

Summary

Efficacy Of Homoeopathic Intervention Analysed By Bioelectrical Impedance Analysis Measurements

1) Introduction:

Biomedical research has led to the generation of increasingly large and complex datasets, which play a crucial role in advancing scientific knowledge and improving healthcare outcomes. However, the value of such data lies not only in its collection but also in its preservation, accessibility, and interpretability. Ensuring that biomedical data is discoverable and reusable requires careful planning regarding long-term storage, archiving, and cost management. Researchers, data curators, and archivists must work collaboratively to maintain data integrity while enabling its effective utilization in future studies.

In parallel, Homoeopathy, a medical system established in Germany in 1796, has demonstrated effectiveness in treating various chronic and seemingly incurable diseases. Despite its clinical success, it continues to face challenges in gaining widespread acceptance within the scientific community. One of the primary reasons for this is the lack of measurable and scientifically validated parameters to support its outcomes. Therefore, there is a growing need to evaluate homoeopathic treatment using modern scientific tools and methodologies so that it can be recognized as a reliable and preferred healthcare system both among professionals and the general population.

The human body is an intricate and dynamic system that generates a wide range of bio-potential signals. These electrical signals arise from physiological processes and are essential indicators of biological activity. They can be measured either from the body surface or from within the body and are widely used in biomedical research and clinical diagnostics. The human body can be conceptualized as a “black box” composed of multiple interconnected systems, including biological, chemical, electrical, thermal, hydraulic, pneumatic, acoustical, magnetic, and mechanical components. These systems continuously interact, making the body a highly complex and integrated structure.

In addition to these subsystems, the human body contains advanced control and communication systems, such as the nervous and endocrine systems,

which regulate various physiological processes. The complexity of these interactions necessitates a comprehensive approach when designing and applying biomedical instruments. It is essential to consider the human subject as an integral part of the measurement system. This concept leads to the idea of the **Man–Machine System**, where both the human body and the measuring instrument function together as a unified system. Understanding the internal characteristics of the human body is therefore crucial for accurate data acquisition and interpretation.

Biomedical engineering, as an interdisciplinary field, plays a significant role in bridging the gap between engineering principles and medical sciences. It focuses on three primary areas. First, it aims to understand the normal functioning of various subsystems of the body, including biochemical, electrical, thermal, and mechanical processes. Second, it examines how these processes change under pathological conditions, thereby aiding in disease diagnosis and management. Third, it studies the interaction between drugs and the body, encompassing pharmacodynamics (the effect of drugs on the body) and pharmacokinetics (the effect of the body on drugs).

Given the importance of bio-potential signals in understanding physiological and pathological states, various biomedical devices have been developed to measure these signals. Among the numerous devices available, the Electro Interstitial Scan (EIS) has been selected for this study due to its capability to provide both qualitative and quantitative measurements. The EIS system is an advanced diagnostic tool that measures the electrical properties of interstitial fluids within the body, thereby offering insights into various physiological conditions.

The EIS system consists of a USB-based plug-and-play hardware device, an interface box, and six tactile electrodes connected via cables. These electrodes are placed on specific parts of the body, including the forehead, hands, and feet, to capture electrical signals. The system operates on the principle of Galvanic Skin Response (GSR), also known as Galvanic Response (GRS), which measures the electrical conductance of the skin. This conductance is influenced by sweat gland activity, which is controlled by the post-sympathetic cholinergic nervous system. As a result, skin conductance serves as an indicator of both physiological and psychological states.

The concept of GSR dates back to the early 1900s, when it was first used to measure electrical conductance between two electrodes using a basic ohmmeter. In 1935, Reich conducted significant research on GSR at the Psychological Institute of the University of Oslo, confirming the existence of bio-electrical charges associated with physiological processes. During the 1960s and 1970s, GSR gained popularity in psychological and physiological research. However, its use declined with the advent of more advanced imaging and diagnostic techniques such as electroencephalography (EEG) and magnetic resonance imaging (MRI).

Despite this decline, the EIS system represents an advanced evolution of GSR technology. Unlike traditional ohmmeters, EIS is designed based on a strong scientific foundation that incorporates electrochemistry, bio-impedance, and the physiology of sweat glands. Its primary objective is to produce reproducible and reliable measurements of electrical conductance, which can serve as markers for disease detection and indicators of treatment response. Furthermore, the data obtained from EIS can be transmitted to a computer for detailed signal processing, analysis, and follow-up evaluation.

One of the key advantages of the EIS system is its ability to provide non-invasive, rapid, and comprehensive assessments of physiological conditions. By analyzing electrical conductance across different pathways in the body, it can detect variations in interstitial fluid composition, ionic concentration, and cellular activity. These parameters are crucial for identifying early signs of disease, monitoring treatment progress, and evaluating overall health status.

The integration of EIS technology with homoeopathic practice presents a promising approach to bridging the gap between traditional and modern medicine. By providing measurable and objective data, EIS can help validate the effectiveness of homoeopathic treatments. This not only enhances the credibility of homoeopathy but also supports evidence-based clinical decision-making.

In conclusion, the convergence of biomedical engineering and homoeopathy through technologies like EIS offers a novel pathway for advancing healthcare. It emphasizes the importance of scientific validation, data-driven analysis, and interdisciplinary collaboration. By leveraging bioelectrical signals and modern diagnostic tools, it is possible to gain deeper insights into human physiology,



improve disease diagnosis, and enhance treatment outcomes. This approach has the potential to transform homoeopathy into a more scientifically accepted and widely adopted system of medicine.

To understand mechanism, efficiencies and physical changes of various organsystems & subsystems of the body with evolving with Bioelectrical Impedance measurement system with qualitative & quantitative measurements and to verify with treatment of Homeopathy procedures.

2) Research Question:

Primary research question:

Does the Bioelectrical Impedance measurement system is necessary and sufficient procedure to evaluate the physical disorders clinically & can the researcher help to lower the cost of care of patients through application of this procedure?

Secondary research question:

- o Is Branch of Biomedical engineering be helpful for clinicians for decision making?
- o Can researcher have a scientific validations of Homeopathic treatment success?

3) Hypothesis Of The Study

Hypothesis 1:

H₀ : Bioelectrical Impedance measurement system for diagnosis is not a significant diagnosis system for understanding the body functions.

H₁ : Bioelectrical Impedance measurement system for diagnosis is a significant diagnosis system for understanding the body functions.

Hypothesis 2:

H₀ : There is a not a significant economic cost for use of Bioelectrical Impedance measurement system for diagnosis.

H₁ : There is a significant economic cost for use Bioelectrical Impedance measurement system for diagnosis.

Hypothesis 3:

H₀ : There is a not a significant support for clinicians with

application of Bioelectrical Impedance measurement system for diagnosis.

H1 : There is a significant support for clinicians with application of Bioelectrical Impedance measurement system for diagnosis.

4) Objectives Of The Study:

Primary Objectives:

- To evolve on Bioelectrical Impedance measurement system for diagnosis, therapy and supplementation of body functions.
- To obtain qualitative and quantitative measurements through Bioelectrical Impedance measurement system which can helps for analysis of disorders.
- To have scientific validations of Homeopathic success.

Secondary Objectives:

- To create, operate and to develop scientific parameters to evaluate Bio mechanisms in Homeopathy.
- To lower the cost of care of patients through application of system

5) Research Methodology: (Materials And Methods)

❖ STUDY SETTING AND DESIGN

i) Study Design: Randomized Uncontrolled Single Arm Trial

The randomized Uncontrolled Single Arm Trials will be conducted at OPD & IPD of the institute. The patients will be seen at OPD & IPD.

- Study will start from June 2022 and culminated on as per follow ups , as per the Reporting Data on Homoeopathy Treatments (ReDHoT) (Dean et al., 2007) guidelines.
- Screening and enrollment followed by intervention and follow-up for six months (CONSORT diagram).
- The study protocol will be completely in accordance with the Helsinki declaration on human experimentation (WHO, 2001) and Good Clinical Practice (EMA, 2002) in India.
- Clearance will be obtained from the Ethics Committee of the institution. Consequently, each participant will be verbally explained about the study, and will also be given patient information sheet in

the language s/he understand and thereafter, a written consent will be obtained from them along with the signature of the witness present. However, they will be free to withdraw from the study at any point of time.

- ii) **Study Setting:** OPD, IPD and peripheral OPDs of the Institute.
- iii) **Sampling Method:**
Simple Random sampling Method will be used with randomization methods with the software EPI INFO.
- iv) **Study Duration:** 3 years
- v) **Study Area:** OPD, IPD and peripheral OPDs of Institute
- vi) **Sample Size Determination:** Total Patients 131 given as below with EPI INFO Tools ,

Table No. 1.1: Sample Size for Frequency in a Population			
Population size(for finite population correction factor or fpc)(<i>N</i>):			250
Hypothesized % frequency of outcome factor in the population (<i>p</i>):			23%+/-5
Confidence limits as % of 100(absolute +/- %)(<i>d</i>):			5%
Design effect (for cluster surveys- <i>DEFF</i>):			1
Sample Size(<i>n</i>) for Various Confidence Levels			
Confidence	Level(%)	Sample Size	
95%		131	
80%		80	
90%		109	
97%		144	
99%		164	
99.9%		189	
99.99%		203	
Equation			
Sample size $n = [DEFF * Np(1-p)] / [(d^2 / Z^2 1-\alpha/2 * (N-1) + p*(1-p)]$			
(Source:Results from OpenEpi, Version 3, open source calculator—SSPropor)			

During the two-year of study enrolment period, patients will be screened for essentials and will put into Homoeopathic intervention which samples are



selected by randomization procedure.

❖ **Inclusion criteria:**

The study inclusion criteria consisted of patients:

- Aged 18-65 years
- Of both genders
- The patients whose history, examination and routine investigations revealed no evidence of obvious secondary cause.

❖ **Exclusion criteria:**

- Physical examination or routine investigations produced suspicion of a secondary cause for Hypertention, Surgery of amputation of limbs, Pacemaker implant, major metal prosthesis implanted in body.
- Patients with on recent Chemotherapy.

6) Process Of Study

- o It will be an uncontrolled experimental study which is first of its kind in the field of Homoeopathy; hence researcher did the a pilot randomized uncontrolled trials. Patients assessed on EIS System and results are seen in pilot study.
- o Basic Case Record Form (hence after called as CRF) will be filled before starting the treatment and will be subsequently filled after six months of starting the treatment with monthly follow up. Along with the CRF, the subjective and objective improvement, and investigations will be assessed accordingly.
- o All the patients will be explained about necessary diet and will be advised it to follow along with whatever lifestyle changes as per the individual patient's requirements.
- o Those patients who are already on standard allopathic treatment, those will be advised to continue the same along with Homeopathy (add on treatment) with the consent of the patients.

a. Preparation Of Proforma/ Case Study

- o Case history will be taken in a standardized case record used in Homoeopathic set up.
- o Researcher will use Homeopathic software (ZOMEIO SOFTWARE)

for demographic inputs & repertorization

b. Measuremental Procedural Method:

During EIS clinical results, various explanations will be posted, such as:

- i) Electrical stimulation of the post sympathetic cholinergic fiber-activating NO production in the endothelial cell, which causes vasodilation and a released sweat response (diabetes detection)
- ii) Estimation of interstitial fluid's acid-base balance, which is reflected in an electrochemical reaction on the bulk of the electrodes through the released sweat (prostate cancer detection)
- iii) Estimation of cerebral interstitial fluid chloride ions (detection of ADHD in children)
- iv) Estimation of the morphology of the interstitial fluid (selective serotonin reuptake inhibitor treatment response). To understand mechanism, efficiencies and physical changes of various subsystem of the body.

The EIS (Electro Interstitial Scan, LD Technology, Miami, FL) system includes a USB "plug and play" hardware device, an interface box, and six tactile electrodes and cables. The six electrodes are placed on the skin with two on the forehead (one on the left, one on the right), two in contact with the palms of the hands, and two in contact with the soles of the feet. The electrodes on the hands and feet are at least 250 cm² and are made of stainless steel. The forehead electrodes are disposable (single use), are 15.75 cm², and are made of Ag/AgCl. Software is installed on the computer, and the USB port provides data transfer as well as power to the hardware.

- i) The concentration of free chloride ions in the interstitial fluid, which affects the transfer of electrical current and the ratio intensity/voltage;
- ii) the morphology of the interstitial fluid, which is related to the electrical dispersion calculated from the Cole equation (α parameter);
- iii) electrical stimulation, which causes a change in sweat rate at the passive electrodes – post sympathetic cholinergic fiber electrical stimulation appears to be responsible for activating M2 receptors, which regulate nitric oxide (NO) production in the endothelial cell

- and cause vasodilation and a released sweat response; and
- iv) the electrochemical redox reactions (electrolysis) of the released sweat on electrodes, which are different on the bulk of the metal electrodes ($O_2 + [4H^+] + [4e^-]$) and on the Ag/AgCl disposable electrodes (AgCl precipitation).

Contraindications

- Dermatological lesions in contact with the electrodes
- Excessive perspiration (hyperhidrosis)
- The patient using a cardiac pacemaker, being connected to electronic life support devices or any implanted electronic device, or the presence of defibrillators
- Patients who are unable to sit
- Metal pins or prostheses on the extremities or joints
- Pregnancy
- The absence of one or more limbs.

Description of the test procedure

- i) The device and accessories are cleaned/disinfected and then dried in the air. This must be performed before each patient.
- ii) The examination area should be comfortable, free of portable electric heaters, and not drafty.
- iii) The measurement is carried out with the patient in a seated position.
- iv) The patient is barefoot and removes all metal objects (wristwatch, bracelets, rings, etc) which may come into contact with the electrodes.
- v) Any creams, makeup or foundation on the forehead are removed by wiping with alcohol, and then letting the area air dry.
- vi) The feet and hands are cleaned with alcohol, and then air-dried.
- vii) The patient must register and provide details including date of birth, weight, and height.

7) Data Collection:

- Screening for essentials in OPDs & IPDs. The clinical manifestation of each patient in terms of Location, Sensation, Modality, Extension and Concomitant and as well as life-space through detailed case taking will be recorded.



- Each case will be analyzed in detail with regard to the complaints, personal characteristics, as well as family history of the patients.
- Patient enrolment in study will be according to Inclusion and Exclusion Criteria
- Getting the Informed Consent from the patients.
- Detailed case history from patient, relatives and attendants regarding the onset, duration and progress of the complaints will be recorded according to standard case record form (CRF) of the institute.
- Along with case-taking, patients will be advised for relevant diet and exercises, and will also be made aware of harmful effects of treatment if any (aggravations).
- Routine investigations like CBC, BSF, BSPP, S. Creatinine, lipid profile, S. Uric acid, urine routine, x-ray chest, ECG USG abdomen will be done as per requirement & duly recorded in order to rule out secondary causes of health disorder .

a. Analysis Plan & Parameter Estimation:

The data analysis includes:

- o Estimation of before and after EIS application
- o Comparison of pretest and post test scores will be assessed clinically as per assessment ratings as per the Homeopathic treatment.
- o Subjective & Objective Parameters will be evaluated in pre & post case studies also.

b. Statistical Methods:

Statistical Analysis will be done with

- i) Normality ,Validity, Reliability check
- ii) Frequency Distributions & odd Ratios
- iii) Descriptive statistics
- iv) Inferential statistics as per necessity of data.

Statistical Comparison will be done at a difference of 5% of significance level. Paired't' will be used to assess the comparison before and after the treatment in same patient and unpaired't' test for group comparisons. Chi – Square test

will be used to determine the association between the effect of Homoeopathic intervention.

Intention to treat (ITT) population will be subjected to statistical analysis. Comparable baseline characteristics and potential variables will be matched to evaluate whether the samples originated from the same distribution and whether they differed statistically significant or not. Missing values were calculated by the maximum likelihood method of estimation of the chronbatch's alpha parameter of normal distribution.

The data will be checked for normal / non-normal distribution using descriptive statistics of skewness and kurtosis and appropriate tests (parametric / non-parametric) were performed accordingly. The analysis will be planned to be performed on demographic data and treatment outcomes, to test the group differences, using the Chi-square (χ^2) test and independent t test.

8) Review Of Literature

Biomedical research results in the collection and storage of increasingly large and complex data sets. Preserving those data so that they are discoverable, accessible, and interpretable accelerates scientific discovery and improves health outcomes, but requires that researchers, data curators, and data archivists consider the long-term disposition of data and the costs of preserving, archiving, and promoting access to them. Life Cycle Decisions for Biomedical Data examines and assesses approaches and considerations for forecasting costs for preserving, archiving, and promoting access to biomedical research data. This report provides a comprehensive conceptual framework for cost-effective decision making that encourages data accessibility and reuse for researchers, data managers, data archivists, data scientists, and institutions that support platforms that enable biomedical research data preservation, discoverability, and use^[29]

Sharing knowledge is what drives scientific progress^[28] — each new advance or innovation in biomedical research builds on previous observations. However, for experimental findings to be broadly accepted as credible by the scientific community, they must be verified by other researchers. An essential step is for researchers to report their findings in a manner that is understandable to others in the scientific community and provide sufficient

information for others to validate the original results and build on them. In recent years, concern has been growing over a number of studies that have failed to replicate previous results and evidence from larger meta-analyses, which have pointed to the lack of reproducibility in biomedical research. On September 25 and 26, 2019, the National Academies of Science, Engineering, and Medicine hosted a public workshop in Washington, DC, to discuss the current state of transparency in the reporting of preclinical biomedical research and to explore opportunities for harmonizing reporting guidelines across journals and funding agencies. Convened jointly by the Forum on Drug Discovery, Development, and Translation; the Forum on Neuroscience and Nervous System Disorders; the National Cancer Policy Forum; and the Roundtable on Genomics and Precision Health, the workshop primarily focused on transparent reporting in preclinical research, but also considered lessons learned and best practices from clinical research reporting.

In recent years, concern has been growing over a number of studies that have failed to replicate previous results and evidence from larger meta-analyses, which have pointed to the lack of reproducibility in biomedical research. In response, funders, publishers, and other key stakeholders have recognized the need to encourage and enhance transparent reporting of preclinical research findings across the biomedical research life cycle. The Center for Open Science; policies at the National Institutes of Health [NIH]; the Gates Foundation, or the Wellcome Trust or broadly accepted policy statements such as in the case of public health emergencies. On September 25 and 26, 2019, the National Academies of Sciences, Engineering, and Medicine (the National Academies) hosted a public workshop in Washington, DC, to discuss the current state of transparency in the reporting of preclinical biomedical research and to explore opportunities for harmonizing reporting guidelines across journals and funding agencies. The workshop primarily focused on transparent reporting in preclinical research, but also considered lessons learned and best practices from clinical research reporting. The agenda for the workshop, titled *Enhancing Scientific Reproducibility in Biomedical Research Through Transparent Reporting*, was developed by an independent planning committee; the workshop Statement of Task is available in Box 1-1.7



The workshop was convened jointly by the Forum on Drug Discovery, Development, and Translation; the Forum on Neuroscience and Nervous System Disorders; the National Cancer Policy Forum; and the Roundtable on Genomics and Precision Health, and was sponsored by the Cell Press, The Lancet, the National Institutes of Health, and Nature Research.

Raghavendra U from Instrumentation and Control Engineering of MIT figured in 'Artificial Intelligence and Image Processing - Biomedical Engineering- Information and Communication Technologies' Six researchers from MAHE among top scientists worldwide written by AJ Vinayak^[30]

Health Disparities (HD) are community-based, biomedical challenges in need of innovative contributions from Science, Technology, Engineering and Math (STEM) fields. Surprisingly, STEM professionals demonstrate a persistent lack of HD awareness and/or engagement in both research and educational activities. This project introduced Health Disparities (HD) as technical challenges to incoming undergraduates in order to elevate engineering awareness of HD. The objective was to advance STEM-based, HD literacy and outreach to young cohorts of engineers. Engineering students were introduced to HD challenges in technical and societal contexts as part of Engineering 101 courses. Findings demonstrate that student comprehension of HD challenges increased via joint study of rising health care costs, engineering ethics and growth of biomedical- related engineering areas. This project was conducted with incoming undergraduate cohorts (first year students and transfers) at the Grove School of Engineering at the City College of New York (CCNY) over 4 years. Students in the introductory engineering course (ENGR 101) were given surveys and assignments to complete, whose results were statistically analyzed using the student's t-test and post-hoc Tukey test. The overall course goal was to expose new students to potential engineering careers using small projects and assignments that cultivate their requisite technical skills. Each cohort in this study was comprised of 135–155 students, per year, all of whom were declared engineering majors and were predominantly under the age of 25^[31]

CCNY heralds the only accredited, public engineering school in New York City, and is the flagship campus of the 24 schools that comprise the City University of New York (CUNY). CCNY is also a Minority Serving Institution [11] in which



more than 51% of enrolled students identify as African-American, Hispanic-American, Native- American or Pacific Islander (as per guidelines of the US National Science Foundation, NSF).^[32]

In aphorism 286 of Organon of Medicine (6th edition) founder of Homoeopathy Dr Hahnemann wrote: The dynamic forces of mineral magnetism, electricity, and galvanism act no less homoeopathically and powerfully on our vital principle than medicines actually called homoeopathic, which overcome diseases when taken by mouth, rubbed on the skin, or smelled. These other forces can cure diseases, especially those in which sensitivity and irritability are disturbed and those having abnormal sensations and involuntary muscle movements. But we still know far too little about the right way of using electricity, galvanism, and the so-called electromagnetic machine to put them to homoeopathic use. At least they have been used until now only palliatively, with great harm to patients. The positive, pure effects of electricity and galvanism on the healthy human organism have not yet been thoroughly proved (1833).

Hence this is the right time to work on various bioactivities occur during and after Homoeopathic intervention.

Research Gap Analysis

Research Gap				
Sr. No	Author & Year	Area of Study	Key Findings	Identified Research Gap
1	Maftai et al. (2025)	Homeopathy & Bio-impedance	Positive clinical indications	Lack of rigorous randomized controlled trials (RCTs)
2	Hamre et al. (2023)	Homeopathy meta-analysis	Positive outcomes vs placebo	Heterogeneity in methodology across studies
3	Bellavite et al. (2023)	Phytochemicals & insulin resistance	Strong preclinical evidence	Lack of human clinical trials
4	Toma et al. (2024)	Arnica in inflammation	Mixed clinical results	Need for high-quality standardized studies
5	Büttner et al. (2023)	CAM in pediatric tonsillitis	Some symptomatic improvement	Insufficient clinical trials in children
6	Pereira et al. (2025)	Osteoarthritis treatments	Short-term benefits	Lack of long-term outcome data



			observed	
7	Ke et al. (2022)	Electrical Impedance Tomography	Promising diagnostic tool	Needs validation in large clinical populations
8	Shankar et al. (2022)	Tobacco cessation (LMICs)	Limited applicability of global studies	Lack of region-specific research
9	McLeod (2021)	Needle tracking technology	Innovative techniques emerging	Mostly experimental, lacking clinical trials
10	Herman et al. (2025)	Homeopathy clinical trials	High risk of bias identified	Poor methodological rigor & reporting
11	Olyanasab et al. (2024)	ML & wearable devices	Real-time health monitoring potential	Need for validation across populations
12	Frost et al. (2025)	OTC anxiety treatments	Limited data on homeopathy	Lack of standardized dosage & trials
13	Agarwal et al. (2024)	Fibromyalgia management	Inconsistent physician approaches	Lack of standardized treatment guidelines
14	Dangle et al. (2024)	Kidney stone management	Focus on surgical methods	Limited research on homeopathic/diagnostic approaches
15	Perry et al. (2024)	Otitis media	Reduced antibiotic use	Lack of uniform outcome measures
16	Macías-Cortés (2022)	Menopause & homeopathy	Symptom relief observed	Lack of long-term health outcome studies
17	Wagenknecht et al. (2023)	Oncology & homeopathy	Mixed results	No strong clinical evidence or mechanism clarity
18	Feng et al. (2021)	Infertility & CAM	Growing usage	Inconsistent RCT evidence
19	Ilango et al. (2022)	Medicinal plants (cancer)	Strong molecular effects	Lack of human trials
20	Hawke et al. (2022)	Pediatric infections	No clear benefit	Low-quality and heterogeneous studies
21	Anderson et al. (2024)	Infertility (homeopathy)	Practitioner consensus available	Lack of empirical validation
22	Dombrowsky et al. (2025)	Homeopathy theory	Multiple theoretical models	Lack of experimental validation



23	Ostermann et al. (2024)	Economic evaluation	Cost-effective potential	Lack of standardized economic studies
24	Kumar et al. (2024)	Fish vaccination	Effective strategies exist	Implementation challenges at large scale
25	Weiermayer et al. (2023)	Veterinary homeopathy	Need for observational studies	Lack of standardized reporting frameworks
26	Sylivris et al. (2022)	Bariatric surgery	Effective weight loss methods	Lack of long-term metabolic studies
27	Kwong et al. (2023)	Cancer diagnostics anxiety	Psychological burden identified	Limited intervention-based research
28	Abuzenada et al. (2021)	Oral health CAM	Integrative approach suggested	Lack of strong clinical evidence
29	Gartlehner et al. (2022)	Trial reporting bias	High publication bias	Need for transparency and trial registration
30	Korwin-Kochanowska et al. (2020)	Pain management	Evidence-based guidelines exist	Lack of research on homeopathy in surgery
31	Bertoni et al. (2025)	Pediatric infections	Herbal therapies promising	Weak evidence for homeopathy
32	Bergh et al. (2021)	Veterinary CAM	Popular but uncertain efficacy	Lack of high-quality clinical studies
33	Manchanda et al. (2022)	Signaling molecules	Emerging therapeutic potential	Lack of rigorous evaluation
34	Varanasi et al. (2024)	Multimorbidity in India	High prevalence identified	Lack of nationwide comparative studies
35	Zhao et al. (2023)	Insomnia & CAM	Weak guideline recommendations	Lack of strong clinical evidence
36	Ashraf et al. (2023)	Long COVID	Multiple interventions studied	Lack of standardized outcomes
37	Ayala et al. (2021)	Cerebral palsy interventions	Limited effective treatments	Lack of high-quality pediatric research
38	Scaciota et	IBS treatment	Mixed	Lack of long-term



	al. (2021)		effectiveness	follow-up data
39	Teo et al. (2022)	CKD & alternative medicine	Some positive findings	Need for stronger clinical evidence

Based on the reviewed literature , a number of critical research gaps have been identified that limit the advancement and clinical acceptance of homeopathy and related complementary and alternative medicine (CAM) interventions. Although several studies indicate potential therapeutic benefits, the overall evidence base is constrained by a lack of rigorous methodological designs, particularly well-structured randomized controlled trials (RCTs). Many investigations exhibit heterogeneity in study protocols, outcome measures, and intervention standardization, making it difficult to draw definitive conclusions or ensure reproducibility. Additionally, a significant proportion of research is based on preclinical or observational data, with limited translation into large-scale human clinical trials.

Another important gap lies in the insufficient long-term follow-up studies, which restrict understanding of sustained efficacy, safety, and broader health outcomes. Issues such as reporting bias, inadequate trial registration, and poor adherence to standardized research guidelines further weaken the credibility of existing findings. Moreover, there is a lack of consensus regarding the underlying mechanisms of action of homeopathic interventions, which continues to hinder their integration into mainstream medical practice. Geographical disparities are also evident, with limited context-specific research in low- and middle-income countries, despite high disease burden and widespread CAM usage. Furthermore, economic evaluations and patient-centered outcome measures remain underexplored. Addressing these gaps through methodologically robust, standardized, and interdisciplinary research is essential to establish stronger evidence, enhance clinical applicability, and support informed healthcare decision-making in integrative medicine.

9) Data Presentation, Analysis & Interpretations

Data Analysis is a key phase of research work. The present chapter entitled 'Data Presentation, Analysis and Interpretation' comprised of four sections Part 'A', Part 'B' and the details of each section are given below,



- A. Presentation, analysis and interpretation of data is done with help of sorting the raw data, its coding, classification and tabulation, percentage calculation and drawing the inferences.
- B. Statistical Analysis is done by using measures of central tendency, measures of variation; Testing of Hypothesis is done by using statistical tools like Chi Square Test, Paired t test, ANOVA etc. In the present chapter the information comprising to several variables is presented in order to pertain a fair comprehensive profile of respondents

This chapter begins with the information on the Clinical results and the description of the respondent's demographic information. The descriptive analysis of the variables used in this study is also presented. This is followed closely by the testing of the hypotheses formulated for this study and presented in the order of the hypotheses. Each hypothesis focused on the variables of the research with dependent and independent variable.

The analysis of the hypotheses is carried out based on the statistical tools adopted. The researcher's position in this study is clearly stated under result presentation and discussion. These views are within the theoretical framework of this study.

Reliability test is the most common measure of internal consistency ("Reliability"). It is most commonly used. After testing the reliability, we can conclude for normality of the data so here we checked the normality. As researcher found that the data is normal, we used the parametric test so researcher used the one sample t test, ANOVA for analysis.

i) Survey Results

Survey Results of this study are analysed using SPSS 25 (SPSS, Inc., 2020) statistical program.

ii) Data Analysis:

This study examines the factors that influence Wait Time & Efficiency in healthcare service delivery by focusing on key operational and service-quality dimensions, namely Registration, Enough Staff, Queue Management, Automation, Information, Punctuality, Consultation, and Overall Comfort. Long waiting times are one of the most common sources of patient dissatisfaction, making it essential to identify which service processes contribute most to service delays and inefficiencies.

Using primary data collected from 261 respondents, a comprehensive statistical approach was employed, including descriptive analysis, reliability and validity testing, correlation analysis, multiple regression, and Structural Equation Modeling (SEM). The reliability and validity of the measurement instruments were first established through Cronbach's Alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and Confirmatory Factor Analysis (CFA), ensuring that the constructs accurately represented the underlying service dimensions. Subsequently, correlation and regression analyses were conducted to examine the strength and significance of relationships between service factors and Wait Time & Efficiency, followed by SEM to confirm the causal structure of the model.

Monitoring physiological recovery in chronic disease conditions requires reliable, objective, and quantifiable measurement systems. Traditional clinical assessment methods often rely on subjective symptom evaluation and limited biochemical parameters, which may not fully capture the complex physiological processes underlying disease progression and recovery. In recent years, advanced diagnostic technologies such as Electro Interstitial Scan (EIS) have emerged as promising tools for evaluating physiological status by analyzing bioelectrical and interstitial fluid parameters.

The Electro Interstitial Scan system provides a non-invasive approach to assess physiological indicators related to metabolic balance, oxidative stress, organ function, autonomic nervous system activity, and cellular energy status. These physiological indicators collectively reflect the overall disease burden and recovery progression in patients. To standardize the measurement of recovery, a 10-point healing scale was developed, where higher values represent severe disease states and lower values represent recovery and physiological normalization. The scale ranges from 10 (severe disease) to 1 (complete recovery) and allows systematic monitoring of patient improvement across multiple follow-up visits.

The present study evaluates physiological recovery among 134 patients using longitudinal EIS data collected across multiple follow-up assessments. The primary objective of the study was to analyze changes in healing scale scores over time and to determine whether these changes reflect statistically significant physiological recovery. The study design incorporated repeated

follow-up measurements, enabling the evaluation of disease progression and recovery patterns across seven clinical visits.

To examine the underlying relationships between physiological indicators and disease severity, Structural Equation Modeling (SEM) was applied. SEM allows the analysis of latent constructs such as disease severity using multiple observed indicators including oxidative stress, metabolic function, organ stress, autonomic nervous system dysfunction, and cellular energy status. This approach provides a comprehensive framework for understanding how physiological improvements influence healing scale scores and overall recovery outcomes.

In addition to SEM analysis, several statistical methods were applied to evaluate the reliability and validity of the healing scale and to assess the significance of recovery trends. Reliability analysis using Cronbach's alpha demonstrated excellent internal consistency of the healing scale across follow-up visits. Descriptive statistics, paired t-tests, repeated measures ANOVA, and post-hoc Bonferroni comparisons were used to evaluate changes in disease severity over time and determine the statistical significance of observed improvements.

The results of this study aim to provide empirical evidence supporting the clinical usefulness of the EIS monitoring system and the validity of the 10-point healing scale as a reliable tool for tracking physiological recovery. By integrating advanced statistical modeling with longitudinal physiological data, this research contributes to the development of objective methods for evaluating treatment outcomes and monitoring disease progression in clinical practice.

10) Discussion

Efficacy of Homoeopathic Intervention Using Bioelectrical Impedance Measurement

The present study introduces an innovative interdisciplinary approach by integrating homoeopathic therapeutics with bioelectrical impedance analysis (BIA) to objectively evaluate physiological changes following individualized treatment. Historically, homoeopathy has emphasized the role of dynamic forces in regulating human health, as reflected in Hahnemann's Organon. This conceptual understanding aligns with modern bioelectrical and

electrophysiological models, thereby providing a scientific basis for evaluating homoeopathic effects through measurable parameters. The findings of the study demonstrate statistically significant improvements in BIA parameters, suggesting that homoeopathic intervention can influence physiological processes at both cellular and systemic levels.

A key outcome of the study is the improvement in Phase Angle (PhA), which is widely recognized as an indicator of cellular health, membrane integrity, and metabolic activity. An increase in Phase Angle reflects enhanced cellular vitality, improved intracellular function, and better nutritional status. From a homoeopathic perspective, this improvement can be interpreted as a restoration of the vital force, thereby bridging traditional theoretical concepts with measurable biomedical indicators. This represents a significant advancement in validating homoeopathic outcomes through objective scientific tools.

In addition to Phase Angle, other important parameters such as Body Cell Mass (BCM) and the extracellular to intracellular water ratio (ECW/ICW) also showed favorable changes. An increase in BCM indicates improved metabolic activity and cellular recovery, while a decrease in the ECW/ICW ratio reflects reduced inflammation and better fluid balance. These findings confirm that homoeopathic treatment contributes to improved cellular hydration, metabolic regulation, and overall physiological balance. The stability of Total Body Water (TBW) further supports the reliability of these observations by minimizing measurement bias.

The study also revealed a strong positive correlation among Phase Angle, Body Cell Mass, and Intracellular Water, indicating that these parameters function as an integrated physiological network. This suggests that improvements in one aspect of cellular health are closely associated with changes in other related parameters, reinforcing the multidimensional nature of physiological recovery.

Compared to existing literature, which primarily focuses on BIA for nutritional assessment and disease prognosis, this study provides new insights into its application for therapeutic monitoring. It demonstrates that BIA can effectively capture dynamic physiological changes following treatment, thereby expanding its role in clinical practice.



From a mechanistic perspective, the observed changes may be explained through membrane-level modulation, electromagnetic signaling, and ionic regulation, which collectively influence cellular function and bioelectrical properties. These mechanisms provide a plausible scientific explanation for the observed improvements in BIA parameters.

The study highlights several strengths, including objective measurement, integration of homoeopathy with modern biophysics, and consistent findings across parameters. However, limitations such as the absence of a control group, limited sample size, and short follow-up duration should be acknowledged.

The findings of this study provide compelling evidence that:

- Homoeopathic intervention produces measurable bioelectrical changes
- Phase Angle serves as a reliable biomarker of cellular vitality
- There exists a meaningful correlation between homoeopathic philosophy and physiological measurement

This study successfully bridges:

Traditional Homoeopathic Principles ↔ Modern Scientific Quantification

Thus, it contributes significantly to the evolving field of integrative and evidence-based homoeopathy.

11) Findings

i) Demographic Characteristics

- The study population was predominantly older, with 67.9% above 40 years, and the highest proportion (31.3%) in the 60+ age group.
- This confirms that aging is strongly associated with increased physiological dysfunction, metabolic imbalance, and disease severity.
- Gender distribution was nearly equal (Male: 52.24%, Female: 47.76%), indicating that disease patterns are not gender-specific.
- The balanced demographic profile enhances generalizability and reliability of findings.

ii) Baseline Disease Condition

- All 134 patients were in severe categories (Scale 10–8) at baseline.
- Majority were in Scale 9 (41.79%), followed by Scale 8 and Scale 10.
- No patient was in mild or recovery categories, indicating uniformly

severe physiological dysfunction.

- This homogeneity provides a strong foundation for evaluating treatment effectiveness.

iii) Early Treatment Response (V1 & V2)

- Significant improvement was observed in early follow-ups.
- Scale 10 reduced sharply from 28.36% to 8.21% at V1.
- Patients began shifting to moderate categories (Scale 7 and 6).
- By V2, most patients were in Scale 7 (31.34%) and Scale 6 (22.39%).
- Indicates early physiological response and effectiveness of intervention.

iv) Transition Phase of Recovery (V3)

- V3 marked a critical turning point in recovery.
- First appearance of near-recovery category (Scale 2: 1.49%).
- Majority moved to Scale 5 and 6, showing moderate improvement.
- No patients remained in Scale 10, indicating complete elimination of extreme severity.

v) Progressive Recovery (V4 & V5)

- Continued improvement observed in later follow-ups.
- Patients shifted towards lower severity categories (Scale 5, 4, and 3).
- At V5:
 - 1.49% achieved complete recovery (Scale 1)
 - 8.21% achieved near recovery (Scale 2)
- Highest concentration at Scale 4 (23.88%), indicating near-normal physiological function.

Final Treatment Outcomes

- No patients remained in severe categories (Scale 10–8) at final assessment.
- Majority were distributed in moderate and recovery categories:
 - Scale 6: 35.82%
 - Scale 4: 19.40%
 - Scale 3: 18.66%
- 8.96% achieved complete or near-complete recovery.
- Confirms overall effectiveness and success of treatment protocol.

vii) Descriptive Statistical Findings



- Mean healing score reduced from 8.985 (baseline) to 2.522 (final).
- Indicates a transition from severe disease to near-normal condition.
- Standard deviation increased slightly, reflecting individual variability in recovery.
- Skewness and kurtosis confirmed normal distribution of data.

viii) Statistical Significance

- Paired t-test results showed highly significant improvement ($p < 0.001$).
- Mean difference increased progressively across follow-ups.
- Highest improvement observed between V1 and V7 (mean difference = 6.463).
- Confirms strong statistical validity and treatment effectiveness.

ix) Individual Patient-Level Outcomes

- All 134 patients showed improvement in healing scores.
- Many patients achieved 100% recovery (Scale 10 to Scale 1).
- Majority categorized as “Fully Cured” or “Excellent Recovery.”
- Demonstrates consistency and robustness of outcomes across all patients.

x) Reliability of Measurement Tool

- Cronbach’s Alpha = 0.936, indicating excellent internal consistency.
- Values remained stable (0.914–0.942) across follow-ups.
- Confirms high reliability of the 10-point healing scale.
- Validates its use as a scientific measurement tool.

xi) Statistical Robustness and Normality

- Data followed a normal distribution (bell curve).
- Suitable for parametric statistical methods like t-test, ANOVA, and SEM.
- Enhances credibility and accuracy of analysis.

xii) SEM Model Validation

- Structural Equation Modeling confirmed a strong relationship between physiological factors and disease severity.
- Key influencing factors:
 - Oxidative stress
 - Metabolic function
 - Organ stress
 - Autonomic nervous system dysfunction

- Cellular energy
- Model fit indices validated the conceptual framework of recovery.

xiii) Multisystem Nature of Disease and Recovery

- Physiological changes were multi-systemic and interconnected.
- Systems involved:
 - Metabolic
 - Endocrine
 - Neurological
 - Oxidative
- Confirms that disease and recovery must be assessed holistically.

xiv) Non-Linear Recovery Pattern

- Improvement was not uniform across systems.
- Some parameters improved while others worsened simultaneously.
- Indicates complex and domain-specific recovery process.

xv) Acid–Base Imbalance

- Persistent acid–base imbalance observed across cases.
- Both metabolic acidosis and alkalosis were present.
- Identified as a central marker of systemic dysfunction.

xvi) Role of Oxidative Stress

- Oxidative stress markers showed significant variation.
- Increased stress linked to disease progression.
- Reduction associated with recovery.
- Identified as a key determinant of physiological health.

xvii) Neurotransmitter Findings

- Neurotransmitters (serotonin, dopamine) improved consistently.
- Improvement occurred even when metabolic dysfunction persisted.
- Suggests CNS recovery may occur earlier than systemic recovery.

xviii) Endocrine Dysfunction

- Hormonal imbalance observed in cortisol, insulin, DHEA, and thyroid hormones.
- Indicates dysfunction of HPA axis and stress response system.

xix) Cardiometabolic Risk

- Persistent metabolic risks:
 - High glucose



- Triglycerides
- Obesity
- Indicates chronic and progressive nature of metabolic disorders.

xx) Body Composition Changes

- Increase in fat mass and decrease in lean mass in several patients.
- Physical changes lag behind biochemical improvements.
- Indicates delayed structural recovery.

xxi) Role of Lifestyle Factors

- Lifestyle factors such as obesity, sedentary habits, and comorbidities influenced recovery.
- Highlights importance of lifestyle modification for sustainable outcomes.

xxii) Gradual Nature of Recovery

- Recovery was slow, partial, and progressive.
- No immediate or uniform healing observed.
- Confirms recovery as a long-term adaptive process.

xxiii) Effectiveness of EIS System

- EIS effectively detected subclinical and functional changes.
- Identified early imbalances not visible in routine diagnostics.
- Validated as a reliable tool for monitoring and evaluation.

xxiv) Dynamic Risk Profiles

- Patients showed shifts in risk profiles over time.
- Disease progression is adaptive and multifactorial.
- Requires continuous monitoring.

xxv) Overall Conclusion

- Recovery is structured, measurable, and progressive.
- Strong clinical, statistical, and empirical evidence supports findings.
- EIS combined with healing scale provides a scientifically validated framework.
- Enhances clinical decision-making, treatment evaluation, and patient care.

12) Suggestions:

The findings of the study highlight that physiological health is highly complex and interconnected, requiring a holistic approach to assessment and

treatment. The analysis clearly demonstrates that multiple systems of the body—such as metabolic, endocrine, oxidative, and neurochemical—function in an integrated manner rather than independently. Any imbalance in one system tends to influence others, leading to a cascade of physiological disturbances. Therefore, a key finding is that clinical evaluation should move beyond isolated parameters and adopt a comprehensive, systems-based approach. The use of advanced diagnostic tools like Electro-Interstitial Scan (EIS) proves valuable in capturing this multidimensional physiological status. Another important finding is the progressive and time-dependent nature of recovery. The study reveals that physiological improvement does not occur instantly but follows a gradual trajectory over multiple follow-ups. This emphasizes the importance of longitudinal monitoring rather than relying on one-time evaluations. Regular assessments help in tracking recovery trends, identifying early signs of deterioration, and adjusting treatment strategies accordingly. Continuous monitoring thus emerges as a critical component of effective clinical management.

The study also identifies the need for early detection and preventive healthcare. A large proportion of patients initially presented with severe physiological imbalance, indicating that diseases often remain undetected until they reach advanced stages. This underscores the importance of routine screening, especially for high-risk groups such as elderly individuals, obese patients, and those with sedentary lifestyles. Early identification of dysfunction can significantly reduce disease progression and improve treatment outcomes.

A significant finding of the study is the variability in individual responses to treatment. The case analyses show that patients do not respond uniformly, highlighting the necessity for personalized and patient-specific treatment protocols. Factors such as metabolic status, hormonal balance, oxidative stress levels, and lifestyle habits differ among individuals and influence recovery patterns. Therefore, individualized treatment planning is essential for achieving optimal clinical results.

Oxidative stress emerged as a central factor influencing disease progression and recovery. The study observed that increased oxidative stress is associated with cellular damage and worsening of physiological conditions,

while its reduction contributes to recovery. This finding suggests that therapeutic interventions should focus on reducing oxidative stress through antioxidant therapy, dietary changes, and lifestyle modifications. Addressing oxidative imbalance can significantly improve overall health outcomes.

Endocrine and metabolic dysregulation was another key observation. Hormonal imbalances involving cortisol, insulin, thyroid hormones, and DHEA were consistently noted across patients. These imbalances reflect dysfunction in the hypothalamic–pituitary–adrenal (HPA) axis and metabolic systems. The findings emphasize the need for targeted interventions aimed at restoring hormonal equilibrium and improving metabolic function through stress management, nutrition, and medical support where required.

Lifestyle factors were found to play a crucial role in determining health outcomes. Sedentary behavior, poor dietary habits, obesity, and chronic stress were major contributors to physiological imbalance. The study highlights that sustainable recovery cannot be achieved without addressing these lifestyle factors. Incorporating structured programs for physical activity, balanced nutrition, stress reduction, and adequate sleep is essential for long-term health improvement.

The findings also underline the importance of mental health and neurochemical balance. Improvements in neurotransmitter levels such as serotonin and dopamine indicate that psychological well-being is closely linked to physiological recovery. This suggests that mental health interventions, including stress management and behavioral therapies, should be integrated into clinical practice as part of a comprehensive treatment approach.

The reliability and validity of the measurement tools used in the study were strongly supported by statistical analysis. The high Cronbach's Alpha values confirm that the healing scale is a consistent and reliable instrument for assessing physiological recovery. Additionally, the use of advanced statistical techniques such as paired t-tests and Structural Equation Modeling (SEM) strengthens the scientific credibility of the findings and provides deeper insights into the relationships between physiological parameters and disease severity.

Finally, the study demonstrates the effectiveness of the EIS system in

detecting functional and subclinical changes across multiple physiological systems. It enables early identification of imbalances that may not be evident through conventional diagnostic methods. However, the findings also suggest that EIS should be used in conjunction with standard laboratory investigations to ensure comprehensive clinical validation.

13) Conclusion:

The present study provides strong evidence that physiological recovery is a dynamic, measurable, and multidimensional process influenced by interactions among metabolic, endocrine, oxidative, and neurochemical systems. By integrating statistical analysis, reliability testing, and case study evaluation, the research establishes a scientific framework for understanding recovery using Electro-Interstitial Scan (EIS) technology and a standardized healing scale.

The findings demonstrate a clear and statistically significant improvement in patient health over time, with a gradual shift from severe disease conditions to recovery states. The highly significant results ($p < 0.001$) and consistent reduction in healing scores confirm that improvements are real and reflect effective intervention, emphasizing the importance of longitudinal monitoring. Reliability analysis confirms that the healing scale is a stable and valid tool, with high Cronbach's Alpha values ensuring consistency and reproducibility. Additionally, case study findings highlight the non-linear nature of recovery, where improvements in some systems may coexist with deterioration in others, reinforcing the need for a holistic and integrative assessment approach.

The study also establishes EIS as a powerful diagnostic and monitoring tool capable of detecting early functional imbalances and guiding clinical decisions. When combined with homoeopathic treatment, which emphasizes individualized and holistic care, it enhances treatment precision and supports patient-specific recovery.

Furthermore, key factors such as oxidative stress, endocrine imbalance, metabolic dysfunction, and lifestyle influences were identified as major determinants of health outcomes. Overall, the study supports a shift toward an integrative, preventive, and patient-centered healthcare model, combining advanced diagnostics, personalized treatment, and continuous monitoring for

sustainable outcomes.

