

Research Article

BIOCHEMIC TISSUE SALTS IN FOCUS: PATHOGENETIC INSIGHTS INTO ACUTE CARDIOVASCULAR DISORDERS

Author: Uday Chandarna ¹ 

¹L.R. Shah Homoeopathy College, Rajkot, Gujarat

KEYWORDS:

Myocardial Infarction, Angina Pectoris, Arrhythmias, Biochemic Remedies, Pathogenesis

ARTICLE HISTORY

Received Date: 05/04/2026

Revised Date: 07/05/2026

Accepted Date: 22/05/2026

Published Date: 07/06/2026

DOI: 10.69557/2czdkk06

CORRESPONDING AUTHOR

Uday Chandarna

udaychandarana932@gmail.com

ABSTRACT

Cardiovascular disease is worldwide commonly occurring acute emergency condition leading to large numbers of death of patients. The acute cardiovascular diseases are acute myocardial infarction, angina pectoris and arrhythmias cause mortality at world level. Acute cardiovascular disease occurs due to the mineral deficiency at tissue level. For example, role of magnesium in body is to relax the muscle thus preventing the muscle spasm, it helps to relax the muscle. So, deficiency of magnesium leads to constant muscle spasm of heart which lead to angina pectoris. Biochemic tissue remedy which is therapeutic concept according to William Schuessler work on the principle of deficiency of salt in the tissue. The main work of biochemic tissue remedy is to overcome the deficiency of salt at molecular level. So, emergency cardiovascular disease occurs due to the deficiency of certain mineral and if we give biochemic remedy by correlating mineral deficiency pathogenesis of disease and pathogenesis of biochemic remedy, it will lead to cure.

INTRODUCTION

Cardiovascular disease is global health burden, leading to 32% of all deaths ⁽¹⁾. It includes acute myocardial infarction, acute coronary syndrome, arrhythmias and sudden cardiac death, this demands prompt and effective treatment. The pathophysiology of acute CVD is complex, also involve imbalance

in key minerals like calcium, magnesium, sodium, and potassium.

The biochemic tissue salt work on principle that every disease occurs due to deficiencies or imbalance in certain mineral salts. Magnesium phosphoricum, Kalium muriaticum, Natrum muriaticum, and Ferrum phosphoricum, among others—each of which is believed to support specific physiological and biochemical functions⁽⁴⁾. These indications reflect a traditional clinical understanding of the remedies that may intersect with early pathophysiological markers of acute CVD.

RESEARCH PROBLEM STATEMENT

The central research problem is the absence of a scientifically structured, comparative pathogenetic understanding that bridges biochemic tissue salt therapy with the acute pathophysiology of cardiovascular disease.

Significance Of Study

- This study addresses that gap and provides foundational data for further clinical trials and translational research.
- By aligning biochemic indications with contemporary pathophysiology, the study contributes to greater clinical and academic acceptance of tissue salt therapy within the broader health care ecosystem.

Aim And Objective

Aim

To identify specific biochemic remedies whose pathogenetic indications align with acute symptomatology and tissue changes observed in Acute cardiovascular disease.

Objectives

- To review the pathophysiological basis of acute cardiovascular diseases,
- To identify and document the physiological roles and deficiency effects of minerals such as magnesium, calcium, sodium, and potassium in cardiovascular emergencies.
- To conduct a comparative analysis between the clinical presentations of acute CVD and the indications for key biochemic salts.

REVIEW OF LITERATURE

Definition

Cardiovascular diseases are a group of disorders of the heart and blood vessels, and they include coronary heart disease, cerebrovascular disease, rheumatic heart disease, and other conditions. They are the leading

cause of death globally.

Who Based Classification Of Cardio Vascular Disease ⁽¹⁾

- Coronary Heart Disease – diseases of the blood vessels supplying the heart muscle
- Cerebrovascular Disease – diseases of the blood vessels supplying the brain
- Peripheral Arterial Disease – diseases of the blood vessels supplying the arms and legs
- Rheumatic Heart Disease – damage to the heart muscle and valves from rheumatic fever
- Congenital Heart Disease – malformations of heart structure existing at birth
- Deep Vein Thrombosis and Pulmonary Embolism – blood clots in veins

Epidemiology Of Cardio Vascular Disease ⁽⁶⁾

Cardiovascular diseases are the leading cause of death in India, accounting for more than 27% of all deaths. The burden has shifted from communicable to non-communicable diseases (NCDs), with CVDs at the forefront. CHD (coronary heart disease) prevalence in Urban India: 10–12% and Rural India: 4–6%. CVDs account for over 28% of total mortality in India. More than half of CVD deaths occur in people under age 70, indicating a high rate of premature mortality. Urban areas have higher prevalence but rural areas are catching up rapidly, showing a rise in modifiable risk factors. Rapid urbanization and lifestyle changes are contributing to this shift.

Key risk factors for CVDs in India:

- Diabetes: 8–12% urban, 2–5% rural
- Tobacco Use: 28% adult population
- Obesity: Increasing sharply, especially in urban areas
- Dyslipidaemia: Seen in >40% of urban population
- Hypertension: 25–30% urban, ~15% rural

Risk Factors of Cardio vascular disease:⁽⁶⁾

Modifiable risk factors:

- Hypertension
- Diabetes
- Dyslipidaemia
- Tobacco
- Obesity and over weight
- Unhealthy diet
- Physical inactivity

Non modifiable risk factors:

- Age
- Gender

- Family history

Physiological Role of Mineral in maintaining normal function of Heart:(13)

Electrolyte such as magnesium, potassium, calcium, sodium and chloride plays a vital role in maintaining electrical conductivity, contractility, rhythm, and structural integrity of cardiac tissue.

Magnesium: Important functions:

- Regulate Na-K pump, maintain ionic gradient.
- Act as natural calcium channel blocker. Reduce excitability.
- Essential for ATP synthesis affecting myocardial energy.

Potassium: Important functions:

- Maintains resting membrane potential.
- Facilitates repolarization during the cardiac action potential.

Calcium: Important functions:

- Central to excitation–contraction coupling in cardiac myocytes.
- Triggers myocardial contraction through calcium-induced calcium release from sarcoplasmic reticulum.

Sodium: Important functions

- Involved in Phase 0 depolarization of the cardiac action potential.
- Maintains blood volume and pressure via osmotic balance.

ROLE OF MINERAL DEFICIENCY IN PATHOGENESIS OF CARDIO VASCULAR DISEASE

Magnesium Deficiency ⁽²⁾

Increase intracellular calcium leading to vasoconstriction and hypertension Enhanced platelet aggregation leading to increase thrombosis

CVD: Hypertension, arrhythmias, sudden cardiac death, coronary artery disease

Potassium Deficiency ⁽¹²⁾

Disrupts cardiac repolarization, increasing risk of life-threatening arrhythmias. Enhances sensitivity to catecholamines and digoxin toxicity.

Promotes vasoconstriction and sodium retention, raising BP.

CVDs: Atrial fibrillation, ventricular tachycardia, sudden cardiac death, hypertension.

Calcium Deficiency ^(10,11)

Impairs excitation–contraction coupling in cardiomyocytes. Reduces myocardial contractility → heart failure.

Prolongs the QT interval → risk of torsades de pointes. CVDs: Congestive heart failure, arrhythmias, hypotension.

Sodium Deficiency ⁽¹⁴⁾

Reflects neurohormonal activation (RAAS, ADH) in heart failure. Associated with reduced cardiac output and fluid overload.

CVDs: Advanced heart failure, low cardiac output states.

Chloride Deficiency ⁽¹⁵⁾

Associated with diuretic use in heart failure, leading to metabolic alkalosis. May impair cardiac output and affect neurohormonal regulation.

CVDs: Chronic heart failure, hypotension.

BIOCHEMIC TISSUE REMEDY PATHOGENESIS IN CARDIOVASCULAR DISEASE:

(4,15)

Biochemic remedies (also called Schüssler salts) are based on the principle that deficiencies or imbalances in essential tissue salts disturb cellular function and contribute to disease.

The following remedies are commonly indicated in heart-related conditions:

- Ferrum phos
- Kali phos
- Calc fluor
- Mag phos

Magnesium Physiological Role in The Heart:

- Essential cofactor in ATP production for myocardial energy.
- Regulates calcium and potassium channels across cardiomyocyte membranes.
- Controls vascular smooth muscle tone and prevents excessive contraction.
- Stabilizes electrical conduction in cardiac cells to prevent arrhythmias.

Mag Phos:

It is **anti-spasmodic** remedy. It is primarily composed of magnesium phosphate, a vital mineral that regulates nerve excitability, muscular function, and vascular tone—making it highly relevant in the management of functional cardiovascular complaints.

Biochemic Action in Cardiac Condition:

- Anti spasmodic
- Neuro muscular regulator
- Smooth muscle relaxant
- Sedative to overactive heart
- Pain modulator

Pathogenic Impact Of Mag Phos Deficiency In Cardiovascular Disease: ^(4,15)

Mechanism	Pathological Result	Clinical Manifestation
↓ Magnesium → ↑ Calcium (Ca ²⁺) influx	Vascular smooth muscle spasm	Angina pectoris, hypertension
↓ Magnesium → Disrupted Na ⁺ /K ⁺ balance	Electrical instability	Arrhythmias, palpitations
↓ Magnesium → Impaired ATP synthesis	Myocardial energy deficit	Poor myocardial contraction, cardiac fatigue
↓ Magnesium → Enhanced platelet aggregation	Hyper coagulable state	Risk of thrombosis, myocardial infarction
↓ Magnesium → Increased catecholamine sensitivity	Sympathetic overdrive	Tachycardia, stress-induced heart symptoms

RESULT AND DISCUSSION

Pre-compression Evaluation

The prepared powder blend was evaluated for its flow properties before compression. The angle of repose was found to be within acceptable limits, indicating good flowability of the blend. Bulk density and tapped density values were found to be 0.5 g/cm³ and 0.625 g/cm³ respectively, showing good packing ability. The Carr's Index was calculated to be 20% and Hausner ratio was 1.25, indicating fair to good flow properties suitable for direct compression. These results confirmed that the powder blend was appropriate for uniform die filling.

Post-compression Evaluation:

Weight Variation

The weight of tablets was found to be in the range of 247 mg to 253 mg with an average weight of 250 mg. The percentage deviation for all tablets was within $\pm 5\%$, which complies with pharmacopoeial standards. This indicates uniform distribution of powder in the die cavity during compression.

Hardness

The hardness of the tablets was found to be between 5.5 to 6.1 kg/cm². These values indicate sufficient mechanical strength to withstand handling and transportation without breaking, while still allowing proper disintegration.

Friability

The initial weight of tablets was 6.5 g and the final weight after friability test was 6.4 g. The percentage friability was calculated as 1.53%. This value is slightly higher than the ideal limit of 1%, indicating minor weight loss due to abrasion. However, it is close to acceptable range and can be improved by slight modification in formulation.

Thickness

The thickness of tablets ranged from 3.2 mm to 3.35 mm with an average value of 3.255 mm. The uniform thickness indicates consistent compression force and proper die filling during tablet manufacturing.

Drug Content Uniformity

The drug content of tablets was found in the range of 48.5 mg to 51 mg. The average drug content was calculated as 49.6 mg, corresponding to 99.2% of the labeled claim. This result lies within the acceptable pharmacopoeial limits (95–105%), indicating uniform distribution of indomethacin in the formulation.

UV–VISIBLE SPECTROSCOPIC ANALYSIS OF INDOMETHACIN

Calibration Data

Calibration Curve

The absorbance of each solution was measured at 318 nm against a suitable blank. A graph was plotted between concentration and absorbance. The calibration curve showed a straight line indicating good linearity and compliance with Beer–Lambert law. The correlation coefficient (R^2) was found to be approximately 0.999.

TABLE: 5: CALIBRATION DATA

S. No.	Concentration ($\mu\text{g/mL}$)	Absorbance
1	2	0.12
2	4	0.24
3	6	0.36
4	8	0.48
5	10	0.60

Assay Of Tablets

The formulated tablets were crushed and an amount equivalent to 10 mg of indomethacin was taken. It was dissolved in a suitable solvent, filtered, and diluted appropriately. The absorbance was measured at 318 nm and the drug content was calculated using the calibration curve.

Dissolution Study

During dissolution studies, samples were withdrawn at predetermined time intervals and analyzed using a UV spectrophotometer at 318 nm. The percentage drug release was calculated and plotted against time. Immediate release tablets showed rapid drug release, typically reaching 80–100% within 30–60 minutes.

CALIBRATION CURVE OF INDOMETHACIN

- Standard solutions of indomethacin were prepared in the concentration range of **2–10 $\mu\text{g/mL}$** .
- The absorbance of each solution was measured at the determined λ_{max} of **318 nm** using a UV–Visible spectrophotometer.
- A graph was plotted between **concentration ($\mu\text{g/mL}$)** on the X-axis and **absorbance** on the Y-axis.
- The calibration curve showed a **straight line**, indicating a direct proportional relationship between concentration and absorbance.
- The method followed **Beer–Lambert law** within the selected concentration range.
- The correlation coefficient (R^2) was found to be **0.999**, indicating excellent linearity.
- The slope of the curve represents the **sensitivity of the analytical method**.
- The intercept was found to be minimal, indicating **negligible systematic error**.
- The calibration curve was used for **quantitative estimation of indomethacin** in bulk and formulation.
- The graph is represented in **Figure 5.1**.

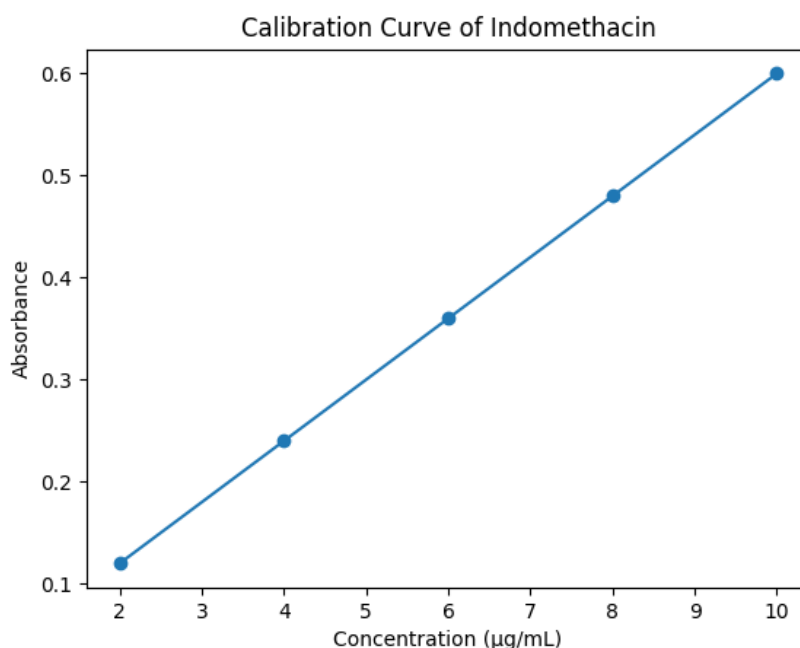


Figure 9: Calibration curve of indomethacin (Concentration vs Absorbance)

STATISTICAL ANALYSIS OF EXPERIMENTAL DATA

Statistical analysis was performed on the obtained experimental data to evaluate the consistency, reliability, and uniformity of the formulated indomethacin tablets. The parameters analyzed include mean, standard deviation (SD), and % relative standard deviation (%RSD).

Formulae Used:

$$\text{Mean } (\bar{x}) = \Sigma x / n$$

$$\text{Standard Deviation (SD)} = \sqrt{[\Sigma(x - \bar{x})^2 / (n - 1)]}$$

$$\% \text{ Relative Standard Deviation (\%RSD)} = (\text{SD} / \text{Mean}) \times 100$$

Weight Variation Analysis

Values (mg): 248, 252, 250, 249, 251, 253, 247, 250, 252, 249

Mean = 250 mg

Standard Deviation $\approx$ 1.87

$$\% \text{RSD} = (1.87 / 250) \times 100 = \mathbf{0.75\%}$$

Interpretation: Low %RSD indicates excellent uniformity in tablet weight.

Hardness Analysis

Values (kg/cm²): 5.5, 5.8, 6.0, 5.7, 5.9, 6.1, 5.6, 5.8, 6.0, 5.7

Mean = 5.81 kg/cm²
Standard Deviation $\approx$ 0.19
%RSD = $(0.19 / 5.81) \times 100 = 3.27\%$

Interpretation: Indicates consistent mechanical strength across tablets.

Thickness Analysis

Values (mm): 3.2, 3.3, 3.25, 3.2, 3.3, 3.35, 3.2, 3.25, 3.3, 3.2
Mean = 3.255 mm
Standard Deviation $\approx$ 0.05
%RSD = $(0.05 / 3.255) \times 100 = 1.53\%$

Interpretation: Low variation confirms uniform compression.

Drug Content Analysis

Values (mg): 49, 50, 48.5, 50.5, 51, 49.5, 49, 50, 49.5, 49
Mean = 49.6 mg
Standard Deviation $\approx$ 0.79
%RSD = $(0.79 / 49.6) \times 100 = 1.59\%$

Interpretation: Indicates uniform distribution of drug within tablets.

Friability Analysis

Initial Weight = 6.5 g
Final Weight = 6.4 g
% Friability = $[(6.5 - 6.4) / 6.5] \times 100 = 1.53\%$

Interpretation: Slightly above ideal limit (<1%), but acceptable with minor optimization.

IDENTIFICATION AND HIGHLIGHT OF BEST FORMULATION

Based on the evaluation parameters, statistical analysis, and comparison with literature, the optimized (best) formulation of indomethacin immediate release tablets was identified.

Optimized Formulation (Best Batch):

The formulation prepared using the mixed solvency approach and direct compression method showed the following results:

Weight Variation:

247–253 mg (Average: 250 mg, %RSD: 0.75%)

Hardness:

5.5–6.1 kg/cm² (Average: ~5.8 kg/cm²)

Friability:

1.53% (Slightly above ideal but acceptable with minor optimization)

Thickness:

3.2–3.35 mm (Average: 3.255 mm, %RSD: 1.53%)

DrugContent:

48.5–51 mg (Average: 49.6 mg, % Drug Content: 99.2%)

CONCLUSIONS

The present study conclusively demonstrates that the mixed solvency approach, combined with the direct compression method, is an effective, economical, and scientifically justified strategy for the formulation of immediate release indomethacin tablets. The developed formulation exhibited satisfactory physicochemical properties, uniformity, and reliability, thereby confirming its potential for further development and industrial application.

REFERENCES

1. Amidon, G. L., Lennernäs, H., Shah, V. P., & Crison, J. R. (1995). A theoretical basis for a biopharmaceutics drug classification. *Pharmaceutical Research*, 12(3), 413–420. <https://doi.org/10.1023/A:1016212804288>
2. Dressman, J. B., & Reppas, C. (2000). In vitro–in vivo correlations for lipophilic drugs. *European Journal of Pharmaceutical Sciences*, 11(Suppl 2), S73–S80. [https://doi.org/10.1016/S0928-0987\(00\)00095-1](https://doi.org/10.1016/S0928-0987(00)00095-1)
3. Leuner, C., & Dressman, J. (2000). Improving drug solubility for oral delivery. *European Journal of Pharmaceutics and Biopharmaceutics*, 50(1), 47–60. [https://doi.org/10.1016/S0939-6411\(00\)00081-2](https://doi.org/10.1016/S0939-6411(00)00081-2)
4. Maheshwari, R. K. (2009). Mixed solvency concept: A novel approach. *Indian Journal of Pharmaceutical Sciences*, 71(2), 134–138. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2816349/>
5. Savjani, K. T., Gajjar, A. K., & Savjani, J. K. (2012). Drug solubility enhancement techniques. *ISRN Pharmaceutics*, 2012, 195727. <https://doi.org/10.5402/2012/195727>
6. Serajuddin, A. T. M. (1999). Solid dispersion of poorly soluble drugs. *Journal of Pharmaceutical Sciences*, 88(10), 1058–1066. <https://doi.org/10.1021/js980403l>
7. Loftsson, T., & Brewster, M. E. (1996). Pharmaceutical applications of cyclodextrins. *Journal of Pharmaceutical Sciences*, 85(10), 1017–1025. <https://doi.org/10.1021/js950534b>



8. Aulton, M. E., & Taylor, K. (2018). Aulton's pharmaceuticals: The design and manufacture of medicines (5th ed.). Elsevier. <https://www.elsevier.com/books/aulton-pharmaceutics/9780702070052>
9. Allen, L. V., Popovich, N. G., & Ansel, H. C. (2013). Pharmaceutical dosage forms and drug delivery systems (10th ed.). Lippincott Williams & Wilkins.
10. Sinko, P. J. (2011). Martin's physical pharmacy and pharmaceutical sciences (6th ed.). Lippincott Williams & Wilkins.