Valuing (AFT-VAL)
Knowledge Level	Nice to Know (NK), Knows How (KH)
Teaching Method	Brainstorming, Lecture with Group Discussion, Problem-Based Learning
Assessment	Presentation, Class Presentation, Peer Assessment, Quiz

LEARNING OBJECTIVES

By the end of this chapter, students should be able to:

1. Define Intellectual Property and explain its importance in research
2. Describe the different types of Intellectual Property Rights
3. Explain the concept of Patents and the patenting process in India
4. Describe the Traditional Knowledge Digital Library (TKDL) and its significance

5. Explain the relevance of IPR in Ayurveda and traditional medicine
6. Identify measures to protect traditional knowledge from biopiracy
7. Appreciate the role of IPR in promoting innovation while preserving traditional heritage

9.1 INTRODUCTION TO INTELLECTUAL PROPERTY

What is Intellectual Property?

Intellectual Property (IP) refers to creations of the mind, including inventions, literary and artistic works, designs, symbols, names, and images used in commerce. These creations are intangible assets that can be legally protected.

Definition: *Intellectual Property is a category of property that includes intangible creations of the human intellect, which are recognized and protected by law from unauthorized use by others.*

Why is IP Important?

Intellectual Property serves several crucial functions:

- **Recognition of Creativity:** Acknowledges and rewards creative effort and innovation
- **Economic Incentive:** Provides financial motivation for research and development
- **Knowledge Dissemination:** Encourages sharing of information through disclosure requirements
- **Competitive Advantage:** Allows creators to benefit commercially from their innovations
- **Protection from Misappropriation:** Safeguards against unauthorized use or theft

The Ancient Perspective

The concept of protecting knowledge and attributing it to original sources has ancient roots in Indian tradition:

"आचार्यात् पादमादत्ते पादं शिष्यः स्वमेधया।
पादं सब्रह्मचारिभ्यः पादं कालक्रमेण च।।"

"A student acquires one-fourth from the teacher, one-fourth through self-study, one-fourth from fellow students, and one-

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Introduction to Medical Statistics

CHAPTER OVERVIEW

Component	Details
Lecture Hours (LH)	1
NLHT	1
NLHP	Nil
Domain	Cognitive/Knowledge (CK), Cognitive/ Comprehension (CC), Cognitive/ Application (CAP)
Knowledge Level	Must Know (MK), Desirable to Know (DK), Knows How (KH)
Teaching Method	Lecture with PPT, Group Discussion, Problem-Based Learning, Team-Based Learning
Assessment	Log Book, Quiz, Presentation, Interaction

LEARNING OBJECTIVES

By the end of this chapter, students should be able to:

1. Define statistics and explain its meaning in a medical context
2. Explain the objectives of medical statistics
3. Differentiate between descriptive and inferential statistics

4. Describe the scope and relevance of medical statistics in Ayurveda
5. Define Evidence-Based Medicine and its components
6. Explain Integrative Medicine and its relevance to Ayurveda
7. Apply basic statistical concepts to Ayurveda research scenarios

11.1 DEFINITION OF STATISTICS

What is Statistics?

The word 'Statistics' is derived from the Latin word 'status' or Italian word 'statista' or German word 'statistik' meaning a political state. Originally, statistics referred to the collection of data regarding the state (population, military, taxation, etc.).

Definition: *Statistics is the science of collecting, organizing, presenting, analyzing, and interpreting numerical data to make decisions in the face of uncertainty.*

Definitions by Scholars

Croxton and Cowden: *"Statistics is the science which deals with the collection, analysis and interpretation of numerical data."*

Horace Secrist: *"Statistics is the aggregate of facts, affected to a marked extent by multiplicity of causes, numerically expressed, enumerated or estimated according to reasonable standards of accuracy, collected systematically for a predetermined purpose, and placed in relation to each other."*

The Ayurveda Perspective

In Ayurveda, the concept of systematic data collection and analysis aligns with the principles of Pramana (means of valid knowledge). The ancient Acharyas emphasized:

- Pratyaksha Pramana (Direct observation) - Data collection through direct observation
- Anumana Pramana (Inference) - Drawing conclusions from observed data
- Yukti Pramana (Logical reasoning) - Applying logical analysis to interpret findings

"संख्यानं च परीक्षा च गणितं च प्रयोजनम्।
युक्तिश्च प्रमितिर्ज्ञेया पञ्चैते बुद्धिलक्षणम्।।" –

The five characteristics of intelligence include enumeration, examination, calculation, application, and logical conclusion.

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Hypothesis and Test of Significance

CHAPTER OVERVIEW

Component	Details
Lecture Hours (LH)	1
NLHT	3
NLHP	Nil
Domain	Cognitive/Comprehension (CC), Cognitive/Application (CAP)
Knowledge Level	Must Know (MK), Shows How (SH)
Teaching Method	Lecture with PPT, Discussion, Problem-Based Learning, Team-Based Learning
Assessment	Log Book, Quiz, Class Presentation

LEARNING OBJECTIVES

By the end of this chapter, students should be able to:

1. Define hypothesis and explain its role in scientific research
2. Differentiate between null hypothesis and alternative hypothesis
3. Classify hypotheses based on directionality (one-tailed and two-tailed)
4. Explain the concept and importance of test of significance

5. Describe the steps involved in hypothesis testing
6. Define and interpret p-value, level of significance, and confidence interval
7. Explain Type I and Type II errors and their implications
8. Apply hypothesis testing concepts to Ayurveda research scenarios

18.1 CONCEPT OF HYPOTHESIS

What is a Hypothesis?

A **hypothesis** is a tentative statement or educated guess about the relationship between two or more variables that can be tested through scientific investigation. It serves as a starting point for research and provides direction for the study.

Definition

"A hypothesis is a specific, testable prediction about what is expected to happen in a study. It is a preliminary explanation of observed phenomena, formulated on the basis of limited evidence, that serves as a basis for further investigation."

The Ayurvedic Perspective

The concept of hypothesis in Ayurveda can be correlated with **'Yukti Pramana' (युक्ति प्रमाण)** - logical reasoning based on observation and inference. Ancient Acharyas formulated hypotheses about disease causation, treatment efficacy, and drug actions through systematic observation and logical deduction.

"युक्तिस्तु बुद्धिः सा ज्ञेया त्रिकालविषया त्रिषु।
भूते भाविणि वर्तमाने सर्वत्र साध्वसाधु वा।।"

This shloka emphasizes that Yukti (logical reasoning) helps in understanding phenomena across past, present, and future - essentially the foundation of hypothesis formation.

Characteristics of a Good Hypothesis

Characteristic	Description	Ayurveda Example
Testable	Can be verified through observation or experimentation	Guduchi reduces FBS levels in Prameha

Salient Features of the Book

- First of Its Kind
- Complete NCISM Curriculum Coverage
- All NLHT Activities Elaborated
- Authentic Ayurvedic Clinical Examples
- Six-Part Standardised Chapter Format
- Modern Research Toolkit
- Research Ethics, IPR & TKDL
- Authoritative Authorship

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