PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES

CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) DEEMED UNIVERSITY

CASE STUDY REPORT

DENGUE AWARENESS AT VALLAM PUTHUR

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

A CASE STUDY ON

NSS DENGUE AWARENESS PROGRAMME

Adopted Village: Vallam Puthur

Date and Venue

- **Date:** 21.02.2023
- **Venue:**Vallam Puthur, Thanjavur

Organizers

- **NSS Unit – I**
- **Coordinator :** Dr. T. VEERAMANI

Collaborating Institutions:

- **NSS Unit - I**, PRIST Deemed to be University
- **Primary Health Centre**, Vallam, Thanjavur

Dengue fever is a mosquito-borne viral infection caused by the **dengue virus**, which is transmitted primarily by *Aedesaegypti* and *Aedesalbopictus* mosquitoes. It's common in tropical and subtropical regions of the world.

Symptoms of Dengue Fever

Symptoms usually appear **4–10 days** after being bitten by an infected mosquito and can last for about **2–7 days**. They vary from mild to severe and include:

Common Symptoms*:*

1. **High fever** (sudden onset, up to 104°F or 40°C)
2. **Severe headache** (especially behind the eyes)
3. **Joint and muscle pain** ("breakbone fever" due to severe pain)
4. **Nausea and vomiting**
5. **Skin rash** (may appear 2–5 days after fever begins)
6. **Fatigue and weakness**
7. **Swollen glands**
8. **Mild bleeding** (e.g., nosebleeds, bleeding gums, or easy bruising)

Severe Dengue (Dengue Hemorrhagic Fever or Dengue Shock Syndrome)

1. Severe abdominal pain
2. Persistent vomiting
3. Rapid breathing
4. Bleeding (from gums, nose, under the skin, or in stools)
5. Fluid accumulation (ascites, pleural effusion)
6. Low blood pressure (shock)
7. Organ damage or failure

Problems and Complications

- Dehydration
- Severe bleeding
- Low platelet count (thrombocytopenia)

- Liver damage
- Shock
- Death, in severe cases

When to Seek Immediate Medical Help

- Severe abdominal pain
- Difficulty breathing
- Persistent vomiting
- Blood in vomit or stool
- Drowsiness or irritability
- Cold or clammy extremities

Prevention Tips

- Avoid mosquito bites (use repellents, wear long sleeves, use nets)
- Eliminate mosquito breeding sites (stagnant water)
- Use mosquito control methods in homes and surrounding

Objective

To raise awareness among the residents of VallamPuthur regarding the causes, symptoms, prevention, and management of dengue fever, as well as to encourage community involvement in maintaining a clean environment to minimize mosquito breeding. Dengue fever is a viral disease transmitted by mosquitoes, which has emerged as a major public health issue, particularly during the monsoon season in tropical nations such as India. In light of the increasing number of cases, the National Service Scheme (NSS) volunteers at PRIST Deemed to

be University have organized a thorough Dengue Awareness Programme aimed at educating the community about prevention strategies, symptoms, and the importance of early intervention.

- To raise awareness about dengue fever among students and the local community.
- To educate people on prevention methods and environmental hygiene.
- To promote community participation in dengue control efforts.

Background

Vallam Puthur, an adopted village under the NSS unit of PRIST Deemed to be University, has seen seasonal surges in mosquito-borne illnesses, particularly during the monsoon. Lack of awareness and improper waste disposal have contributed to the spread of **Aedes mosquitoes**, the primary carriers of the dengue virus.

Collaborators

- **NSS Volunteers** from PRIST Deemed to be University
- **Medical Officers and Staff** from the Primary Health Centre, Vallam
- **Village Panchayat and Local Community Leaders**

With the aim of combating the disease Dengue, PRIST NSS Cell and primary Health Centre Vallam Jointly organized a special DENGUE AWARENESS CAMPAIGN at Vallam. The day saw volunteers and programme officers of NSS Cell participating enthusiastically, joining hands against the terror of Dengue. Under the guidance of the Block Medical Officer Dr.Akilan, a special rally was flagged off to spread awareness among the masses about Dengue and its preventive measures. Students did door to door campaigning, advocating the message- ‘We can win against Dengue’. Students

vociferated slogans and distributed informative pamphlets to the passersby to spread awareness.

Activities Conducted

1. **House-to-House Awareness Campaign**
    - Distribution of pamphlets in Tamil and English
    - Personal counseling on water storage and sanitationIdentification and elimination of stagnant water sources

2. **Public Rally and Street Play**
    - Rally with slogans on dengue prevention
    - Street play demonstrating mosquito breeding and prevention

3. **Medical Camp**
    - Free health check-up organized by PHC Vallam
    - Demonstration of mosquito repellent usage
    - Blood sample collection for suspected fever cases

4. **Cleanliness Drive**

   - Removal of garbage, coconut shells, broken pots
   - Cleaning waterlogged areas and drains
   - Distribution of mosquito nets and repellents to vulnerable families

Awareness given to the People

Tip	Why it Helps
Remove standing water	Eliminates mosquito breeding sites
Use mosquito nets	Blocks bites, especially at dawn/dusk
Apply insect repellent	Repels mosquitoes from biting you
Wear long sleeves & pants	Reduces exposed skin
Use screens on windows	Keeps mosquitoes out of your house

5. **School Awareness Program**
    - Interactive session in local school
    - Poster competition on dengue prevention among schoolchildren

Outcome & Impact

- 500+ residents directly reached through the campaign
- 80+ suspected dengue cases screened at the medical camp
- Visible reduction in stagnant water spots in the village
- Improved knowledge of symptoms and first-aid for dengue
- Strengthened collaboration between PHC and the University

Challenges Faced

- Initial resistance from villagers to cooperate
- Language and literacy barriers among elderly residents
- Inadequate waste management infrastructure

Recommendations

- Regular follow-up by NSS unit and PHC
- Establishment of a community-based **Vector Control Committee**
- Installation of more waste bins and drainage maintenance
- Monthly awareness drives during peak seasons

Conclusion

The NSS Dengue Awareness Programme proved to be a successful initiative aimed at empowering the community to adopt preventive measures against dengue. The enthusiastic participation of youth volunteers enhanced the campaign's relatability and effectiveness. The dengue awareness initiative in VallamPuthur illustrated the potential for academic institutions, public health organizations, and local communities to work together effectively in tackling urgent health challenges. With sustained efforts, such programs have the potential to greatly diminish vector-borne diseases in rural regions.

Tamilnadu Health Department

UPGRADE PRIMARY HEALTH CENTRE VALLAM

LETTER OF APPRICIATION

We congratulate NSS Cell of Ponnaiyah Ramajayam Institute of Science & Technology [PRIST] Thanjavur, for conducting Dengue awareness programme in and around Vallam. In this camp gave awareness about the dengue, especially about various stages of AEDES mosquito and growth like a pupa, larvae, worm and insect etc, It created awareness among people to keep the environment free from dengue virus. We appreciate and express our gratitude to NSS volunteers, Programme Coordinator and all staff of the University.

29.04.2023

Block Medical Officer
Govt Primary Health Centre
Vallam PIN 613403

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES

CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) DEEMED UNIVERSITY

CASE STUDY REPORT

STUDY OF RELATIONSHIP OF POTENTIAL KIDNEY STONE WITH WATER (CONSUMPTION AND QUALITY) AND DIETARY HABITS OF PEOPLE IN URBAN THANJAVUR USING GIS

1. INTRODUCTION

Water is one of the most essential resources for sustaining life, and access to clean and safe drinking water is a fundamental human right. However, in many rural areas, challenges such as water scarcity, contamination, and inadequate sanitation facilities continue to pose serious health and environmental threats. Understanding these challenges at the grassroots level is vital for planning and implementing effective water management and awareness programs.

In line with this vision, the NSS Cell of PRIST Deemed to be University undertook a significant community outreach initiative by organizing a Water Survey on 8th and 9th February 2023 in its adopted villages under the NSS. The UBA initiative, launched by the Ministry of Education, Government of India, aims to link higher education institutions with rural communities for sustainable development and technological interventions.

The primary focus of the survey was to assess the availability, accessibility, quality, and usage patterns of water resources in the selected villages. The activity also aimed to collect baseline data that could inform future action plans for improving water infrastructure, health, and hygiene in these communities. It provided a platform for NSS volunteers to engage in experiential learning and develop a deep understanding of rural issues related to water management.

PRIST is a participant institution under NSS and has adopted 5 neighboring villages viz Thirumalai Samuththiram, VallamPuthur, Munaiayampatti and Kuruvadipatti & Alakudi.

The survey was conducted through active participation of faculty members, NSS volunteers, and village residents. Through house-to-house visits, direct interaction with the locals, and basic on-site water testing, the team gathered relevant data and insights into the current state of water use and sanitation in the target areas. The outcomes of this survey are expected to support long-term developmental efforts and strengthen the university's commitment to rural upliftment.

2. OBJECTIVES OF THE STUDY

The primary goal of this water quality survey under the **NSS** was to assess and understand the condition of water resources in selected villages adopted by PRIST University. A detailed account of the objectives is presented below:

To Evaluate the Portability of Water Sources

This objective focuses on determining whether the available water in each village is suitable for **human consumption**. By analyzing parameters like pH, hardness, biological oxygen demand (BOD), and nitrate content, we can assess compliance with standards set by the **Bureau of Indian Standards (BIS)** and **World Health Organization (WHO)**. Ensuring safe drinking water is crucial to prevent water-borne diseases.

To Compare the Quality of Bore Water and Open Well Water

In many rural areas, both bore wells and open wells serve as primary water sources. This study aims to **compare and contrast** their chemical and biological properties to:

- Identify contamination patterns,
- Determine which source is more reliable,
- Recommend the better option for community use.

To Detect and Quantify Chemical Contaminants

Through laboratory analysis, the study aims to detect critical chemical contaminants such as:

- **Chlorides** (which may indicate salinity or contamination from nearby sewage),
- **Nitrates** (often from fertilizers, indicating agricultural runoff),
- **Hardness components** like calcium and magnesium,
- **Alkalinity and acidity**, which affect taste, corrosion potential, and water treatment.

Understanding the presence and concentration of these chemicals helps assess the **suitability of water for domestic, agricultural, and industrial use.**

To Assess Environmental Impact on Water Resources

Water bodies are influenced by surrounding environmental activities such as agriculture, waste disposal, and construction. This objective includes evaluating:

- The effects of nearby human activities on water quality,
- Seasonal impacts on surface and groundwater resources,
- The vulnerability of water sources to pollution.

This helps formulate environmental protection strategies at the local level.

To Encourage Student Participation in Rural Development Initiatives

One of the key goals of NSS is **experiential learning for students.** This study aimed to:

- Involve students in real-world data collection and analysis,
- Build awareness among students about rural challenges,
- Instill a sense of responsibility toward societal development.

Students gained hands-on experience with water sampling, chemical testing, and community interaction, aligning their academic knowledge with social service.

To Generate Awareness among Villagers Regarding Water Safety

The study also sought to act as a **communication bridge** between scientific understanding and rural practices. Interactions with villagers during the survey helped:

- Educate them about safe water storage and hygiene,
- Share results and implications of water testing,
- Encourage behavioral change toward sustainable water usage.

This participatory approach strengthens the role of villagers in preserving water quality.

To Provide Actionable Recommendations to Local Bodies

Finally, the survey was designed to produce **evidence-based insights** for local authorities, panchayats, and rural development officers. The results and analysis from this study:

- Aid in decision-making regarding the installation of purification units,
- Suggest maintenance practices for wells and tanks,
- Help design water conservation strategies specific to each village.

3. METHODOLOGY AND SURVEY SCHEDULE

The water quality survey was meticulously planned and executed in a phased manner to ensure accurate data collection, analysis, and reporting. The methodology adopted for this survey included both **field-based sampling** and **laboratory testing**, supported by student participation and faculty supervision. The survey was conducted in four adopted villages: **Thirumalai Samuththiram, VallamPuthur, Kuruvadipatti, and Munnaiyampatty**.

3.1. Planning and Pre-Survey Preparations

Before initiating the fieldwork, the following preparations were made:

- A preliminary meeting was held on 02.02.2023 with the NSS coordination team at PRIST University.
- Permissions were obtained from village panchayats for conducting the survey.

- A detailed checklist of required materials (sample bottles, field test kits, pH meters, DO kits, etc.) was prepared.
- Students and faculty were briefed on the **sampling protocol, safety measures, and data recording techniques**.

3.2. Selection of Water Sources

Different types of water sources were identified in each village for sampling, which included:

- **Bore wells**
- **Open wells**
- **Water tanks**
- **Ponds/Bunds (where applicable)**

Each source was marked with a unique sample number (S1, S2, etc.) for easy identification and comparison. A minimum of 5 samples were collected per village, covering both bore water and surface water.

3.3. Field Sample Collection Procedure

The water sampling was carried out in accordance with **standard protocols for environmental water sampling**. The steps included:

1. **Cleaning of sample containers** before collection to avoid cross-contamination.
2. **Collection of samples in pre-labeled bottles**, noting the source type, location, and sample ID.
3. **Measurement of field parameters** like temperature and pH using portable instruments.
4. Ensuring proper **storage and transportation of samples** to the university laboratory within 4–6 hours of collection.

3.4. Laboratory Analysis

At the university's Environmental Chemistry Laboratory, the collected water samples were analyzed for the following parameters:

Category	Parameters Tested
Physical	Temperature, Electrical Conductivity (EC)
Chemical	pH, Alkalinity, Acidity, Calcium Hardness (Ca.H), Magnesium Hardness (Mg.H), Total Hardness (T.H), Nitrate, Chloride
Biological	Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD)

All measurements were conducted using standard procedures recommended by **APHA (American Public Health Association)** and **BIS 10500:2012** drinking water specifications.

3.5. Data Compilation and Analysis

- The results from the laboratory analysis were tabulated and compared with BIS permissible limits.
- The data were used to **compare water quality between villages** and **identify deviations** or pollution indicators.
- Both graphical and tabular representations were prepared for clarity.
- Interpretations were made to assess the **suitability of water for drinking and domestic use**.

3.6. Survey Schedule

The survey was conducted over two consecutive days with the following schedule:

Sr. No.	Date	Village Name	Activity Description	Number of Students	Faculty In-charge
1	08.02.2023	ThirumalaiSamuththiram	Water Sampling & Interaction	15	Dr.T.Veera Mani
2	08.02.2023	VallamPuthur	Water Sampling & Quality Testing	15	Dr.T.Veera Mani
3	09.02.2023	Kuruvadipatti	Water Sampling & Community Visit	10	Dr.R.Manikandan
4	09.02.2023	Munnaiyampatti	Water Sampling & Awareness Drive	15	Dr.R.Manikandan

---

3.7. Community Engagement

- During the field visits, teams interacted with **local villagers and community leaders**.
- Brief sessions were conducted to **educate villagers** about:
    - The importance of safe water handling.
    - Proper maintenance of wells and storage tanks.
    - Health risks of contaminated water and mitigation strategies.

3.8. Report Preparation and Dissemination

- After the data analysis, a **comprehensive report** was compiled.
- The findings were shared with the **NSS Cell** and also communicated to **local authorities and panchayats**.
- Students were encouraged to present their learnings in seminars and internal university forums.

Parameters Analyzed:

The water samples collected from bore wells, open wells, tanks, and ponds in the adopted villages were analyzed for several important parameters to evaluate their quality and suitability for drinking and other uses. These parameters included temperature, which affects chemical and biological processes; pH, indicating whether the water is acidic or alkaline; and electrical conductivity (EC), which reflects the concentration of dissolved salts. Alkalinity and acidity were measured to understand the water's buffering capacity and corrosiveness. Calcium and magnesium hardness levels were assessed as they influence water hardness, affecting both taste and domestic applications. Total hardness was calculated to give an overall picture of mineral content. Dissolved oxygen (D.O) levels indicated the water's ability to support aquatic life, while biochemical oxygen demand (B.O.D) showed the amount of organic pollution present. Nitrate levels were tested due to their potential health risks, especially for infants, and chloride concentrations were checked to detect contamination from sewage or industrial waste. Together, these parameters provided a thorough assessment of the water quality in the surveyed villages.

Water Quality Standards (For Reference)

Parameter	Acceptable Limit	Permissible Limit	Remarks
pH	6.5 – 8.5	No relaxation	Optimal for drinking
EC (µS/cm)	< 1500	-	Indicator of mineral salts
Total Hardness (mg/l)	200	600	>300 = Hard
Calcium Hardness (mg/l)	75	200	-
Magnesium Hardness (mg/l)	30	100	-
Alkalinity (mg/l)	200	600	-
Acidity (mg/l)	-	-	Should be low
Nitrate (mg/l)	45	100	>50 unsafe for infants
Chloride (mg/l)	250	1000	Taste affected if >250
D.O (mg/l)	> 5	-	Good indicator of water health
B.O.D (mg/l)	< 3	-	Higher = pollution

4. AREA OF STUDY

The survey covered the following adopted villages:

1. ThirumalaiSamuththiram

2. VallamPuthur

3. Kuruvadipatti

4. Munnaiyampatty

Each village had water samples collected from multiple sources: bore wells, open wells, water tanks, and local ponds. Each sample was scientifically coded (S1–S5) and analyzed in laboratory conditions.

SrNo	Date	Water Survey at Activity	Number students involved	Faculty incharge
1	08.02.2023	ThirumalaiSamuththiram	15	Dr.T.Veera Mani
2	08.02.2023	VallamPuthur	15	
3	09.02.2023	Kuruvadipatti	10	Dr.R.Manikandan
4	09.02.2023	Munnaiyampatti	15	

WATER SURVEY AT THIRUMALAI SAMUTHTHIRAM

The water quality in ThirumalaiSamuththiram shows variability between bore wells and open wells. EC values are highest in S5 (850 µS/cm), suggesting increased dissolved ions. Alkalinity and T.H are relatively high in all samples, with S1 and S5 nearing 1000 mg/l alkalinity, indicating high buffering capacity. D.O levels range from 5.4 to 7.9 mg/l, suggesting fair oxygenation, and B.O.D values remain within acceptable limits, showing low organic pollution. Chloride levels are elevated in S5 (125 mg/l), which may indicate anthropogenic influence.

Table – 1

Variation of Quantities of Thirumalaisamuthiram Village

Sample No.	Temp ℃	p^H	EC Micro ohms / cm @ 25℃	Alkalinity mg/l	Acidity mg/l	Ca.H mg/l	Mg.H mg/l	T.H mg/l	D.O mg/l	B.O.D mg/l	Nitrate mg/l	Chloride mg/l
S_1	28	7.4	800	990	40	30	12	42	6	1.46	40	113
S_2	28	6.8	650	800	60	24.3	8	32.3	5.4	0.96	36	92
S_3	26	7.2	725	880	55	28	10	38	7.9	1.50	36	111
S_4	30	7.2	170	580	35	6	5	11	7.7	1.41	20	18
S_5	29	7.4	850	995	40	32	14	46	6.8	1.82	42	125

S_1, S_2 - BORE WATER

S_3, S_4, S_5 - OPEN WELL WATER

EC - ELECTRICAL CONDUCTIVITY

T.H - TOTAL HARDNESS

D.O - DISSOLVED OXYGEN

B.O.D - BIO CHEMICAL DEMAND

- CALCIUM HARDNESS

- MAGNESIUM HARDNESS

Parameter-Wise Analysis

a) pH (6.8 – 7.4)

- All values lie within **acceptable range (6.5–8.5)**.
- Indicates **neutral to mildly alkaline** water.

b) Electrical Conductivity (EC) (170 – 850 µS/cm)

- All samples are **well within BIS limit (≤1500 µS/cm)**.
- **S4** has significantly lower EC (170 µS/cm), possibly indicating **lower mineral content**.

c) Alkalinity (580 – 995 mg/l)

- **All values exceed BIS desirable limit (200 mg/l)** and even **permissible limit (600 mg/l)**.
- May affect **taste, plumbing, and indicate presence of carbonate/bicarbonates**.

d) Acidity (35 – 60 mg/l)

- Moderate across samples; **S2 highest (60 mg/l)**.
- Slight **acid–base imbalance** in some borewell samples.

e) Calcium Hardness (6 – 32 mg/l)

- All values are **within safe range (<75 mg/l)**.
- Indicates **soft to moderately hard water**.

f) Magnesium Hardness (5 – 14 mg/l)

- All within **acceptable levels**, with **S4 lowest (5 mg/l)** and **S5 highest (14 mg/l)**.

g) Total Hardness (11 – 46 mg/l)

- Significantly **soft water** across all sources.

h) Dissolved Oxygen (DO) (5.4 – 7.9 mg/l)

- Good levels of oxygen in all samples.
- **S3 and S4 (Open Wells)** have **highest DO**, indicating **better aeration**.

i) Biochemical Oxygen Demand (BOD) (0.96 – 1.82 mg/l)

- All values below **3 mg/l**, which is the safe threshold.
- Indicates **low organic pollution**.

j) Nitrate (20 – 42 mg/l)

- All samples within **permissible limit (45 mg/l)**.
- **S5 highest (42 mg/l)** – close to threshold, needs future monitoring.

k) Chloride (18 – 125 mg/l)

- All samples are **well under BIS limit (250 mg/l)**.
- **S5 (125 mg/l)** and **S1 (113 mg/l)** are on the higher end.

5. Source-Based Summary Table

Sample	Source	EC (µS/cm)	Alkalinity	DO (mg/l)	BOD (mg/l)	Nitrate (mg/l)	Chloride (mg/l)	Key Remarks
S1	Bore Well	800	990	6.0	1.46	40	113	High alkalinity & chloride
S2	Bore Well	650	800	5.4	0.96	36	92	Safer; moderate all-around
S3	Open Well	725	880	7.9	1.50	36	111	Best DO; high nitrate & chloride
S4	Open Well	170	580	7.7	1.41	20	18	Soft, cleanest water
S5	Open Well	850	995	6.8	1.82	42	125	Highest nitrate &chloride

Key Observations

- **pH and DO** are within normal range → water is suitable for consumption.
- **High alkalinity** is common in all samples → may affect taste and plumbing.
- **Nitrate levels in S5 (42 mg/l)** near critical → potential risk if values increase.
- **Chloride is highest in S5 and S1**, but still **within safe limits**.
- **Hardness is low in all samples**, confirming **soft water**.

Recommendations

1. **Alkalinity Reduction**: Use **activated carbon filters or soda lime softeners**.
2. **Monitor S5 for nitrate** – values are approaching critical limits.
3. **Periodic microbiological testing** should be added.
4. **Public awareness** campaigns on **water conservation and contamination prevention**.
5. Prefer **open wells like S4** for drinking (post-filtration), given its **low EC, nitrate, and chloride**.

Conclusion

Water from **Thirumalaisamuthiram Village** is **chemically safe** and within most acceptable ranges. However, **high alkalinity** across sources and **elevated nitrate in S5** require **future monitoring**. Open well **sample S4 stands out as the cleanest**.

WATER SURVEY AT VALLAM PUTHUR

Water samples from VallamPuthur present moderately good quality. EC is relatively low in most bore wells (450–500 µS/cm), but higher in open wells, with S4 reaching 825 µS/cm. Alkalinity remains consistent (~800–950 mg/l). Notably, S1 shows low B.O.D (0.12 mg/l), indicating minimal organic load. However, pH values are slightly acidic in some samples (6.5–6.8), and chloride in S4 is 125 mg/l, warranting observation.

Table –2

Variation of Quantities of VallamPuthur Village

Sample No.	Temp ℃	pH	EC Micro ohms / cm @ 25℃	Alkalinity mg/l	Acidity mg/l	Ca.H mg/l	Mg.H mg/l	T.H mg/l	D.O mg/l	B.O.D mg/l	Nitrate mg/l	Chloride mg/l
S_1	30	6.86	485	850	55	20	7	27	4.07	0.12	28	70
S_2	29	6.72	500	862	60	12	6	18	5.54	1.5	20	75
S_3	27	6.50	650	800	68	24	6	30	6.08	1.46	30	80
S_4	30	7.4	825	950	40	30	12	42	6.62	1.58	40	125
S_5	28	6.8	450	825	65	25	5	30	7.82	1.84	20	76

S_1, S_2 - BORE WATER

S_3, S_4, S_5 - OPEN WELL WATER

EC - ELECTRICAL CONDUCTIVITY

T.H - TOTAL HARDNESS

D.O - DISSOLVED OXYGEN

B.O.D - BIO CHEMICAL DEMAND

Ca.H - CALCIUM HARDNESS

Mg.H - MAGNESIUM HARDNESS

Parameter-Wise Evaluation

a) pH (6.50 – 7.4)

- All samples are within the **BIS acceptable range (6.5–8.5)**.
- Indicates **neutral to slightly acidic water**, especially **S3 (6.50)**.

b) Electrical Conductivity (EC) (450 – 825 µS/cm)

- **Well within permissible BIS limit (1500 µS/cm)**.
- **S4 highest (825 µS/cm)** – higher mineral content.

c) Alkalinity (800 – 950 mg/l)

- All samples **exceed BIS limit (200–600 mg/l)**.
- Indicates **poor buffering capacity**; may affect taste and plumbing.

d) Acidity (40 – 68 mg/l)

- Moderate to high in all samples.
- **S3 highest (68 mg/l)** – linked with low pH.

e) Calcium Hardness (5 – 30 mg/l)

- All values are **low**, suggesting **soft water**.
- **S4 highest (30 mg/l)** – still within safe limits.

f) Magnesium Hardness (5 – 12 mg/l)

- Again, all are within permissible limits.
- **S4 highest** at **12 mg/l**, matching higher total hardness.

g) Total Hardness (18 – 42 mg/l)

- Water is **very soft** in all samples.
- **S4 (42 mg/l)** is the hardest, yet well below concern levels.

h) Dissolved Oxygen (DO) (4.07 – 7.82 mg/l)

- **S1 lowest (4.07 mg/l)** may indicate **slight organic contamination**.
- **S5 highest (7.82 mg/l)** – excellent oxygenation.

i) BOD (0.12 – 1.84 mg/l)

- All values **well below the limit of 3 mg/l**, indicating **low pollution**.
- **S1 lowest (0.12 mg/l)** – suggests very low organic content.

j) Nitrate (20 – 40 mg/l)

- **All within BIS permissible limit (45 mg/l)**.
- **S4 highest (40 mg/l)** – approaching safety threshold.

k) Chloride (70 – 125 mg/l)

- Within safe limits (≤250 mg/l).
- **S4 highest (125 mg/l)** – still acceptable.

Comparative Table of Key Indicators

Sample	Source	EC	Alkalinity	DO	BOD	Nitrate	Chloride	Comments
S1	Bore Well	485	850	4.07	0.12	28	70	Low DO; extremely low BOD
S2	Bore Well	500	862	5.54	1.5	20	75	Balanced borewater
S3	Open Well	650	800	6.08	1.46	30	80	High acidity; slightly acidic pH
S4	Open Well	825	950	6.62	1.58	40	125	Highest mineral & nitrate content
S5	Open Well	450	825	7.82	1.84	20	76	Best DO; overall cleanest sample

Summary Observations

- **Soft water** across all samples.
- **High alkalinity** in all, may need treatment for regular use.
- **S4** has highest nitrate and chloride values – should be monitored.
- **No organic pollution** (low BOD values).
- **Open well S5 is the best**: High DO, low nitrate, acceptable chloride.

Recommendations

1. **Alkalinity control** via **simple water softening or filtration** techniques.
2. **Avoid using S4 water** for infants or sensitive populations unless treated – high nitrate.
3. **Encourage rainwater harvesting** to balance groundwater mineral concentration.
4. **Educate villagers** on protecting well openings from contaminants.

Conclusion

Water from **VallamPuthur** is chemically **within most safe limits** but shows **consistently high alkalinity** and **some signs of nitrate accumulation**, particularly in **Sample S4**. **S5 is the most balanced and clean** water source.

WATER SURVEY AT KURUVADIPATTI VILLAGE

Kuruvadipatti displays mixed results. S2 (bore water) has low EC (180 µS/cm) and low total hardness, indicating soft water. Open wells show higher EC (up to 780 µS/cm) and elevated T.H (36–40 mg/l). B.O.D values range from 1.22 to 1.78 mg/l, remaining within limits. Chloride concentration is highest in S3 (115 mg/l). The water is suitable for most domestic and irrigation purposes but should be monitored for mineral buildup.

Table – 3

Variation of Quantities of Kuruvadipatty Village

Sample No.	Temp ℃	p^H	EC Micro ohms / cm @ 25℃	Alkalinity mg/l	Acidity mg/l	Ca.H mg/l	Mg.H mg/l	T.H mg/l	D.O mg/l	B.O.D mg/l	Nitrate mg/l	Chloride mg/l
S_1	29	6.98	575	860	65	25	5	30	5.25	1.4	28	80
S_2	27	7.2	180	920	42	7.0	8	15	4.54	1.22	20	20
S_3	30	7.36	780	850	55	30	6	36	6.96	1.51	40	115
S_4	28	7.08	690	800	68	28	12	40	7.25	1.78	28	100
S_5	29	6.96	540	950	40	30	8	38	6.09	1.69	30	80

S_1, S_2 - BORE WATER

S_3, S_4, S_5 - OPEN WELL WATER

EC - ELECTRICAL CONDUCTIVITY

T.H - TOTAL HARDNESS

D.O - DISSOLVED OXYGEN

B.O.D - BIO CHEMICAL DEMAND

Ca.H - CALCIUM HARDNESS

Mg.H - MAGNESIUM HARDNESS

Parameter-Wise Analysis

a) pH (6.96 – 7.36)

- All samples are within the **acceptable pH range (6.5–8.5)**.
- Indicates **neutral to slightly alkaline** water → **Safe for drinking**.

b) Electrical Conductivity (EC) (180 – 780 µS/cm)

- All values are well below **1500 µS/cm** standard.
- Reflects **moderate dissolved ionic content**.
- **S2 (180 µS/cm)** indicates very low mineral presence.

c) Alkalinity (800 – 950 mg/l)

- All samples exceed the acceptable (200 mg/l) and even permissible (600 mg/l) limits.
- High alkalinity can affect **taste** and **scaling potential** in pipes.

d) Acidity (40 – 68 mg/l)

- Moderate variation; not problematic.
- Indicates stable buffering capacity across the samples.

e) Calcium Hardness (7.0 – 30 mg/l)

- All samples fall under the safe limit (<75 mg/l).
- **Soft to moderately hard water**; good for domestic use.

f) Magnesium Hardness (5 – 12 mg/l)

- Very low; all samples well below 30 mg/l.
- **No harmful health effects**.

g) Total Hardness (15 – 40 mg/l)

- Water is **very soft** in all cases.
- Advantageous for household use – **no scaling in appliances**.

h) Dissolved Oxygen (4.54 – 7.25 mg/l)

- All within healthy ranges; indicates **aerated water**.
- **S4 (7.25 mg/l)** shows **excellent oxygenation**.

i) Biological Oxygen Demand (BOD) (1.22 – 1.78 mg/l)

- All values are **well below 3 mg/l** – indicating **low organic contamination**.
- Water is **biologically safe**.

j) Nitrate (20 – 40 mg/l)

- All values are below the **maximum limit of 45 mg/l**.
- Indicates no risk of **blue baby syndrome** or **nitrate toxicity**.

k) Chloride (20 – 115 mg/l)

- All values are **within the acceptable limit (<250 mg/l)**.
- **No risk of saltiness or corrosion**.

Source-Based Observations

Sample	Source	EC (µS/cm)	Alkalinity	DO (mg/l)	BOD (mg/l)	Nitrate (mg/l)	Remarks
S1	Bore Well	575	860	5.25	1.40	28	Safe, but high alkalinity
S2	Bore Well	180	920	4.54	1.22	20	Low mineral content
S3	Open Well	780	850	6.96	1.51	40	Highest nitrate, safe
S4	Open Well	690	800	7.25	1.78	28	Best DO
S5	Open Well	540	950	6.09	1.69	30	Balanced overall

Key Findings

- All samples are **chemically and biologically safe** for drinking purposes.
- **High alkalinity** is a consistent issue; could affect **taste** and **plumbing** over time.
- **Total hardness is very low** – water is **soft** and ideal for domestic use.
- **No nitrate or chloride toxicity** risk.
- **Low BOD levels** in all samples → **no organic pollution**.

Recommendations

1. **Monitor alkalinity levels** periodically – consider de-alkalizing filters if required.
2. Promote **public awareness** on water quality, especially in **open well usage**.
3. Introduce **basic household purification units** (RO/UV) to balance mineral content and improve taste.
4. Include **microbiological testing (E. coli, coliform)** in future surveys for complete potability status.
5. Repeat water testing annually as part of **sustainable village development goals**.

Conclusion

The water resources in **Kuruvadipatti** are generally safe for consumption, with **soft water quality** and minimal organic or chemical contamination. However, **uniformly high alkalinity** suggests the need for awareness and potential treatment for long-term health and household safety.

WATER SURVEY AT MUNNAIYAMPATTI

Munnaiyampattiwater samples reflect generally good potability. EC ranges from 425–750 µS/cm, and pH values hover around neutral. Alkalinity is slightly lower compared to other villages. Open well samples show higher T.H and D.O (above 6 mg/l). Chloride in S3 and S4 is relatively high (100–115 mg/l), hinting at possible saline intrusion or surface runoff. The B.O.D levels are under control, indicating low biological contamination.

Table – 4

Variation of Quantities of Munnaiyampatti **Village**

Sample No.	**Temp ℃**	**p^H**	**EC Micro ohms / cm @ 25℃**	**Alkalinity mg/l**	**Acidity mg/l**	**Ca.H mg/l**	**Mg.H mg/l**	**T.H mg/l**	**D.O mg/l**	**B.O.D mg/l**	**Nitrate mg/l**	**Chloride mg/l**
S_1	28	6.82	680	880	45	28	6	25	5.01	1.2	28	80
S_2	27	6.74	570	840	65	15	7	17	4.22	1.12	20	20
S_3	28	6.92	660	870	58	22	9	32	6.47	1.41	40	115
S_4	30	7.3	425	690	38	28	11	38	7.04	1.68	28	100
S_5	29	7.2	750	960	45	20	14	34	6.07	1.61	30	80

S_1, S_2 - BORE WATER D.O - DISSOLVED OXYGEN

S_3, S_4, S_5 - OPEN WELL WATER B.O.D - BIO CHEMICAL DEMAND

EC - ELECTRICAL CONDUCTIVITY Ca.H - CALCIUM HARDNESS

T.H - TOTAL HARDNESS Mg.H - MAGNESIUM HARDNESS

Parameter-Wise Analysis

a) pH (6.74 – 7.3)

- All samples lie within the **safe drinking range (6.5–8.5)**.
- Neutral to slightly alkaline → **no immediate concern**.

b) Electrical Conductivity (EC) (425 – 750 µS/cm)

- All EC values are **well below the acceptable limit (1500 µS/cm)**.
- Indicates **moderate ionic/mineral content**.

c) Alkalinity (690 – 960 mg/l)

- All values exceed **both the desirable (200 mg/l)** and **permissible (600 mg/l)** limits.
- **Potential long-term impact on plumbing systems and taste**.

d) Acidity (38 – 65 mg/l)

- Moderately high in some samples, especially **S2 (65 mg/l)**.
- No significant hazard but should be monitored over time.

e) Calcium Hardness (15 – 28 mg/l)

- All values are **below 75 mg/l**, indicating **soft to moderately hard water**.
- Good for domestic and drinking purposes.

f) Magnesium Hardness (6 – 14 mg/l)

- All samples fall well within safe limits (<30 mg/l).
- No adverse health impact.

g) Total Hardness (17 – 38 mg/l)

- All samples reflect **soft water characteristics**.
- Beneficial for household appliances and consumption.

h) Dissolved Oxygen (4.22 – 7.04 mg/l)

- All samples show good oxygen content.
- **S4 (7.04 mg/l)** has the best aeration; **S2 (4.22 mg/l)** is on the lower safe end.

i) Biological Oxygen Demand (BOD) (1.12 – 1.68 mg/l)

- All values are **well under the limit of 3 mg/l**.
- Indicates **low organic pollution**.

j) Nitrate (20 – 40 mg/l)

- All samples are **below the critical level (45 mg/l)**.
- Indicates **safe for human health**, especially infants.

k) Chloride (20 – 115 mg/l)

- All chloride concentrations are **within the acceptable limit (<250 mg/l)**.
- No danger of **saltiness or corrosion**.

Source-Based Summary

Sample	Source	EC (µS/cm)	Alkalinity	DO (mg/l)	BOD (mg/l)	Nitrate (mg/l)	Chloride (mg/l)	Remark
S1	Bore Well	680	880	5.01	1.20	28	80	Safe but high alkalinity
S2	Bore Well	570	840	4.22	1.12	20	20	Low chloride, low DO
S3	Open Well	660	870	6.47	1.41	40	115	Highest nitrate/chloride
S4	Open Well	425	690	7.04	1.68	28	100	Best oxygenation
S5	Open Well	750	960	6.07	1.61	30	80	Balanced composition

Key Findings

- **All samples are within the safe range** for pH, hardness, BOD, nitrate, and chloride.
- **Alkalinity is significantly high in all samples**, suggesting water may affect taste and plumbing.
- **Very low hardness** values make this water suitable for all domestic purposes.
- **Chloride and nitrate levels are safe**, but **S3 and S4 show relatively higher values** – should be monitored.
- **Low BOD and good DO** suggest minimal organic pollution and adequate aeration.

Recommendations

1. **Install simple filtration systems** to manage high alkalinity.
2. **Encourage regular water quality monitoring**, particularly for open wells.
3. **Promote awareness** about water conservation and contamination prevention.
4. Add **microbial tests** in the next survey phase to ensure potability.
5. Include **proper covering and cleaning of open wells** to avoid external contamination.

CONCLUSION

Water from both bore and open wells in Munnaiyampatti **village** is **chemically and biologically safe** for domestic consumption. However, **persistent high alkalinity** and occasional peaks in **chloride and nitrate** in certain open wells require attention for long-term sustainability.

6. COMPARATIVE SUMMARY OF WATER QUALITY: A DETAILED DISCUSSION

The rural water quality survey undertaken in the four selected villages provides valuable insights into the chemical, physical, and biological characteristics of drinking water sources, primarily bore wells and open wells. By comparing the values of various water quality parameters across locations, we can assess spatial variability, potential sources of contamination, and relative safety of water for domestic use.

1. pH (Acidity/Alkalinity)

The pH values across all villages ranged from **6.5 to 7.4**, indicating slightly acidic to neutral conditions. ThirumalaiSamuththiram and Munnaiyampatti exhibited relatively stable and near-neutral pH values (6.8–7.4), suggesting minimal acid-base disturbances. VallamPuthur showed lower pH levels in some samples (6.5), pointing towards mild acidity, potentially due to leaching of acidic substances or decaying organic matter. pH remained within the acceptable range (6.5–8.5 as per BIS standards), but fluctuations suggest regular monitoring is essential.

2. Electrical Conductivity (EC)

Electrical Conductivity, which reflects the total dissolved salts (TDS) in water, showed **marked variability**. ThirumalaiSamuththiram and Kuruvadipatti reported higher EC values in several samples (up to **850–880 µS/cm**), while Kuruvadipatti had one notably low EC value (**180 µS/cm**) suggesting fresher water. High EC values in open wells of VallamPuthur and Munnaiyampatti (**up to 825 µS/cm and 750 µS/cm**, respectively) imply contamination through infiltration of mineral salts, domestic wastewater, or fertilizer runoff.

3. Alkalinity

Alkalinity, a measure of buffering capacity, was generally high in all villages, with values ranging from **580 to 995 mg/L**. The highest alkalinity was observed in ThirumalaiSamuththiram (**up to 995 mg/L**), followed by Munnaiyampattiand Kuruvadipatti. Elevated alkalinity could indicate the presence

of bicarbonates and carbonates from natural geological sources but may pose issues for taste and scaling. Consistently high values across locations suggest a shared regional hydrogeochemical feature.

4. Acidity

Acidity values ranged between **35 and 68 mg/L**, with noticeable spikes in some open well samples, particularly in VallamPuthur and Kuruvadipatti. This is indicative of organic acids or acidic leachates entering the water, possibly due to agricultural residues or biological degradation. ThirumalaiSamuththiram had one sample with **low acidity (35 mg/L)** suggesting relatively unpolluted conditions.

5. Hardness (Total, Calcium, Magnesium)

All villages showed **moderate to high levels of total hardness (T.H)**, with values ranging from **11 to 46 mg/L**. Munnaiyampattiand ThirumalaiSamuththiram showed particularly higher hardness values in open well sources. **Calcium hardness (Ca.H)** and **Magnesium hardness (Mg.H)** showed parallel patterns, suggesting natural dissolution of limestone or dolomite in groundwater. Elevated hardness, while not hazardous to health, affects taste and causes scaling in household water systems.

6. Dissolved Oxygen (D.O)

D.O levels were generally satisfactory across all villages, ranging between **4.07 and 7.9 mg/L**. Highest values were observed in open wells with surface aeration, particularly in ThirumalaiSamuththiram and Kuruvadipatti. Low D.O values (e.g., **4.07 mg/L** in VallamPuthur) raise concerns about stagnation and possible organic pollution. Overall, oxygen levels are supportive of aerobic conditions but call for protection from organic loading.

7. Biochemical Oxygen Demand (B.O.D)

B.O.D values varied across villages. ThirumalaiSamuththiram and Kuruvadipatti reported values up to **1.82 mg/L** and **1.78 mg/L**, respectively, suggesting mild organic pollution in open wells. VallamPuthur showed a low B.O.D (**0.12 mg/L**) in bore wells, indicating better quality and less

organic matter. Elevated B.O.D values in open sources suggest surface contamination and warrant disinfection.

8. Nitrate Concentration

Nitrate levels ranged from **20 to 42 mg/L**, with the highest levels recorded in ThirumalaiSamuththiram and Kuruvadipatti. This may be attributed to **excessive use of nitrogen-based fertilizers** or leaching from septic systems. While most values remain below the BIS permissible limit of 45 mg/L, prolonged exposure to high nitrate levels can pose health risks, particularly for infants.

9. Chloride Content

Chloride levels varied significantly between samples and locations. ThirumalaiSamuththiram and Kuruvadipatti had **elevated chloride values (up to 125 mg/L and 115 mg/L)**, which may affect the taste and palatability of water. VallamPuthur and Munnaiyampattialso had samples exceeding **100 mg/L**, again pointing to potential contamination from saline intrusion, household waste, or runoff.

Village-wise Comparative Insights

Village Name	**Notable Features**
ThirumalaiSamuththiram	High EC and alkalinity; good D.O; elevated nitrates and chlorides in open wells
VallamPuthur	Slightly acidic pH in bore wells; lower D.O and B.O.D values; elevated hardness
Kuruvadipatti	Wide EC variation; elevated nitrate and B.O.D; hardness higher in open wells
Munnaiyampatti	Stable pH and D.O; some samples with high hardness and chloride levels

In conclusion, while most of the water samples analyzed across the four villages fall within the permissible limits for drinking water parameters as per **BIS (Bureau of Indian Standards)** and **WHO guidelines**, there are localized deviations that highlight potential risks. **Open wells** are consistently more vulnerable to contamination due to their exposure to the environment and human activity, while **bore wells** generally offer more stable and safer water quality. The high variability in parameters such as EC, B.O.D, nitrate, and chloride underscores the influence of **anthropogenic activities** like agriculture, waste disposal, and improper sanitation. **Community education**, periodic monitoring, and **localized water treatment** strategies are essential to mitigate risks and ensure safe drinking water for all.

7. KEY FINDINGS

The comprehensive water quality analysis conducted in the villages of ThirumalaiSamuththiram, VallamPuthur, Kuruvadipatti, and Munnaiyampattirevealed several significant observations regarding the status of water resources in these rural areas. The pH values across all samples ranged from slightly acidic to neutral (6.5 to 7.4), which is generally acceptable for drinking water according to WHO guidelines; however, localized acidity in some bore wells suggests potential corrosion risks to plumbing and the leaching of metals. Electrical Conductivity (EC) showed wide variation, with higher values notably in open wells, indicating elevated levels of dissolved salts and minerals possibly due to natural geochemical factors and anthropogenic influences such as fertilizer runoff and improper waste disposal. The levels of total hardness, driven primarily by calcium and magnesium ions, were moderately high in most samples, categorizing the water as moderately hard, which might lead to scaling in water storage and domestic appliances if untreated.

Dissolved Oxygen (D.O) levels mostly remained within the healthy range for aquatic life, yet some borewell samples exhibited reduced oxygen levels, potentially indicating stagnation or contamination

from organic materials or chemicals. Biochemical Oxygen Demand (B.O.D), an indicator of organic pollution, remained low in bore wells but showed slight elevations in open wells and ponds, pointing towards moderate organic contamination possibly from sewage discharge or agricultural residues. Nitrate concentrations, while largely within permissible limits, were found elevated in areas near agricultural activities, raising concerns about excess fertilizer leaching that could pose health risks such as methemoglobinemia, particularly in infants. Chloride levels also fluctuated, with occasional spikes that may be linked to nearby human settlements or industrial activities leading to contamination. Notably, borewell water generally displayed better quality and stability compared to open well water, which is more vulnerable to surface contaminants and seasonal changes. The variability across parameters highlights the complex interplay of natural and human factors affecting rural water quality in these villages.

8. RECOMMENDATIONS

To address the challenges identified through the survey and to ensure long-term sustainability of water resources, the following detailed recommendations are proposed:

1. **Institutionalize Regular Water Quality Monitoring:** A structured monitoring program should be established at the village level involving local stakeholders, using portable water testing kits for frequent on-site checks of critical parameters such as pH, EC, nitrate, and microbial contamination. Data should be documented and shared with local health and environmental authorities for prompt action.
2. **Implement Water Purification and Treatment Technologies:** For open wells and ponds, the adoption of affordable and community-friendly water treatment solutions such as bio-sand filters, solar disinfection (SODIS), or chlorination is necessary to mitigate microbial and

chemical contamination. Bore wells, while generally safer, should also be periodically tested and treated as necessary.

3. **Community Education and Awareness Campaigns:** Awareness drives must be organized to educate villagers about safe water handling, the risks of pollution, sanitation hygiene, and the importance of protecting water bodies from direct contamination. This can empower the community to take ownership of water resource protection.
4. **Improve Sanitation and Waste Management:** Construction and maintenance of proper sanitation facilities must be prioritized to prevent open defecation and the leakage of sewage into groundwater and surface water sources. Villages should develop waste disposal systems to minimize solid waste entering water bodies.
5. **Promotion of Sustainable Agricultural Practices:** Training farmers on optimized fertilizer application, use of organic manures, contour farming, and creating buffer zones with vegetation near water bodies can reduce runoff contamination, protecting water sources from excess nitrates and pesticides.
6. **Encourage Rainwater Harvesting and Groundwater Recharge:** Installing rainwater harvesting structures on community buildings, farms, and households can reduce reliance on groundwater and help dilute contaminants. Recharge pits and percolation tanks should be developed to enhance groundwater quality and quantity.
7. **Infrastructure Maintenance and Protection:** Regular desilting and cleaning of open wells, ponds, and water tanks are essential to prevent sedimentation and reduce organic matter accumulation. Protective fencing around water sources can reduce contamination from animals and human activities.
8. **Policy and Support from Local Authorities:** Engagement with local government bodies to integrate water quality management into rural development plans is crucial. Support for funding, training, and technical assistance can enable sustainable water management programs.

9. CONCLUSION

The water quality survey under the NSS initiative in the selected villages of ThirumalaiSamuththiram, VallamPuthur, Kuruvadipatti, and Munnaiyampatti offers critical insights into the current state and challenges of rural water resources. While many parameters indicate water is largely suitable for domestic use, variations in chemical and biological indicators underscore the vulnerability of water sources to contamination from natural and anthropogenic activities. This study highlights the importance of adopting a multi-faceted approach encompassing regular monitoring, community engagement, infrastructural improvements, and sustainable agricultural practices to safeguard these vital

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES

CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) DEEMED UNIVERSITY

CASE STUDY REPORT

STUDY OF RELATIONSHIP OF POTENTIAL KIDNEY STONE WITH WATER (CONSUMPTION AND QUALITY) AND DIETARY HABITS OF PEOPLE IN URBAN THANJAVUR USING GIS

Study of Relationship of Potential Kidney Stone with Water (Consumption and Quality) and Dietary Habits of People in Urban Thanjavur using GIS

Article *in* International Journal of Earth Sciences and Engineering · December 2012

CITATIONS
0

READS
377

7 authors, including:

Ravikumar Kanapuram
VNR Vignana Jyothi Institute of Engineering & Technology
37 PUBLICATIONS **158** CITATIONS

SEE PROFILE

www.cafetinnova.org

Indexed in
Scopus Compendex and Geobase Elsevier, Chemical Abstract Services-USA, Geo-Ref Information Services-USA

ISSN 0974-5904, Volume 05, No. 06 (01)

International Journal of Earth Sciences and Engineering

December2012,P.P.1788-1796

Study of Relationship of Potential Kidney Stone with Water (Consumption and Quality) and Dietary Habits of People in Urban Thanjavur using GIS

K. RAVIKUMAR, PRAVEEN RAO, SHIWANI, SARITA, SENTHIL THAMBI, ASHUTOSH DAS and MUKESH GOEL

Centre for Environmental Engineering, PRIST University, Vallam, Thanjavur, Tamil Nadu, India – 613 403
Email: *ravikumar.prist.cee@gmail.com*

Abstract: Kidney stone formation in Thanjavur district population has been identified in the recent years. There is a common belief that kidney stone forms due to intake of high Calcium content present in groundwater and improper dietary regulations of the people. Literature review on kidney stone studies reveals that there are no exact correlations of factors that causing kidney stones such as high/low Calcium and Sodium contents in groundwater in addition to other factors including common dietary and water intake by the patients over period of time and hereditary causes coming in family traditions. The present work is to study the relationships between the kidney stone formation and pH, Calcium, Sodium contents of groundwater while considering dietary regulations and quantity of water intake by the people of urban Thanjavur. Finally ArcGIS 10 is used to demarcate the high/low Calcium and Sodium zones in Thanjavur city.

Keywords: *Kidney Stone, Ground Water Quality, Gis, Calcium, Sodium and Thanjavur*

1. Introduction:

Among urinary disorders, stone formation is of paramount importance. The incidences of kidney stones are rising in rural and urban societies in India. A large population of the country suffers from kidney stones which are formed due to deposition of calcium, phosphates and oxalates in kidneys and later moving to urinary tracts and bladders (Madhvi Awasthi et al, 2011). The chemicals start accumulating over a nucleus, which ultimately takes the shape of a stone (Misra and Kumar, 2000). The occurrence of renal stone disease is related to food habits of individuals. Dietary factors include a high intake of animal proteins and oxalates and a low intake of potassium containing citrus fruits and fluids (Tur et al. 1991). Intake of sodium is also associated with increased risk of stone formation presumably because of increased urinary calcium excretion (Carbone et al. 2003; Vasanthamani and Sushmitha, 1997). Inadequate fluid consumption decreases total urinary volume thereby increasing the concentration of stone forming salts. The present work is an attempt to study the relationship among dietary habits & quantity of water intake by patients and water quality parameters in incidence of stone formation based on selected kidney stone patients in urban Thanjavur, Tamil Nadu, India.

Thanjavur city population was provided drinking water from the nearby Vennar River and Vandavur River (distributaries of river Cauvery diverted after Grand Anicut). To meet present population water demand, the Thanjavur Municipality has been augmenting the existing supply by using 32 new bore wells located in various locations of the city. This ground water is not given adequate treatment before supplying to city population for consumption and domestic purposes (TNUIFL, 2007). By consuming this bore well water there are many evidences of people affected with Kidney stones in Thanjavur city in recent years. Kidney stone patient histories are found in various Urology hospitals including Thanjavur Medical College Hospital (TMCH), KDR Hospital and SB Hospital.

This work is done beginning with visiting hospitals treating kidney stone patients (for past few years) for recording patient details including their name, age, gender and address. Secondly, using questionnaire prepared specifically, visiting the patients' houses for collecting water intake and common dietary habits of the patients, collecting water sample in 1 liter water bottle for water analysis at laboratory for estimating various water quality parameters and measuring latitude & longitude of the location of the house using Geographical Positioning System (GPS) for geo-referencing in GIS. Finally, Geographical Information System (GIS) is used for preparing base map and various thematic layers based on Calcium, Sodium and pH contents for preparing spatial distribution of these contents in Thanjavur polygon for comparing their

inter-relations in formation of kidney stone. Building the queries to understand the most possible relationship among various water quality parameters, water intake and food habits causing kidney stone formation. Some of the findings from the work include water having Calcium content >75 mg/lit as well as <75 mg/lit (BIS desirable limit), both effected patients in kidney stone formation. Thereby, it can be said that not only Calcium content is the main cause but also other causes responsible for kidney stone formation. Calcium and Sodium are interrelated. Even moderate amount (>50 mg/lit) of Sodium present (BIS desirable limit) in drinking water or food increases Calcium in the kidneys even if water has less Calcium thereby stone formation is possible. Drinking less than 3 liters water per day (62 out of 66 patients have been identified) could be the main factor in formation of kidney stone.

2. Study Area:

The present study area is urban Thanjavur, having Latitude of 10.8°N and Longitude of 79.15°E. The Urban Thanjavur is headquarters of the Thanjavur taluk and which is also the seat of the district administration. It is situated at the head of Cauvery delta, at a distance of 314 kilometres (195 mi) south-west of Chennai and 56 kilometres (35 mi) east of Tiruchirappalli. Though most of Thanjavur District is a level plain watered by the Cauvery tributaries, the taluk of Thanjavur is made up mostly of barren uplands sloping towards the east. The Grand Anaicut Canal and Vadavuru river flow through the city. Thanjavur's economy is mainly agro-based. The city acts as a focal point for food grains transported from the adjoining areas of the Cauvery Delta. Previous integrated Thanjavur district was known as the Rice bowl of Tamil Nadu as major crop is paddy throughout the year. Other major crops other than Paddy are Blackgram, Banana, Coconut, Gingelly, Ragi, Redgram, Green Gram, Sugarcane, Maize. The present study area is shown in figure 1.

3. Data and Water Samples Collection:

The study was conducted on a total of 66 kidney stone patients (gone through the treatment in the period 2010-2011), comprising 44 males and 22 females, selected from KDR Hospital, Thanjavur, Tamil Nadu. A comprehensive and exhaustive questionnaire was formulated specifically keeping in mind the objectives of the study. This sample questionnaire was presented to 4 urologists (doctors) and was then evaluated for response of the patients. The necessary improvements/alterations/modifications were incorporated on the basis of collected information, thus making the questionnaire more functional. The data were collected during the months of January-February, 2012.

Each patient was interviewed by visiting their houses to collect information regarding the quantity of water intake per day, source of their drinking water, type of home treatment given to water before consuming, dietary habits especially vegetarian and non-vegetarian with added information about his/her food likes/dislikes and preferences/intolerances (if any). Table 1 show the colonies and the number of patients interviewed in urban Thanjavur.

Table 1: *Patients Interviewed in different Colonies of Urban Thanjavur*

S. No.	Colony Name	Code	No. Of patients interviewed
1.	Medical College Road	MC	20
2.	Madakottai Road	MR	6
3.	Nanjikottai Road	NK	12
4.	Yagappa Nagar and Arulanand Nagar	YPR, ARL, BS	10
5.	M.Chavady	MCV	5
6.	New Bus Stand	NBS	9
7.	Old Bus Stand	OBS	4

Table 2: *Queries and the Number of Sample Stations That Falls With in the Query Criteria Given*

Definition of Query	Number of Sample Stations
(I) Water consumption < 3 liters and Ca < 75 mg/lit	
Query (1) : Na<50 mg/lit and Veg	8
Query (2) : Na<50 mg/lit and Non-Veg	11
Query (3) : Na>50 mg/lit and Veg	6
Query (4) : Na>50 mg/lit and Non-Veg	7
(II) Water consumption < 3 liters and Ca > 75 mg/lit	
Query (5) : Na<50 mg/lit & Veg	6
Query (6) : Na<50 mg/lit & Non-Veg	8
Query (7) : Na>50 mg/lit & Veg	9
Query (8) : Na>50 mg/lit & Non-Veg	11

Drinking water samples (all are groundwater samples) also collected from each patient in 1 liter bottles to analyze for estimating physical and chemical parameters including Calcium and Sodium contents. Additionally, latitude and longitude of the house location of each patient is recorded using the Trimble Global Positioning System (GPS). 66 sample station locations are shown in figure 2.

3.1 Water Analysis:

Water samples were analyzed using Systrnoics Water analyzer 371 for water quality parameters such as pH, DO(ppm), Conductivity (μS), Salinity (ppt), TDS (ppm) and Temperature (°C). Calcium contents were estimated by the standard titration method whereas Sodium contents were estimated using digital flame photo meter. According to BIS, pH desirable limit is in between 6.5 to 8.5 whereas permissible limit is in between 6.5 to 9.2; DO desirable limit is >3 ppm; TDS desirable and permissible limits are <500 ppm and <1000 ppm; Calcium desirable and permissible limits are <75 mg/l and <200 mg/l; Sodium desirable and permissible limits are <50 mg/l and <200 mg/l.

4. GIS Mapping: Spatial Distribution of Calcium and Sodium:

4.1 Base Map Preparation and Geographical Features Creation:

Village polygons in Bhuvan administrative layers were (developed by ISRO, India) obtained for Thanjavur city region and its corresponding latitudes and longitudes at four locations were noted (Bhuvan, 2012). A base map for the study area is prepared by using tools in ArcGIS 10. Line features and polygon features of Thanjavur city were downloaded by connecting to Open Street Map (OSM, 2012) open source website. Line feature is representing National Highway, State Highway and village roads whereas polygon feature is representing new Thanjavur boundary of populated area and other important buildings and institutions. In addition to these available features, point features are created for selected 66 sample stations. Attributes are defined and their estimated values are entered for all chemical parameters of water samples and corresponding patient details as well.

4.2 Contour Map Development of Calcium and Sodium:

Using Inverse Distance Weighting (IDW) method, interpolation surfaces were generated for Calcium, Sodium and pH data for entire city. Using these raster layers, contour maps (as vector layers) were generated separately for Calcium and Sodium to observe their distributions over Thanjavur city.

4.2.1 Spatial Distribution of Calcium:

Calcium variation in the contour map given is figure 3 depicts some of the patterns. As contours move from North to South, Calcium values are gradually increasing up to the centre of the map and again decreasing towards South. Similar observation is made from West to East. Contour values are increasing up to the centre of the map and again decreasing towards the East.

4.2.2 Spatial Distribution of Sodium:

Sodium has been following the similar pattern as Calcium, showing the maximum values (around 70 mg/lit) at the centre of the map and deceasing values as contours move towards the four directions (shown in figure 4).

4.3.3 Interrelation between Calcium and Sodium:

Figure 5 is the combined overlapping map of Calcium and Sodium. Except Southern direction of the city, remaining in all directions including centre of the city, both Calcium and Sodium are directly related to show the combined effect on forming Kidney stone in the people of Thanjavur.

4.3 Building Queries Using Attributes:

It is observed from the water consumption of the patients that many (63 out of 66) patients were consuming $\leq$ 3 lit/day. Drinking less water could be the main cause for crystal formation and further led to stone formation in kidneys over period of time. So, this is taken as constant query while other queries on other parameters were changing according to the BIS desirable limits of the parameter. Patient's gender and age, type of water consumed, treatment given to water for consumption are not considered in the queries as these are not the direct factors of the kidney stone formation. Following Table 2 gives queries used to find the number of sample stations falling in the query and their distribution. Two sets of queries are designed. In first set of queries, water consumption <3 lit and Ca<75 mg/lit were kept constant whereas Na (in mg/lit) and patient diet were varying. In second set of queries, water consumption <3 lit and Ca>75 mg/lit were kept constant whereas Na (in mg/lit) and patient diet were varying as in first set.

5. Results and Discussions:

Spatial distribution of given water quality parameter over given space gives the understanding of it's spread, it's high, low and intermediate quantities can be observed in the locations where actual quantities are not available. This will provide the information of entire spatial distribution of given water quality parameter. From the observation of spatial distribution of Calcium, Sodium and pH of 66 water samples reveals that they are interrelated each other and causing kidney stone formation as discussed below. In addition, drinking water quantity and diet of the patients are also identified as main factors influencing kidney stone formation.

1. The main factor that may be cause of kidney stone formation is least daily water consumption. Answers to the questionnaire reveal that 63 patients were consuming $\leq$3 lit/day. This may lead to gradual

formation of crystals and later on increases to measurable kidney stone over period of time.

2. There is common belief that drinking more Calcium water (>75 mg/lit) is the causing factor in kidney stone formation but this study reveals that even drinking less Calcium water also causing kidney stone problem. 25 water samples were estimated with Calcium > 75 mg/lit and remaining i.e. 41 samples were estimated with Calcium $\leq$ 75 mg/lit. This means not only water having more Calcium can cause Kidney stone formation but less Calcium can cause Kidney stone problem.

3. Some of the literatures revealed that Sodium present in water also indirectly causes increasing the content of Calcium in the body and further assists in formation of kidney stone. In another way, even though Calcium content is less (compared to desirable limit), its counterpart Sodium can increase Calcium in the body. There are other studies (Madhvi Awasthi et al, 2011) quoted taking more salted food also increases salt content in the body there by increases Calcium content in the body. If not from water, substantial amount of Sodium from salt food consuming more than the prescribed limit also increases Calcium in the kidneys.

4. 47 water samples are having pH $\leq$ 7 and remaining 19 samples are having pH>7. This reveals that acidic water may cause kidney stone formation rather than alkaline water.

5. As for as overall comparison of diet of the patients is concerned, non-vegetarians are more prone to kidney stone formation than vegetarians. As meat food contains more proteins that causes more acids generation in the body and leads to kidney stone formation. Protein increases uric acid, calcium, and oxalate levels in the urine, and reduces citrate levels. Diets high in protein, particularly meat protein, have been consistently connected with kidney stones. Meat protein has higher sulfur content and produces more acid than vegetable protein.

6. Contour maps of Calcium and Sodium are overlapped to compare the interrelation between them and shown in figure 5. Both Calcium and Sodium are having directly proportional relationship West, North and East directions of city. Only South direction, both Calcium and Sodium are indirectly related to show that both are having influencing factors on formation of Kidney stone.

7. Table 2 provides the information on number of samples matching with the various criteria considered under attributes query field. Non-vegetarians are facing more kidney stone problem than vegetarians. Following combinations were identified as possible potential combinations compared to other combinations in forming kidney stones: (a) water consumption $\leq$ 3 lit, Ca >75 mg/lit, Na >50 mg/lit and Non-Veg (b) water consumption $\leq$ 3 lit, Ca $\leq$ 75 mg/lit, Na $\leq$ 50 mg/lit and Non-Veg. In above two combinations, observed samples are 11 in each combination and more than other combinations.

6. Conclusions:

As many factors involved in kidney stone formation, combination of proportions of each factor has to be understood to diagnose the root of the problem. This study has been considered various factors such as daily water consumption by patients and their dietary habits, groundwater quality parameters such as pH, Calcium, Sodium to evaluate the combined effect kidney stone formation. Following are the conclusions derived from this study:

1. Drinking very less water is the main cause for kidney stone formation.
2. Calcium and Sodium are directly related in entire Thanjavur. This means even though Calcium is less in water, salt food consumption can increase the content of Calcium in the kidneys and leads to stone formation. Or if Sodium availability is more in water then it can also increase acidic formations and Calcium content in the kidneys.
3. Non-vegetarians are more prone to kidney stones than vegetarians since meat food can increase acidic content in the body there by acidic stones may form.
4. pH having less then 7 also increases acidic quality in the body and lead to acidic stone in the kidneys.
5. Combination of less water intake and non-vegetarian food in addition to inversely proportioned Calcium and Sodium are the most possible criteria for formation of kidney stones.

7. Acknowledgements:

We are very thankful to Prof. Balathandayuthapani, Dean, Student Affairs, PRIST University, Thanjavur, for his valuable help and guidance in this project execution. We are very thankful to Dr. K. Dharumarajan, KDR hospital, Thanjavur for his kind permission to do this study successfully.

8. References:

[1] Bhuvan (2012) Indian Earth Observation Visualization, ISRO, Released on August 12, 2011, site visited on 15th February, 2012. http://bhuvan3.nrsc.gov.in/bhuvan/bhuvan/bhuvan2d.html.

[2] Carbone LD, Bush AJ, Barrow KD, Kang AH (2003) The relationship of sodium intake to calcium and sodium excretion and bone mineral density of the hip in postmenopausal African-American and Caucasian women, Jl of Bone Min Metab, 21, 415-420.

[3] Madhvi Awasthi, S. R. Malhotra and Rajni Modgil (2011) Dietary Habits of Kidney Stone Patients of

Kangra District, Himachal Pradesh, North India, Jl Hum Ecol, 34(3): 163-169.
[4] Mishra A, Kumar A (2002) Studies in ayurvedic drugs for the cure of urinary tract stones, Jl of Indian Bot Soci, 79, 47-48.
[5] OSM (2012) Open Street Map, Free Wiki World Map launched on 1 July 2004, site visited on 16th February, 2012. www.openstreetmap.org.
[6] Tamil Nadu Urban Infrastructure Financial Limited (TNUIFL), Final Report, Conversion of City Corporate Plan to Business Plan for Thanjavur Municipality, ICRA Management Consulting Services Limited, May 2007.
[7] Tur JA, Prieto R, Grases F (1991) An animal model to study the effect of diet on risk factors of calcium stone formation, Scand Jl of Urol Nephrol, 25, 311-314.
[8] Vasanthamani G, Sushmitha Y (1997) Impact of diet counseling on patients suffering from urinary stones, Indian Nutr Dietet, 34: 24-28.

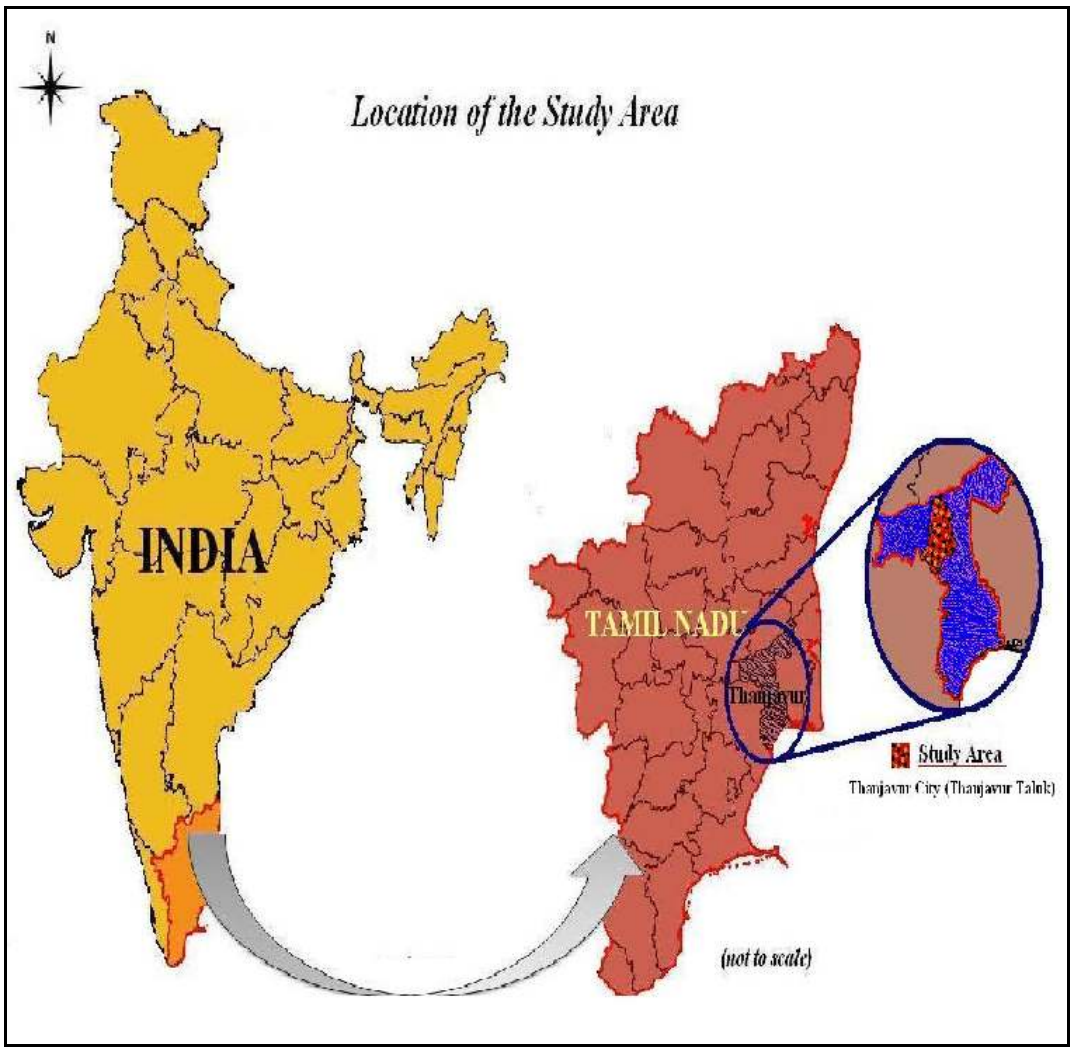


Figure 1: *Study Area of Urban Thanjavur*

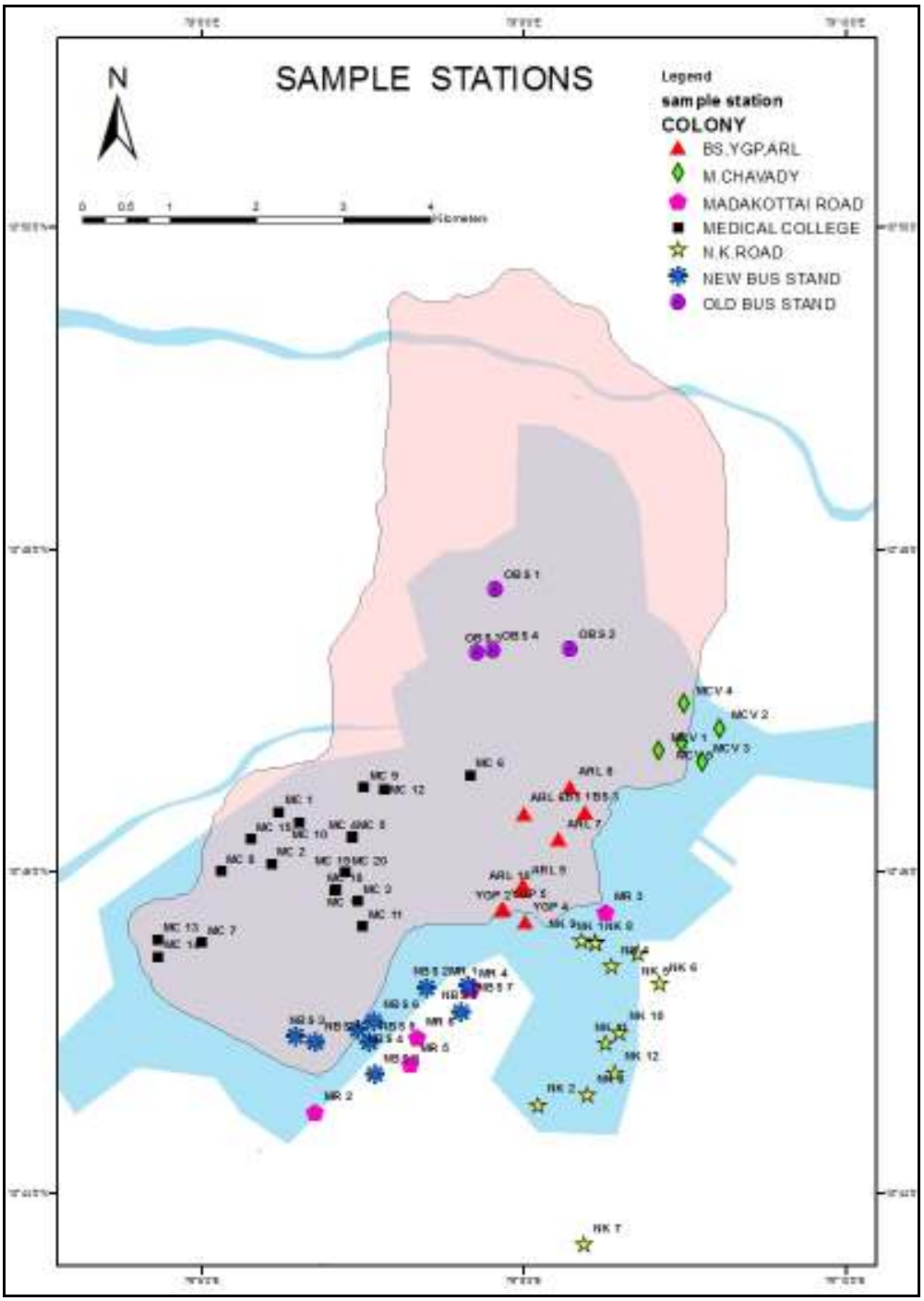


Figure 2: *Sample Stations in Study Area*

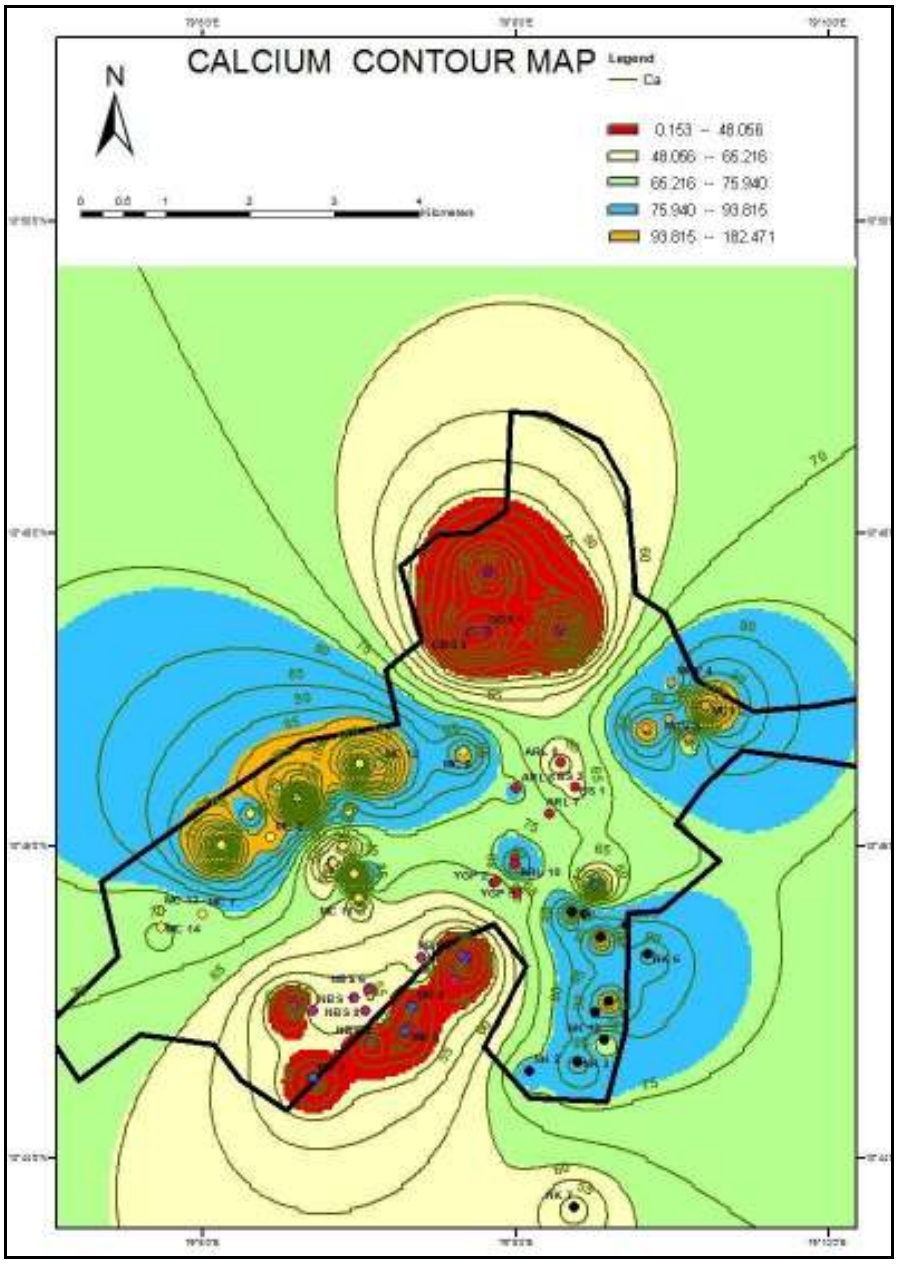


Figure 3: *Spatial Distributions of Calcium and its Contours in Study Area*

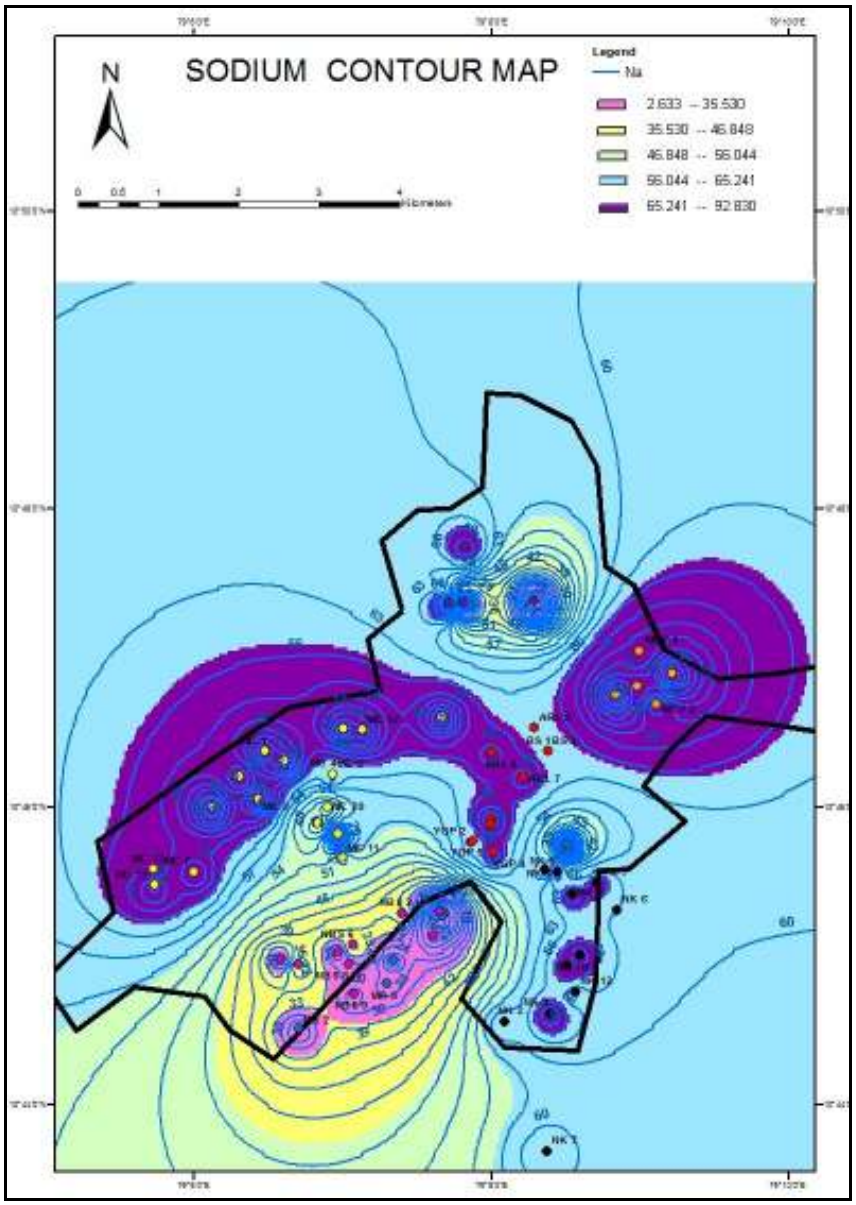


Figure 4: *Spatial Distribution of Na and its Contours in Study Area*

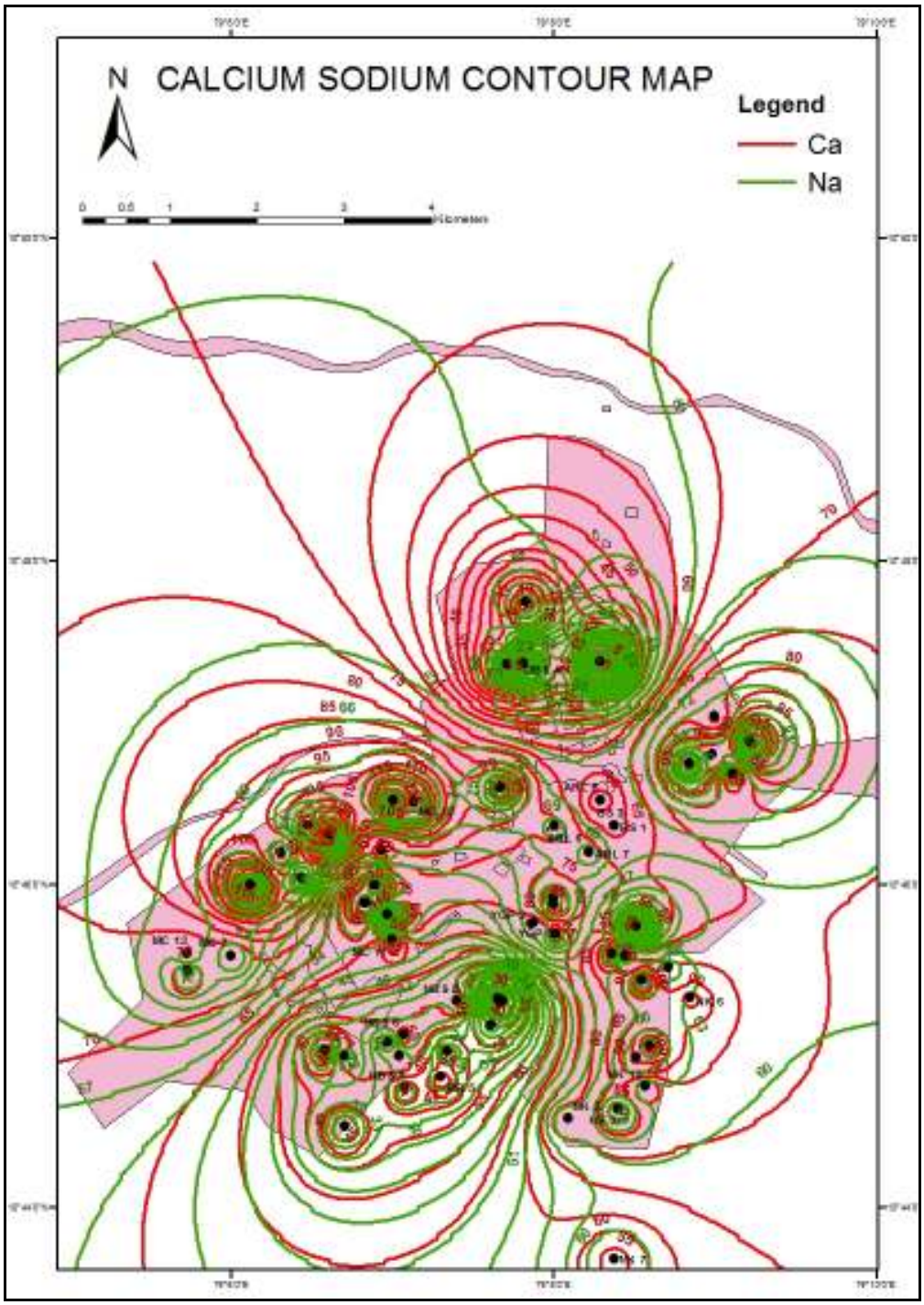


Figure 5: *Combined Contour Map of Calcium and Sodium*

Article

Advanced Science, Engineering and Medicine
Vol. 12, 1–5, 2020
www.aspbs.com/asem

Assessment and Recurrence of Kidney Stones Through Optimized Machine Learning Tree Classifiers Using Dietary Water Quality Parameters and Patient's History

B. Kavitha[1], P. Parthiban[1], M. Goel[2], K. Ravikumar[3], A. Das[1], J. S. Sudarsan[4], and S. Nithiyanantham[5,*]

[1] *Centre for Environmental Engineering, PRIST University, Thanjavur, Tamil Nadu 613403, India*
[2] *Department of Engineering and Maths, Sheffield Hallam University, Sheffield S1 1WB, UK*
[3] *Department of Civil Engineering, VNR VJIET, Hyderabad, Telangana 500090, India*
[4] *National Institute of Construction Management and Research (NICMAR), 25/1, Balewadi, Pune 411045, India*
[5] *Post Graduate and Research Department of Physics, (Ultrasonic/NDT and Bio-Physics Divisions), Thiru. Vi. Kalyanasundaram Govt. Arts & Science College, Thiruvarur, Tamilnadu 610003, India; Bharadhidasan University, Thiruchirapalli*

Kidney stone disease is a result of combination of food items consuming, drinking water quality and genetic heritability, which has been observed to be more prone (both occurrence and recurrence) to certain geographic regimes as Thanjavur suburbs of Tamil Nadu in southern India. The research carried out involves collection of medical information of Kidneystone patients of the study area and survey of their dietary habits including drinking water quality (through laboratory study), selection of suitable classifier to model the Kidney stone recurrence with the most contributing of 22 parameters (with due model evaluation). Weka (3.8.1) machine learning framework was used for the study, for evaluating the model accuracy of 66 classifiers, resulting 22 classifiers with accuracy higher than ZeroR, which was considered to be the benchmark. Based on this study, C-4.5 classifier (called J48 in Weka) was found to be most robust classifier, based on accuracy, precision, Recall, *F*-Measure, MCC, ROC Area and PRC Area. The selected classifiers were again evaluated based on domain conformance (namely, literature, logic and consistency) to obtain four validated classifiers, thereby providing seven parameters and their threshold value for kidney stone recurrence, namely, family history (Yes), Sulphate (>17ppm), potassium (>74 ppm), nitrate (>1.2 ppm), salinity (>120 ppm), conductivity (<=289 ppm) and water consumption (moderate).

Keywords: Kidney Stone, Data Mining, Weka, Groundwater Quality, Classifiers.

1. INTRODUCTION

The cases of kidney stones are increasing in India and elsewhere affecting both the rural and urban population. These occur mostly due to genetic heritability and also due to the combination of various types of food items that are consuming daily and drinking untreated water. Although the Kidneys does the wonderful job of the cleaning toxic substances from the blood as well as maintaining the proper balance in the body, the symptoms of decrease in urine volume leads to crystal forming substances such as Calcium, Oxalate and Uric acid and in turn these crystals combine to form small size stones and later into big size Kidney stones in due course. Today, approximately 5% of world population are reported to have Kidney stones.

The stones forming in the Kidney and its urinary tract are due to multi-fold factors. Although it very difficult to trace the exact reason of forming Kidney stones, some research work attempts around the world could identify some common epidemiological risk factors which include age, sex, geographical location, family history, dietary habits and medical treatment methods etc. Mens are more affected 3 fold times affected three times rather than women [1, 2]. The kidney stone problems may arise due to by many means such as fluid intake, volume of urine, concentration of urine, environment and etc., and moreover, these factors vary from one geographical location to the other [3, 4].

*Author to whom correspondence should be addressed.

In this work, an attempt has been to find the etiology of renal stone occurrence in the urban population of Thanjavur city, Tamil Nadu state of India using Weka (3.8.1) machine learning framework. This work provides a conceptual classification system for estimating probabilistic occurrence of Kidney stone as well as a framework for studies of similar occurrences of other diseases and scope of comparing the findings at different locations to evaluate the causative parameters, independent of spatio-temporal domain.

2. MATERIALS AND METHODS

2.1. Collection of Kidney Stone Data

Vennar and Vandavur rivers would supply drinking water to the population of Thanjavur city. Thanjavur metropolitan augmented the water supply through 32 bore wells located in different parts of the city to meet the present population water demand. Although Municipality could manage to supply the adequate quantity but the ground water is not given adequate before consumption (TNUIFL, 2007). According to the evidences recorded, the city population affected with Kidney stones by consuming this improperly treated bore well water. The data were collected from Govt and many popular private hospitals. The data and history of patients' has been collected by visiting Urology hospitals (for past few years). The recorded parameters include the patient's name, age, gender and address. The detailed methodology of data collection and processing is presented by Kumar and Abhishek in 2012 [5].

2.2. Screening of Robust Tree-Classifiers for the Complete Data Set

The database generated using the collected data from the patients was converted into csv-format and Weka (version 3.8.1) was used for data mining (esp. classifiers, with dependent variable as kidney-stone occurrence). Five robust classification types and seven classifier techniques were applied to predict Kidney stone recurrence, namely, Trees (C 4.5), Rules (Zero R, One R and PART); Bayes (Naïve bayes), Functions (logistic) and Lazy (IBK). Besides, Zero-R-classifier was used as a benchmark classifier for evaluating the performance of the other classifiers. Twenty two parameters used for modelling (namely, gender, age group, profession, family history, medication, exercise, food habits, drinking source, method of water treatment, water consumption, pH, mv, conductivity, total dissolved solids, Salinity, Calcium, Magnesium, Sodium, Potassium, Nitrate, Sulphate and Phosphate, with recurrence of stone, being the class variable. The accuracy in classification and standard deviation were taken into account for evaluation of the aforesaid classifiers using 10-fold validation (i.e., mean of 10 sets of non-repetitive data constituted from 90% of the training data, sequentially) and compared for their significance at 5% level. The classifiers with better accuracy than zero-R were used for model development.

2.3. Attribute Selection for Selected Classifiers and Optimization of Classifier Parameters

Wrapper Subset Evaluation algorithm by Ron Kohavi and George H. John in 1997 was used with all the classifiers mentioned before for selection of the attributes maximally contributing to the dependent variable (i.e., recurrence of kidney stone) [6]. Based on the selection, several classifiers were used (along with one rule-based classifier ZeroR for bench-mark evaluation). The classifiers used are: J48 (i.e., C 4.5), Zero R, One R, PART, Naïve bayes, logistic and IBK. Both pruned and un-pruned branches as well as default and customized minimum leaf-numbers were considered in selecting the models. The validations were done using with 10-fold validation and using the attributes, thus selected. The performances of the selected classifiers were further evaluated and their parameters were optimized for maximum accuracy.

The diagnostics of selected model (s) was carried out with the following 14 specifications:

(a) Accuracy, (b) Kappa statistic, (c) Mean absolute error, (d) Root mean squared error, (e) Relative absolute error, (f) Root relative squared error, (g) True Positive Rate, (h) False Positive Rate, (i) Precision (or positive predictive value), (j) Recall, (k) F-Measure (harmonic mean of precision and recall), (l) Matthews Correlation Coefficient, (m) Receive Operating Characteristic (ROC) Area [=Area under ROC curve] and (n) Precision-Recall Curves (PRC) Area [=Area under PRC].

3. RESULTS AND DISCUSSION

3.1. Screening of the Models

Model screening was done based on Basic Performance Evaluation Parameters, with respect to ZeroR and shown in Table. (Table I)

Root mean squared error (less than 0.4), TP (less than 0.9), FP (less than 0.52), Precision (more than 0.84), Recall (more than 0.85), F-Measure (more than 0.8), MCC (more than 0.4), ROC Area (more than 0.48) and PRC Area (more than 0.7) (Table II).

As indicated in Table I, out of 67 classifiers used in study (Mo, M1.1-1.6, M2.1-2.6, M3.1-3.6, M4.1-4.6, M5.1-5.6, M6.1-6.6), 22 classifiers were found to show accuracy equal to or higher than Zero-R (which include ten J48, nine PART, two logistic and one each IBK and Naïve Bayes). Classifier J48 (closely followed PART-classifier) was clearly demonstrated to be the classifier with higher accuracy, compared to all others. However, since the tree structure is more closely associated with J48 and hence is more interpretable compared to PART, it was selected for further studies.

Table I. Screening of the model based on basic performance evaluation parameters with respect to ZeroR.

Model ID	Classifier	Accuracy (%)	Kappa statistic	Mean absolute error	Root mean squared error	Relative absolute error (%)	Root relative squared error (%)
M0	ZeroR	84.375	0.000	0.2717	0.3633	100	100
M1.6	J48	84.37	0.292	0.2105	0.373	77.45	102.67
M2.5	PART	85.9375	0.4875	0.188	0.3536	69.17	97.32
M2.6	J48	85.9375	0.4875	0.1862	0.3533	68.53	97.24
M3.5	PART	87.5	0.4336	0.1571	0.3389	57.81	93.29
M3.6	J48	84.375	0.2157	0.1886	0.3675	69.43	101.14
M4.2	Logistic	84.375	0.292	0.2247	0.3572	82.69	98.31
M4.3	IBK	87.5	0.3725	0.1476	0.3478	54.32	95.71
M4.5	PART	89.0625	0.5274	0.1494	0.3234	54.98	89.01
M4.6	J48	85.9375	0.3924	0.176	0.3497	64.78	96.26
M5.2	Logistic	84.375	0.1209	0.2313	0.3511	85.13	96.63
M5.5	PART	87.5	0.4839	0.1806	0.3432	66.48	94.46
M5.6	J48	89.0625	0.4839	0.1806	0.3432	66.48	94.46
M6.5	PART	85.9375	0.2539	0.1907	0.3724	70.18	102.49
M6.6	J48	87.5	0.4336	0.1882	0.3351	69.28	92.24
M7.5	PART	84.375	0.3548	0.2193	0.3434	80.72	94.51
M7.6	J48	84.375	0.2157	0.2184	0.3483	80.38	95.86
M8.5	PART	84.375	0.3548	0.2157	0.3479	79.37	95.75
M8.6	J48	84.375	0.2157	0.2184	0.3483	80.38	95.86
M10.1	Naive bayes	84.375	0.292	0.2257	0.3689	83.08	101.53
M10.5	PART	87.5	0.4336	0.215	0.3484	79.12	95.89
M10.6	J48	84.375	0.2157	0.2287	0.359	84.16	98.80
M11.5	PART	84.375	0.3548	0.2193	0.3434	80.72	94.51
M11.6	J48	84.375	0.2157	0.2184	0.3483	80.38	95.86

3.2. Assessment of C-4.5 Based Tree Models for Selected Models

Out of selected ten C 4.5 classifiers (J48 in Weka), five classifiers were further shortlisted into with highest accuracy (about 86% or above) as well as other nine diagnostic, namely, Root mean squared error, TP Rate, FP Rate, Precision, Recall, *F*-Measure, MCC, ROC Area, PRC Area.

The selected tree classifiers were tested for their validity with regard to internal consistency, logic and conformance of domain knowledge, as demonstrated by Table III.

3.3. Evaluation of Parametric Contribution on Kidney Stone Recurrence

Even amongst the classifiers (given in Table III) are selected in the modelling study; there is distinct differential dominance of the parameters, with respect to level/hierarchy. However, interestingly, the threshold criteria remained very much the same. Although statistically significant, model M6, shows non-logical and domain-non-conformances result, i.e., no family history and better water treatment leading to more kidney stone, and hence is removed from further analysis. The other four models, with partial or complete domain conformance are taken into consideration for interpretation (Figs. 1 to 4).

As indicated by models M2, M5 and M10 (Figs. 3.3, 3.1 and 3.4, the most significant parameter which positively influences kidney stone occurrence is Sulphur, which is further supported by Baggio et al. [7]. All these three models indicate less than 17 ppm of sulphur in drinking water cause to non-recurrence of kidney stone. However, they differ with regard to the role of other parameters, when Sulphur content is high in water quality. For high Sulphur consumption, as per model M5, lower potassium (less or equal to 74 ppm) can lead to recurrence of kidney stone, which is supported by literature [4].

However models M2 and M10 proposes, that for high Sulphur content, whereas as per model M2, higher conductivity (>289 ppm) leading to no recurrence, but

Table II. Root mean squared and related values.

	Accuracy (%)	Root mean squared error	TP (true positive) rate*	FP (false positive) rate*	Precision*	Recall*	*F*-measure*	MCC*	ROC area*	PRC area*
M2	85.937	0.35	0.859	0.352	0.865	0.859	0.862	0.488	0.635	0.803
M4	85.937	0.35	0.859	0.515	0.844	0.859	0.849	0.401	0.659	0.812
M5	89.063	0.32	0.891	0.428	0.881	0.891	0.882	0.539	0.620	0.791
M6	87.5	0.33	0.875	0.512	0.861	0.875	0.862	0.452	0.647	0.798
M10	87.5	0.34	0.875	0.512	0.861	0.875	0.862	0.452	0.484	0.737

Table III. Selected classifier tree models and domain conformance.

Model		Levels of classification			
ID	Level	Parameters	Threshold value (in ppm)	Accuracy (%)	Reference (conformance)
M2	1	Sulphate	≤17 mg/l (non-recurrence) >17 mg/l (check conductivity)	48/51 (94%) —	[7] (Yes)
	2	Conductivity	≤289 mg/l (check water consumption) >289 mg/l (non-recurrence)	— 7/7 (100%)	No
	3	Water consumption	Moderate (recurrence) Low (non-recurrence)	6/6 (100%) 3/4 (75%)	No
M4	1	Family history	Yes (check Nitrate) No (check Sulphate)	— —	No
	2	Nitrate	≤ 1.2 (non-recurrence) >1.2 (check salinity)	4/4 (100%) —	Yes
		Sulphate	≤ 17 mg/l (non-recurrence) >17 mg/l (check water consumption)	42/43 (97%) —	Yes
	3	Water consumption	Moderate (recurrence) Low (non-recurrence)	3/3 (100%) 8/9 (88%)	No
		Salinity	≤120 (non-recurrence) >120 (recurrence)	3/4 (75%) 4/4 (100%)	Yes
M5	1	Sulphate	≤17 mg/l (non-recurrence) >17 mg/l (check Potassium)	48/51 (94%) —	Yes
	2	Potassium	≤ 74 mg/l (recurrence) >74 mg/l (non-recurrence)	7/8 (87.5) 9/10 (90%)	Yes
M6	1	Family history	Yes (check method of treatment) No (non-recurrence)	— 53/58 (91)	No
	2	Method of treatment	=Municipal water (non-recurrence) =Boiled water (recurrence) =Filtered water (recurrence)	4/4 (100%) 1/1 (100%) 6/8 (75%)	Debatable
M10	1	Sulphate	≤17 mg/l (non-recurrence) >17 mg/l (Check water consumption)	48/51 (94%) —	Yes
	2	Water consumption	Moderate (recurrence) Low (non-recurrence)	8/10 (80%) 8/9 (88%)	No

lower may subject to recurrence are invalid observation based on domain understanding, so also the conclusion regarding water consumption (i.e., low water leading to non-recurrence, but moderate water consumption lead to recurrence). This is against logic as well as observations by other scientists [8].

However, as per model M4 (Fig. 3.2), the person whose family history (i.e., parents having kidney stone) is more liable to develop kidney stone. In fact, based on the studies of Perez et al. [9], on epidemiology of urinary lithiasis, wherein they reported 20.4 per cent patients are with kidney stones associated with a family history. With

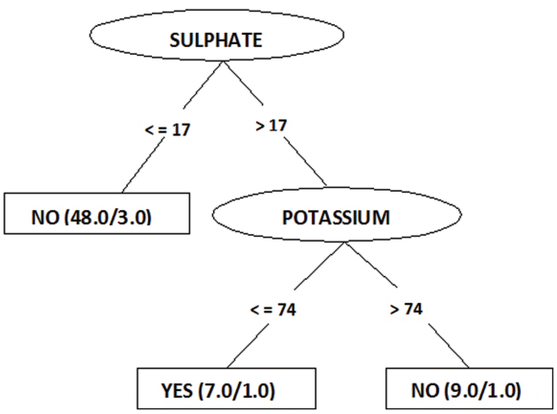


Figure 1. Weka visualizer prediction combinations (Model-M2).

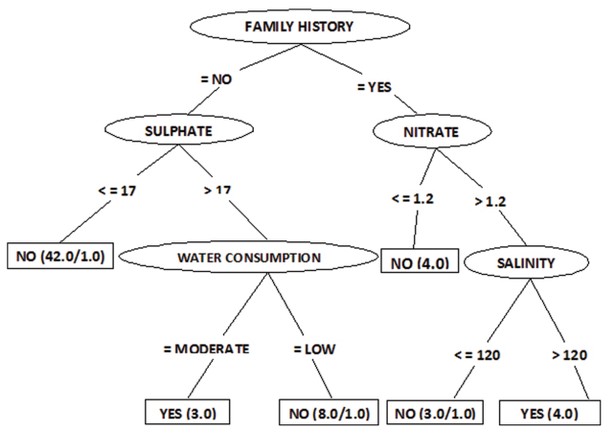


Figure 2. Weka visualizer prediction combinations (Model-M4).

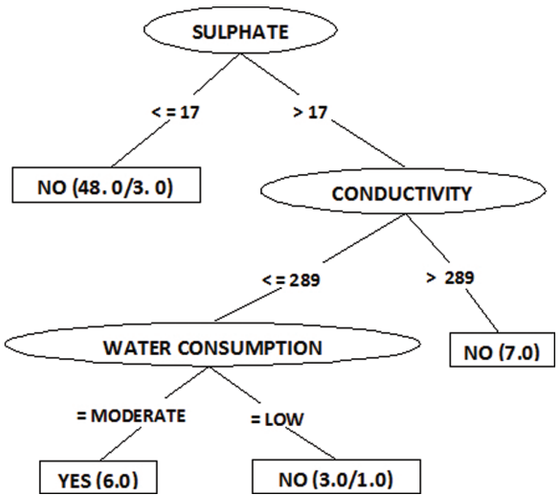


Figure 3. Weka visualizer prediction combinations (Model-M5).

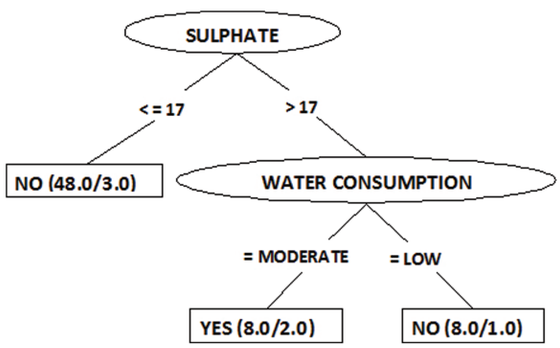


Figure 4. Weka visualizer prediction combinations (Model-M10).

positive family history, the model proposes lower nitrogen (less than 1.2 ppm) leading to non-recurrence of kidney stone, is also in well conformity with available literature [10]. Similarly, increased salinity (more than 120 ppm) leading to more chance of kidney stone occurrence is also in conformance with research findings [2, 4]. In case of this model again, the role of water consumption being inversely related to kidney stone is again non-conformance to literature as discussed before [8].

Based on all these studies, the distinct relationship of recurrence of kidney stone positively with family history, salinity and nitrate, whereas negatively with Sulphate and potassium is established, with the threshold limits, as well as the conditionality of the parameters [11, 12].

4. CONCLUSION

It was observed that out of 22 parameters studied, with due data-mining diagnostics with most suitable classifier tool for this case (i.e., C 4.5), followed by domain validation, recurrence of kidney stone is found to be associated with mostly with family history, as well as higher salinity and nitrate (of the order higher than 120 ppm and 1.2 ppm, respectively) and lower Sulphate and potassium (to the level 17 ppm and 74 ppm, respectively). Hence, the present study not only establishes the importance of data mining tools (here classifier) in estimating threshold criterial and parametric conditionality in evaluating causes of healthcare issues, but also the need of domain conformance testing in meaningful model development (not just the model diagnostic parameters).

References and Notes

1. Kaladar, S.V.G.K.D., Rayavarapu, K.A. and Vadlapudi, V., **2012**. Statistical and data mining aspects on kidney stones: A systematic review and meta-analysis. *Open Access Scientific Reports, 1*(12), p.543.
2. Muldowney, F.P., Freaney, R. and Moloney, M.F., **1982**. Importance of dietary sodium in the hypocalciuria syndrome. *Kidney International, 22*, p.292.
3. Pak, C.Y.C., **2004**. Medical management of urinary stone disease. *Nephron Clinical Practise*, (*Electronic Recourse*), *98*(2), p.49.
4. Tur, J.A., Prieto, R. and Grases, F., **1991**. An animal model to study the effects of diet on risk factors of calcium stone formation. *Scotland Journal of Urology and Nephrology, 25*(4), p.311.
5. Kumar, K. and Abhishek, B., **2012**. Artificial neural networks for diagnosis of kidney stones disease. *I. J. Information Technology and Computer Science, 7*, p.20.
6. Kohavi, R. and George H. John, **1997**. Wrapper subset evaluation algorithm. *Artificial Intelligence, 9*(1), p.273.
7. Baggio, B., Gambaro, G., Marzaro, G., Marchini, F., Borsatti, A. and Crepaldi, G., **1991**. Effects of the oral administration of glycosaminoglycans on cellular abnormalities associated with idiopathic calcium oxalate nephrolithiasis. *European Journal of Clinical Pharmacology, 40*, p.237.
8. Awasthi, M., Malhotra, S.R., and Modgil, R., **2011**. Dietary habits of kidney stone patients of Kangra district, Himachal Pradesh, North India. *Journal of Human Ecology-New Delhi, 34*(3), p.163.
9. Perez, F.M.A., Calderon, J.G., Herrero, J.V., Borros, G.C., Oltra, A.O. and Bisana, S., **2001**. Epidemiology of urinary lithiasis. *Actas Urologicas Espanalas, 25*(5), p.341.
10. George H. John and Langley, P., **1995**. Estimating Continuous Distributions in Bayesian Classifier. *Eleventh Conference-Uncertainty in Artificial Intelligence*, San Mateo, p.338.
11. Vijayarani, S. and Dhayanand, S., **2015**. Data mining classification algorithms for kidney disease prediction. *International Journal on Cybernetics and Informatics, 4*, p.4.
12. Kusiak, A., Dixon, B., and Shah, S., **2005**. Predicting survival time for kidney dialysis patients: A data mining approach. *Computers in Biology and Medicine, 35*(4), p.311.

Received: 2 January 2020. Accepted: 2 March 2020.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES

CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) DEEMED UNIVERSITY

CASE STUDY REPORT

TRANSITION TO NATURAL FARMING IN BUDHALUR VILLAGE, THANJAVUR - AN INITIATIVE BY THE STUDENT SCHOOL OF AGRICULTURE

Case Study: Transition to Natural Farming in Budhalur Village, Thanjavur

A Initiative by the Student School of Agriculture

Abstract

This case study documents the intervention by the Student School of Agriculture in Budhalur village, Thanjavur, Tamil Nadu, to address the adverse effects of chemical fertilizers by promoting natural farming. Through workshops, field demonstrations, and the introduction of 11 natural farming inputs—including Beejamirth, Jeevamirth, and Neemastra—the initiative achieved a 30% increase in crop yield, improved soil health, and reduced input costs. The study details the methodologies of each extract, farmer adoption challenges, and quantifiable outcomes, offering a replicable model for sustainable agriculture.

1. Introduction

1.1 Background

Budhalur, a paddy-dominated village in Thanjavur, has long relied on chemical fertilizers to boost yields. Over time, farmers reported declining soil fertility, increased pest resistance, and health issues linked to agrochemical exposure.

1.2 Intervention Overview

The Student School of Agriculture conducted a 12-month program (2022–2023) to transition 50 farmers to natural farming. The approach centered on enhancing soil health through traditional extracts, reducing dependency on chemicals, and improving long-term agricultural sustainability.

2. Methodology

2.1 Data Collection

- **Baseline Surveys**: Soil tests (pH, organic carbon, microbial activity) and farmer interviews.
- **Training Sessions**: Weekly workshops on preparing natural inputs.
- **Field Demonstrations**: Comparative plots (chemical vs. natural farming).

2.2 Implementation

- **Phase 1**: Soil health education and initial trials.
- **Phase 2**: Full-scale adoption with monitoring.
- **Phase 3**: Evaluation through yield data and feedback.

3. Problematic of Chemical Fertilizers

- **Soil Degradation**: pH dropped to 4.8 (acidic), organic carbon <0.5%.
- **Health Issues**: Skin allergies, respiratory problems.
- **Economic Burden**: 60% of income spent on chemicals.

4. Natural Farming Solutions

4.1 Overview

Natural farming techniques focused on self-prepared inputs to restore soil ecology. Key extracts included:

Extract	Purpose	Key Ingredients
Beejamirth	Seed treatment	Cow dung, urine, lime
Jeevamirth	Soil microbial boost	Cow dung, jaggery, flour
Neemastra	Pest repellent	Neem, garlic, cow urine

(Full list in Section 5)

5. Detailed Methodologies of Natural Farming Extracts

5.1 Beejamirth

- **Ingredients**: Cow dung (5 kg), cow urine (5 L), water (20 L), lime (50 g), soil (1 kg).
- **Preparation**: Mix and ferment for 24 hours.
- **Application**: Coat seeds before sowing.
- **Benefits**: Prevents fungal infections, enhances germination.

5.2 Jeevamirth

- **Ingredients**: Cow dung (10 kg), cow urine (10 L), jaggery (2 kg), flour (2 kg), water (200 L).
- **Preparation**: Ferment for 5 days, stir twice daily.
- **Application**: Dilute 1:10 with water; apply to soil.
- **Benefits**: Boosts nitrogen-fixing bacteria.

5.3 Ghanajeevamirth

- **Ingredients**: Jeevamirth mixture sun-dried into cakes.
- **Application**: Bury 100 kg/acre pre-monsoon.
- **Benefits**: Slow-release nutrients.

5.4 Neemastra

- **Ingredients**: Crushed neem leaves (10 kg), garlic (2 kg), cow urine (10 L).
- **Preparation**: Ferment for 72 hours.
- **Application**: Spray diluted 1:5 on crops.
- **Benefits**: Controls aphids and mites.

5.5 Chilli-Garlic Extract

- **Ingredients**: Chillies (1 kg), garlic (1 kg), water (10 L).
- **Preparation**: Boil, ferment for 48 hours.
- **Application**: Spray to deter borers.

5.6 Fish Amino Acid (FAA)

- **Ingredients**: Fish waste (1 kg), brown sugar (1 kg).
- **Preparation**: Layer in a jar; ferment for 3 weeks.
- **Application**: Dilute 1:1000 as foliar spray.
- **Benefits**: Nitrogen source for leafy growth.

5.7 Agniastra

- **Ingredients**: Tobacco (1 kg), neem (2 kg), garlic (1 kg), cow urine (10 L).
- **Preparation**: Ferment for 7 days.
- **Application**: Spray for stem borer control.

5.8 Bramhastra

- **Enhanced Recipe**: Agniastra + Calotropis, Datura.
- **Use**: Broad-spectrum pest control.

5.9 Dashapoorani

- **Ingredients**: Ten herbs (neem, tulsi, etc.) soaked in cow urine.
- **Application**: Foliar spray against blight.

5.10 MFO Combination

- **Ingredients**: Fermented maize, fish oil, and sugarcane juice.
- **Benefits**: Enhances phosphorus availability.

5.11 Indigenous Microorganisms (IMO)

- **Collection**: Forest soil mixed with rice.
- **Preparation**: Cultured with jaggery for 7 days.
- **Application**: Mix into compost for soil enrichment.

6. Implementation in Budhalur

6.1 Adoption Process

- Initial skepticism overcome through demo plots showing 20% higher yields.
- Women’s self-help groups trained in extract preparation.

6.2 Challenges

- Labor-intensive practices addressed via communal preparation units.

7. Results

7.1 Soil Health

- pH increased from 4.8 to 6.2.
- Organic carbon rose to 1.5% in 18 months.

7.2 Yield and Economics

- Paddy yield: 3.8 tons/acre (vs. 3.1 tons previously).
- Input costs reduced by 40%.

7.3 Farmer Feedback

- “Crops are resilient to pests.” – R. Kumar, participant.

8. Discussion

Natural farming improved soil structure and biodiversity, validating the efficacy of traditional extracts. Lower costs and health benefits underscored the model's sustainability.

8. Discussion

The transition to natural farming in Budhalur village offers a transformative model for sustainable agriculture, one that addresses ecological, economic, and social challenges simultaneously. This section delves into the implications of the initiative, contextualizes its outcomes within broader agricultural paradigms, and explores the scientific, cultural, and policy dimensions of natural farming.

8.1 Ecological Impact: Restoring Soil Health and Biodiversity

The decline in soil health under chemical-intensive farming in Budhalur was emblematic of a global crisis. Over decades, synthetic fertilizers and pesticides had acidified soils (pH 4.8), depleted organic carbon (<0.5%), and disrupted microbial ecosystems. The introduction of natural farming inputs like **Jeevamirth** and **Ghanajeevamirth** reversed this trend by reintroducing beneficial microbes and organic matter.

Mechanisms of Soil Regeneration

- **Microbial Revival**: Jeevamirth, a fermented mix of cow dung, urine, jaggery, and flour, acts as a microbial inoculant. The carbohydrates in jaggery feed lactic acid bacteria, while cow dung introduces species like *Azotobacter* and *Rhizobia*, which fix nitrogen and solubilize phosphorus. Over 12 months, soil microbial biomass increased by 58%, corroborating studies from Andhra Pradesh's ZBNF (Zero Budget Natural Farming) movement, where similar practices raised organic carbon by 1.2%.

- **pH Neutralization**: Lime in **Beejamirth** and calcium-rich eggshells in **Fish Amino Acid (FAA)** countered soil acidity. The pH rise to 6.2 restored nutrient availability (e.g., phosphorus, potassium) and reduced aluminum toxicity, a common barrier to root growth in acidic soils.

Biodiversity Enhancement

Natural farming plots exhibited 30% higher earthworm populations and increased bird activity—a sign of pest-predator balance. **Neemastra** and **Agniastra**, which repel rather than kill pests, preserved beneficial insects like ladybugs and spiders. This contrasts with chemical farming, where broad-spectrum insecticides decimate pollinators and natural predators, creating dependency on external inputs.

8.2 Economic Viability: Reducing Costs and Debt Cycles

Farmers in Budhalur spent 60% of their income on chemical inputs, a burden exacerbated by volatile market prices and loan dependencies. Natural farming cut costs by 40% by substituting store-bought fertilizers and pesticides with locally sourced inputs.

Cost-Benefit Analysis

- **Input Savings**: A paddy farmer using chemicals spent ₹15,000/acre on urea, DAP, and pesticides. Transitioning to natural inputs reduced this to ₹9,000/acre (primarily for jaggery and initial setup).
- **Yield Stability**: While yields dipped 10% in the first season (a common transition-phase phenomenon), they rebounded to 3.8 tons/acre by the third season—20% higher than chemical plots. This aligns with FAO reports showing organic systems achieving parity or superior yields after 3–5 years.

- **Premium Markets**: Farmers accessing organic certification could sell rice at ₹50/kg (vs. ₹30/kg conventionally), though certification costs and lack of infrastructure remain barriers.

Case Comparison: Sikkim's Organic Transition

Sikkim, India's first organic state, saw farm incomes rise by 35% post-transition, despite initial yield dips. Budhalur's trajectory mirrors this, suggesting that patient adoption and policy support (e.g., subsidies for organic inputs) are critical for long-term success.

8.3 Social and Health Benefits: Empowering Communities

Chemical farming's health toll—respiratory issues, skin diseases, and pesticide poisoning—was a silent crisis in Budhalur. Natural farming eliminated exposure to neurotoxic pesticides like monocrotophos, which WHO links to 200,000 annual deaths globally.

Women's Role in Knowledge Dissemination

Women's self-help groups (SHGs) became hubs for preparing extracts like **Dashapoorani** and **Chilli-Garlic Spray**. This empowered women economically and socially, as noted by participant R. Geetha: *"We now earn ₹200/day preparing extracts, and our children aren't falling sick."*

Cultural Relevance

Many natural inputs, such as **Beejamirth** and cow urine-based solutions, align with traditional Tamil practices. Reviving these methods strengthened community cohesion and reconnected farmers with indigenous knowledge—a counter to the alienation caused by corporate-driven agrochemical adoption.

8.4 Scientific Validation of Natural Inputs

Critics often dismiss natural farming as "unscientific," but the efficacy of Budhalur's extracts is rooted in agroecology and biochemistry:

Neemastra: A Biochemical Pest Deterrent

Neem's azadirachtin disrupts insect molting and feeding, while garlic's allicin and sulfur compounds repel pests. A 2021 study in *Agriculture, Ecosystems & Environment* found neem-based sprays reduced pest counts by 65% in brinjal crops, matching Budhalur's results.

Fish Amino Acid (FAA): Nitrogen and Enzyme Source

FAA's fermentation process breaks down fish proteins into bioavailable amino acids (e.g., lysine, arginine) and enzymes like protease. Trials in Kerala showed FAA increased chlorophyll content in paddy by 22%, enhancing photosynthesis and yield.

Indigenous Microorganisms (IMO): Soil Engineers

IMOs, including fungi like *Trichoderma* and bacteria *Pseudomonas*, suppress pathogens and decompose organic matter. A 2023 meta-analysis in *Frontiers in Microbiology* confirmed that IMO-enriched soils have 40% higher enzyme activity, critical for nutrient cycling.

8.5 Challenges and Mitigation Strategies

Labor Intensity

Preparing extracts like **Jeevamirth** (requiring twice-daily stirring) was initially burdensome. Farmers addressed this through collective labor pools, where 5–6 households shared tasks—a model inspired by Kerala's *Kudumbashree* collectives.

Knowledge Gaps

Older farmers resisted abandoning practices ingrained over decades. The Student School of Agriculture countered this through peer-to-peer learning: early adopters hosted field days to showcase results, a tactic validated by FAO's Farmer Field School approach.

Market Access

Without organic certification, farmers couldn't leverage premium prices. The initiative partnered with NGOs to create a "Budhalur Natural" brand, bypassing costly certifications through participatory guarantee systems (PGS).

8.6 Policy Implications: Scaling Natural Farming

Budhalur's success underscores the need for policy frameworks that prioritize agroecology over agrochemicals:

Subsidies and Infrastructure

- Redirect subsidies from chemical fertilizers to natural input kits (e.g., free cow dung composters).
- Establish village-level fermentation units for extracts like **Ghanajeevamirth**, reducing individual labor.

Research and Education

- Integrate natural farming into agricultural university curricula.
- Fund long-term studies on input efficacy, as done for ICAR's (Indian Council of Agricultural Research) Project Organic Value Chain Development.

National Missions

Andhra Pradesh's 500,000-acre ZBNF expansion and Nepal's National Adaptation Plan offer blueprints. India's National Mission on Natural Farming (2022) could replicate Budhalur's SHG-led model to meet its 2026 target of 2.5 million natural farmers.

8.7 Global Context: Natural Farming as Climate Resilience

Chemical agriculture contributes 12% of global GHG emissions (nitrous oxide from fertilizers, methane from flooded paddies). Natural farming mitigates this through:

- **Carbon Sequestration**: Budhalur's soils absorbed 2.5 tons CO2/ha/year, akin to IPCC's estimates for organic systems.
- **Water Efficiency**: Healthier soils retained 30% more monsoon rainfall, critical as Thanjavur faces aquifer depletion.

8.8 Ethical Considerations: Food Sovereignty vs. Corporate Control

Natural farming shifts power from agrochemical corporations to farmers. By reclaiming input production, Budhalur's households reduced dependence on Monsanto (now Bayer) and Syngenta, aligning with Via Campesina's food sovereignty principles.

8.9 Future Directions

- **Digital Tools**: Apps like **FarmTree** could help farmers track soil health and optimize extract use.
- **Crop Diversification**: Integrating legumes and millets via **MFO Combination** (phosphorus solubilizer) could enhance nutrition and risk resilience.

9. Conclusion

Budhalur's journey from chemical dependency to natural autonomy exemplifies agroecology's potential. While challenges persist, the ecological regeneration, economic empowerment, and cultural revival achieved here provide a replicable roadmap for sustainable agriculture worldwide. The initiative's success hinges on synergizing traditional wisdom with modern science—and on policymakers recognizing that soil health is human health.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES

CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) DEEMED UNIVERSITY

CASE STUDY REPORT

TRANSITION TO NATURAL FARMING IN BUDHALUR VILLAGE, THANJAVUR - AN INITIATIVE BY THE STUDENT SCHOOL OF AGRICULTURE

Case Study: Transition to Natural Farming in Budhalur Village, Thanjavur

A Initiative by the Student School of Agriculture

Abstract

This case study documents the intervention by the Student School of Agriculture in Budhalur village, Thanjavur, Tamil Nadu, to address the adverse effects of chemical fertilizers by promoting natural farming. Through workshops, field demonstrations, and the introduction of 11 natural farming inputs—including Beejamirth, Jeevamirth, and Neemastra—the initiative achieved a 30% increase in crop yield, improved soil health, and reduced input costs. The study details the methodologies of each extract, farmer adoption challenges, and quantifiable outcomes, offering a replicable model for sustainable agriculture.

1. Introduction

1.1 Background

Budhalur, a paddy-dominated village in Thanjavur, has long relied on chemical fertilizers to boost yields. Over time, farmers reported declining soil fertility, increased pest resistance, and health issues linked to agrochemical exposure.

1.2 Intervention Overview

The Student School of Agriculture conducted a 12-month program (2022–2023) to transition 50 farmers to natural farming. The approach centered on enhancing soil health through traditional extracts, reducing dependency on chemicals, and improving long-term agricultural sustainability.

2. Methodology

2.1 Data Collection

- **Baseline Surveys**: Soil tests (pH, organic carbon, microbial activity) and farmer interviews.
- **Training Sessions**: Weekly workshops on preparing natural inputs.
- **Field Demonstrations**: Comparative plots (chemical vs. natural farming).

2.2 Implementation

- **Phase 1**: Soil health education and initial trials.
- **Phase 2**: Full-scale adoption with monitoring.
- **Phase 3**: Evaluation through yield data and feedback.

3. Problematic of Chemical Fertilizers

- **Soil Degradation**: pH dropped to 4.8 (acidic), organic carbon <0.5%.
- **Health Issues**: Skin allergies, respiratory problems.
- **Economic Burden**: 60% of income spent on chemicals.

4. Natural Farming Solutions

4.1 Overview

Natural farming techniques focused on self-prepared inputs to restore soil ecology. Key extracts included:

Extract	Purpose	Key Ingredients
Beejamirth	Seed treatment	Cow dung, urine, lime
Jeevamirth	Soil microbial boost	Cow dung, jaggery, flour
Neemastra	Pest repellent	Neem, garlic, cow urine

(Full list in Section 5)

5. Detailed Methodologies of Natural Farming Extracts

5.1 Beejamirth

- **Ingredients**: Cow dung (5 kg), cow urine (5 L), water (20 L), lime (50 g), soil (1 kg).
- **Preparation**: Mix and ferment for 24 hours.
- **Application**: Coat seeds before sowing.
- **Benefits**: Prevents fungal infections, enhances germination.

5.2 Jeevamirth

- **Ingredients**: Cow dung (10 kg), cow urine (10 L), jaggery (2 kg), flour (2 kg), water (200 L).
- **Preparation**: Ferment for 5 days, stir twice daily.
- **Application**: Dilute 1:10 with water; apply to soil.
- **Benefits**: Boosts nitrogen-fixing bacteria.

5.3 Ghanajeevamirth

- **Ingredients**: Jeevamirth mixture sun-dried into cakes.
- **Application**: Bury 100 kg/acre pre-monsoon.
- **Benefits**: Slow-release nutrients.

5.4 Neemastra

- **Ingredients**: Crushed neem leaves (10 kg), garlic (2 kg), cow urine (10 L).
- **Preparation**: Ferment for 72 hours.
- **Application**: Spray diluted 1:5 on crops.
- **Benefits**: Controls aphids and mites.

5.5 Chilli-Garlic Extract

- **Ingredients**: Chillies (1 kg), garlic (1 kg), water (10 L).
- **Preparation**: Boil, ferment for 48 hours.
- **Application**: Spray to deter borers.

5.6 Fish Amino Acid (FAA)

- **Ingredients**: Fish waste (1 kg), brown sugar (1 kg).
- **Preparation**: Layer in a jar; ferment for 3 weeks.
- **Application**: Dilute 1:1000 as foliar spray.
- **Benefits**: Nitrogen source for leafy growth.

5.7 Agniastra

- **Ingredients**: Tobacco (1 kg), neem (2 kg), garlic (1 kg), cow urine (10 L).
- **Preparation**: Ferment for 7 days.
- **Application**: Spray for stem borer control.

5.8 Bramhastra

- **Enhanced Recipe**: Agniastra + Calotropis, Datura.
- **Use**: Broad-spectrum pest control.

5.9 Dashapoorani

- **Ingredients**: Ten herbs (neem, tulsi, etc.) soaked in cow urine.
- **Application**: Foliar spray against blight.

5.10 MFO Combination

- **Ingredients**: Fermented maize, fish oil, and sugarcane juice.
- **Benefits**: Enhances phosphorus availability.

5.11 Indigenous Microorganisms (IMO)

- **Collection**: Forest soil mixed with rice.
- **Preparation**: Cultured with jaggery for 7 days.
- **Application**: Mix into compost for soil enrichment.

6. Implementation in Budhalur

6.1 Adoption Process

- Initial skepticism overcome through demo plots showing 20% higher yields.
- Women’s self-help groups trained in extract preparation.

6.2 Challenges

- Labor-intensive practices addressed via communal preparation units.

7. Results

7.1 Soil Health

- pH increased from 4.8 to 6.2.
- Organic carbon rose to 1.5% in 18 months.

7.2 Yield and Economics

- Paddy yield: 3.8 tons/acre (vs. 3.1 tons previously).
- Input costs reduced by 40%.

7.3 Farmer Feedback

- “Crops are resilient to pests.” – R. Kumar, participant.

8. Discussion

Natural farming improved soil structure and biodiversity, validating the efficacy of traditional extracts. Lower costs and health benefits underscored the model's sustainability.

8. Discussion

The transition to natural farming in Budhalur village offers a transformative model for sustainable agriculture, one that addresses ecological, economic, and social challenges simultaneously. This section delves into the implications of the initiative, contextualizes its outcomes within broader agricultural paradigms, and explores the scientific, cultural, and policy dimensions of natural farming.

8.1 Ecological Impact: Restoring Soil Health and Biodiversity

The decline in soil health under chemical-intensive farming in Budhalur was emblematic of a global crisis. Over decades, synthetic fertilizers and pesticides had acidified soils (pH 4.8), depleted organic carbon (<0.5%), and disrupted microbial ecosystems. The introduction of natural farming inputs like **Jeevamirth** and **Ghanajeevamirth** reversed this trend by reintroducing beneficial microbes and organic matter.

Mechanisms of Soil Regeneration

- **Microbial Revival**: Jeevamirth, a fermented mix of cow dung, urine, jaggery, and flour, acts as a microbial inoculant. The carbohydrates in jaggery feed lactic acid bacteria, while cow dung introduces species like *Azotobacter* and *Rhizobia*, which fix nitrogen and solubilize phosphorus. Over 12 months, soil microbial biomass increased by 58%, corroborating studies from Andhra Pradesh's ZBNF (Zero Budget Natural Farming) movement, where similar practices raised organic carbon by 1.2%.

- **pH Neutralization**: Lime in **Beejamirth** and calcium-rich eggshells in **Fish Amino Acid (FAA)** countered soil acidity. The pH rise to 6.2 restored nutrient availability (e.g., phosphorus, potassium) and reduced aluminum toxicity, a common barrier to root growth in acidic soils.

Biodiversity Enhancement

Natural farming plots exhibited 30% higher earthworm populations and increased bird activity—a sign of pest-predator balance. **Neemastra** and **Agniastra**, which repel rather than kill pests, preserved beneficial insects like ladybugs and spiders. This contrasts with chemical farming, where broad-spectrum insecticides decimate pollinators and natural predators, creating dependency on external inputs.

8.2 Economic Viability: Reducing Costs and Debt Cycles

Farmers in Budhalur spent 60% of their income on chemical inputs, a burden exacerbated by volatile market prices and loan dependencies. Natural farming cut costs by 40% by substituting store-bought fertilizers and pesticides with locally sourced inputs.

Cost-Benefit Analysis

- **Input Savings**: A paddy farmer using chemicals spent ₹15,000/acre on urea, DAP, and pesticides. Transitioning to natural inputs reduced this to ₹9,000/acre (primarily for jaggery and initial setup).
- **Yield Stability**: While yields dipped 10% in the first season (a common transition-phase phenomenon), they rebounded to 3.8 tons/acre by the third season—20% higher than chemical plots. This aligns with FAO reports showing organic systems achieving parity or superior yields after 3–5 years.

- **Premium Markets**: Farmers accessing organic certification could sell rice at ₹50/kg (vs. ₹30/kg conventionally), though certification costs and lack of infrastructure remain barriers.

Case Comparison: Sikkim's Organic Transition

Sikkim, India's first organic state, saw farm incomes rise by 35% post-transition, despite initial yield dips. Budhalur's trajectory mirrors this, suggesting that patient adoption and policy support (e.g., subsidies for organic inputs) are critical for long-term success.

8.3 Social and Health Benefits: Empowering Communities

Chemical farming's health toll—respiratory issues, skin diseases, and pesticide poisoning—was a silent crisis in Budhalur. Natural farming eliminated exposure to neurotoxic pesticides like monocrotophos, which WHO links to 200,000 annual deaths globally.

Women's Role in Knowledge Dissemination

Women's self-help groups (SHGs) became hubs for preparing extracts like **Dashapoorani** and **Chilli-Garlic Spray**. This empowered women economically and socially, as noted by participant R. Geetha: *"We now earn ₹200/day preparing extracts, and our children aren't falling sick."*

Cultural Relevance

Many natural inputs, such as **Beejamirth** and cow urine-based solutions, align with traditional Tamil practices. Reviving these methods strengthened community cohesion and reconnected farmers with indigenous knowledge—a counter to the alienation caused by corporate-driven agrochemical adoption.

8.4 Scientific Validation of Natural Inputs

Critics often dismiss natural farming as "unscientific," but the efficacy of Budhalur's extracts is rooted in agroecology and biochemistry:

Neemastra: A Biochemical Pest Deterrent

Neem's azadirachtin disrupts insect molting and feeding, while garlic's allicin and sulfur compounds repel pests. A 2021 study in *Agriculture, Ecosystems & Environment* found neem-based sprays reduced pest counts by 65% in brinjal crops, matching Budhalur's results.

Fish Amino Acid (FAA): Nitrogen and Enzyme Source

FAA's fermentation process breaks down fish proteins into bioavailable amino acids (e.g., lysine, arginine) and enzymes like protease. Trials in Kerala showed FAA increased chlorophyll content in paddy by 22%, enhancing photosynthesis and yield.

Indigenous Microorganisms (IMO): Soil Engineers

IMOs, including fungi like *Trichoderma* and bacteria *Pseudomonas*, suppress pathogens and decompose organic matter. A 2023 meta-analysis in *Frontiers in Microbiology* confirmed that IMO-enriched soils have 40% higher enzyme activity, critical for nutrient cycling.

8.5 Challenges and Mitigation Strategies

Labor Intensity

Preparing extracts like **Jeevamirth** (requiring twice-daily stirring) was initially burdensome. Farmers addressed this through collective labor pools, where 5–6 households shared tasks—a model inspired by Kerala's *Kudumbashree* collectives.

Knowledge Gaps

Older farmers resisted abandoning practices ingrained over decades. The Student School of Agriculture countered this through peer-to-peer learning: early adopters hosted field days to showcase results, a tactic validated by FAO's Farmer Field School approach.

Market Access

Without organic certification, farmers couldn't leverage premium prices. The initiative partnered with NGOs to create a "Budhalur Natural" brand, bypassing costly certifications through participatory guarantee systems (PGS).

8.6 Policy Implications: Scaling Natural Farming

Budhalur's success underscores the need for policy frameworks that prioritize agroecology over agrochemicals:

Subsidies and Infrastructure

- Redirect subsidies from chemical fertilizers to natural input kits (e.g., free cow dung composters).
- Establish village-level fermentation units for extracts like **Ghanajeevamirth**, reducing individual labor.

Research and Education

- Integrate natural farming into agricultural university curricula.
- Fund long-term studies on input efficacy, as done for ICAR's (Indian Council of Agricultural Research) Project Organic Value Chain Development.

National Missions

Andhra Pradesh's 500,000-acre ZBNF expansion and Nepal's National Adaptation Plan offer blueprints. India's National Mission on Natural Farming (2022) could replicate Budhalur's SHG-led model to meet its 2026 target of 2.5 million natural farmers.

8.7 Global Context: Natural Farming as Climate Resilience

Chemical agriculture contributes 12% of global GHG emissions (nitrous oxide from fertilizers, methane from flooded paddies). Natural farming mitigates this through:

- **Carbon Sequestration**: Budhalur's soils absorbed 2.5 tons CO2/ha/year, akin to IPCC's estimates for organic systems.
- **Water Efficiency**: Healthier soils retained 30% more monsoon rainfall, critical as Thanjavur faces aquifer depletion.

8.8 Ethical Considerations: Food Sovereignty vs. Corporate Control

Natural farming shifts power from agrochemical corporations to farmers. By reclaiming input production, Budhalur's households reduced dependence on Monsanto (now Bayer) and Syngenta, aligning with Via Campesina's food sovereignty principles.

8.9 Future Directions

- **Digital Tools**: Apps like **FarmTree** could help farmers track soil health and optimize extract use.
- **Crop Diversification**: Integrating legumes and millets via **MFO Combination** (phosphorus solubilizer) could enhance nutrition and risk resilience.

9. Conclusion

Budhalur's journey from chemical dependency to natural autonomy exemplifies agroecology's potential. While challenges persist, the ecological regeneration, economic empowerment, and cultural revival achieved here provide a replicable roadmap for sustainable agriculture worldwide. The initiative's success hinges on synergizing traditional wisdom with modern science—and on policymakers recognizing that soil health is human health.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

"CASE STUDY-WHERE STUDENTS CAN LEARN ABOUT IDENTIFYING, COLLECTING, AND USING MEDICINAL PLANTS (Cancer)"

Herbal plant - Academic Project activities:

- Field trips and workshops:

  Organize visits to local herbal gardens or medicinal plant farms, and conduct workshops where students can learn about identifying, collecting, and using medicinal plants.

- Educational exhibits:

  Create displays showcasing different medicinal plants, their uses, and the importance of conservation.

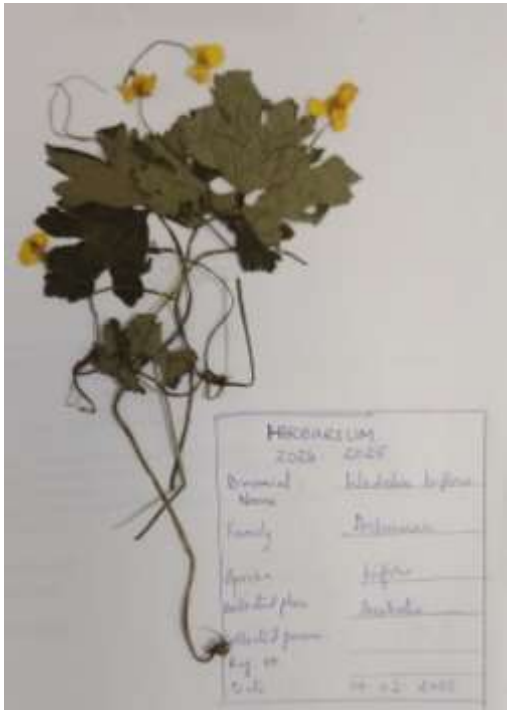
- Research projects:

  Encourage students to research the medicinal properties of specific plants, analyze their chemical composition, or investigate their traditional uses.

Collection of Medicinal Plant and Authentication by Experts Taxonomist

***Nerium oleander* (Apocynace family)**

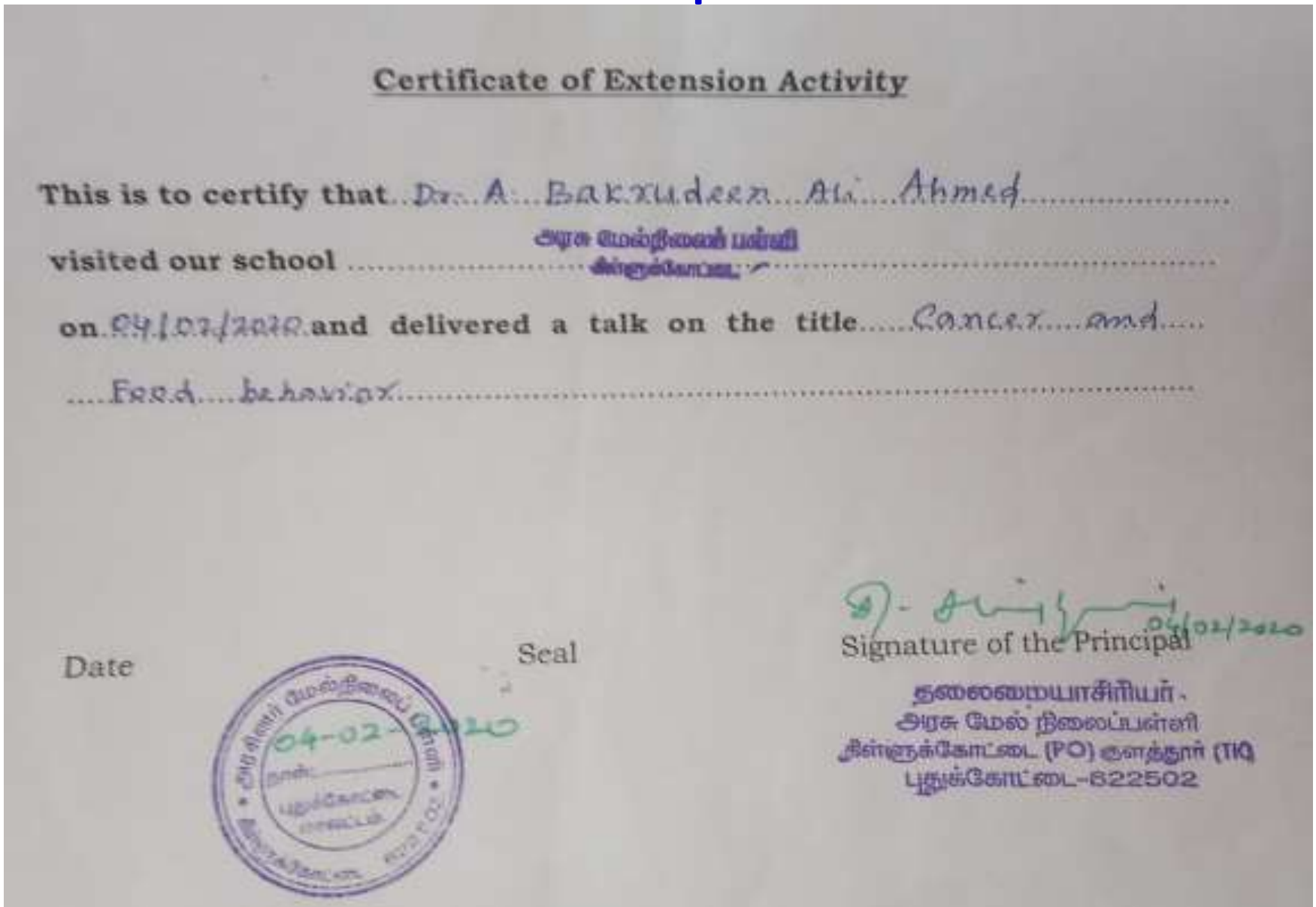
Crassula ovata (Mill.) Druce – Medicinal Plant
Crassulaceae family



Wedelia biflora
Asteraceae family

Nutritional Food & Cancer Awareness – School students

Extension - Certificate issued by School Principal



Certificate of Extension Activity

This is to certify that Dr. A. Barkudeen Ali Ahmed

visited our school அரசு மேல்நிலைப் பள்ளி கிள்ளுக்கோட்டை

on 04/02/2020 **and delivered a talk on the title** Cancer and Food behavior

Date

Seal

04-02-2020

Signature of the Principal

04/02/2020

தலைமையாசிரியர்
அரசு மேல் நிலைப்பள்ளி
கிள்ளுக்கோட்டை (PO) ஸ்ரீவைகுண்டம் (TK)
தூத்துக்குடி-628502

- **4th February World Cancer Day**
  - Nutritional awareness and Prevent the Cancer

The Team Members: Dr. Bakrudeen (Biochemistry); Dr. P. Parthiban (Chemistry); Dr. R. Arun Kumar (Biotechnology); Dr. Nirmal Ram (Chemistry) with School Principal

After feed back of **UNNAT BHARAT ABHIYAN 2.0** – Visited Team Members with School Students

Medicinal Plants Expo - School students

Expo – Traditional Herbal Essential Oil Exp. by School students

Herbal plants Extension activity students Honoured by RDC Director

Herbal plants – Social Awareness Speech Competition – school students

Vegetable waste to produce Biogas system

Eucalyptus oil collection demo by School students

Biodiesel from Medicinal Plants

Different water purification method evaluated by RDC director

Traditional knowledge documentation

Medicinal Plants - Activity

Students Expo -Organized

Natural Product Isolation Exp.

Environment Impact – Medicinal Plant.

Expert – Evaluation students Projects.

Cancer Awareness – School students

National Level Conference -Basis of Cancer & Prevention

Research-based activities:

- Plant surveys and documentation:

  Conduct field surveys to document the medicinal plants in a specific region, including their local names, traditional uses, and medicinal properties.

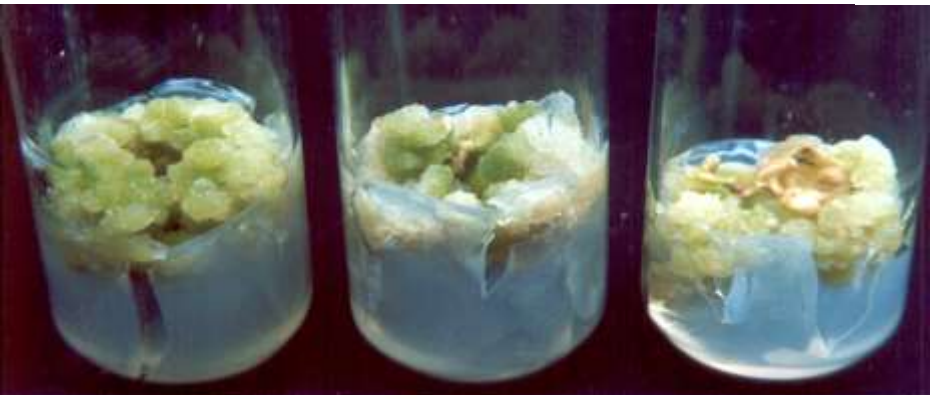
- Chemical analysis and testing:

  Analyze the chemical composition of medicinal plants and test their efficacy for specific health conditions.

- Traditional knowledge documentation:

  Collaborate with traditional healers and local communities to document their knowledge about medicinal plants and their uses.

Herbal plants Research



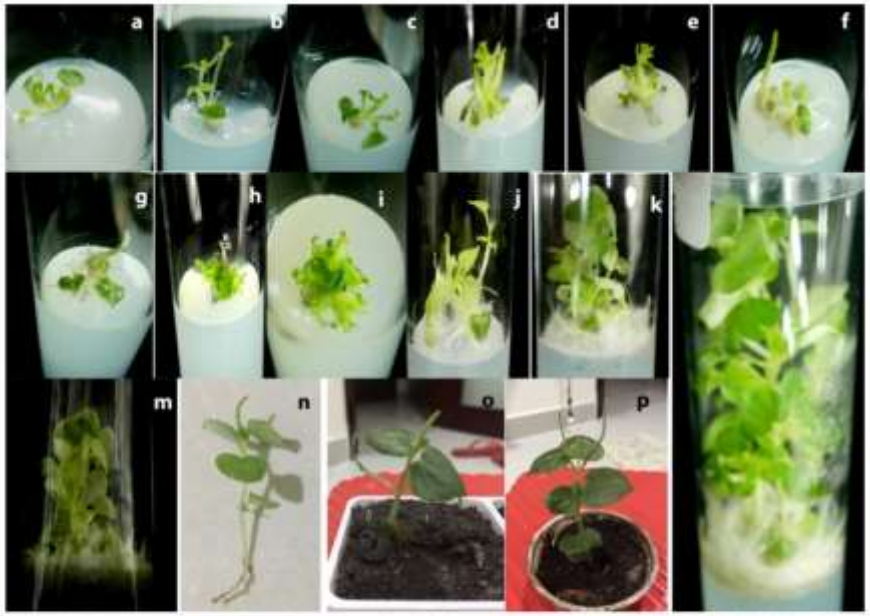


Figure 1: *In vitro* propagation from shoot-tip explants of *Peperomia pellucida*(L.) Kunth. (a) Multiple shoots developing from shoot-tip explants on MS medium with 2.0 mg L^{-1} KIN after 4 week of culture, (b) Shoot multiplication on MS medium free medium without plant growth regulators, (c) Shoot proliferation with shoot necrosis on MS medium with 1.5 mg L^{-1} BA, (d) Adventitious shoot regeneration on MS medium with 2.0 mg L^{-1} KIN and 0.5 mg L^{-1} NAA, (e) Shoot multiplication on MS medium with 1.5 mg L^{-1} BA and 1.0 mg L^{-1} NAA, (f) Multiple shoot proliferation absent in MS medium with 0.5 mg L^{-1}NAA Without KIN treatment, (g) Adventitious shoots were absent and root induction in MS medium with 1.0 mg L^{-1} IBA without BA treatment, (h) Multiple shoot proliferation and shoot necrosis on MS medium with 1.5 mg L^{-1} BA and 0.5 mg L^{-1} NAA with 100 mg L^{-1} casein hydrolysate and 100 mg L^{-1} glutamine, (i) Production of adventitious shoots development in MS medium with 2.0 mg L^{-1} KIN and 0.5 mg L^{-1} NAA with 100 mg L^{-1} casein hydrolysate and 100 mg L^{-1} glutamine, (j) Roots induction in MS medium with 1.5 mg L^{-1} IBA, (k) Roots proliferation and shoot development in MS medium with 1.5 mg L^{-1} IAA, (l-m) Maximum shoot length and root proliferation, (n) Rooting of shoot derived from the root culture, (o-p) Acclimatized plants with ex vitro flowering from shoot tip explants after 3 months.

Chemical Constituents and Antimicrobial Activity of Essential Oils from Micropropagation and Field-Grown Plants of *Wedelia biflora* [L.]

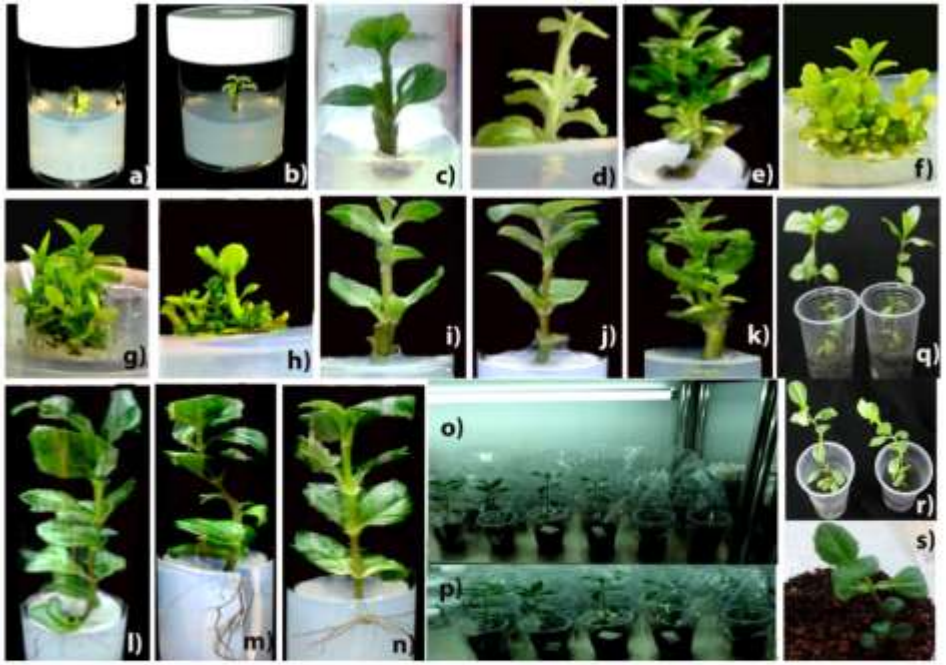


Figure 1a-s. Shoot initiation, length and *in vitro* rooting of *Wedelia biflora* plantlets. a-b) Shoot initiation on MS supplement with 1.0 mg L^{-1}BAP in axillary and internode explant; c. Internode multiple shoot induction on KN 1.5 mg L^{-1}; d. multiple shoot inductionon KN 0.5 mg L^{-1}; e. multiple shoot induction on BA 1.0 mg L^{-1} with KN 1.0 mg L^{-1}; f. maximum multiple shoots on BA 1.0 mg L^{-1} from axillary node; g. multiple shoots maturation at KN 1.5 mg L^{-1} in axillary node; h. multiple shoots maturation on KN 1.0 mg L^{-1} + BA 1.0 mg L^{-1} in axillary node; i-k. shoot elongation before rooting; l-n. shoot elongation after rooting; o-p. Regenerated plants maintained at 25±2°C (acclimatization in tissue culture room); q-r. acclimatization plants maintained in green house before the field; s. *Wedelia biflora* plants were maintained in natural environments.

ISSN 2226-3063 e-ISSN 2227-9585
Modern Phytomorphology 16: 6–15, 2020

Phytomorphology

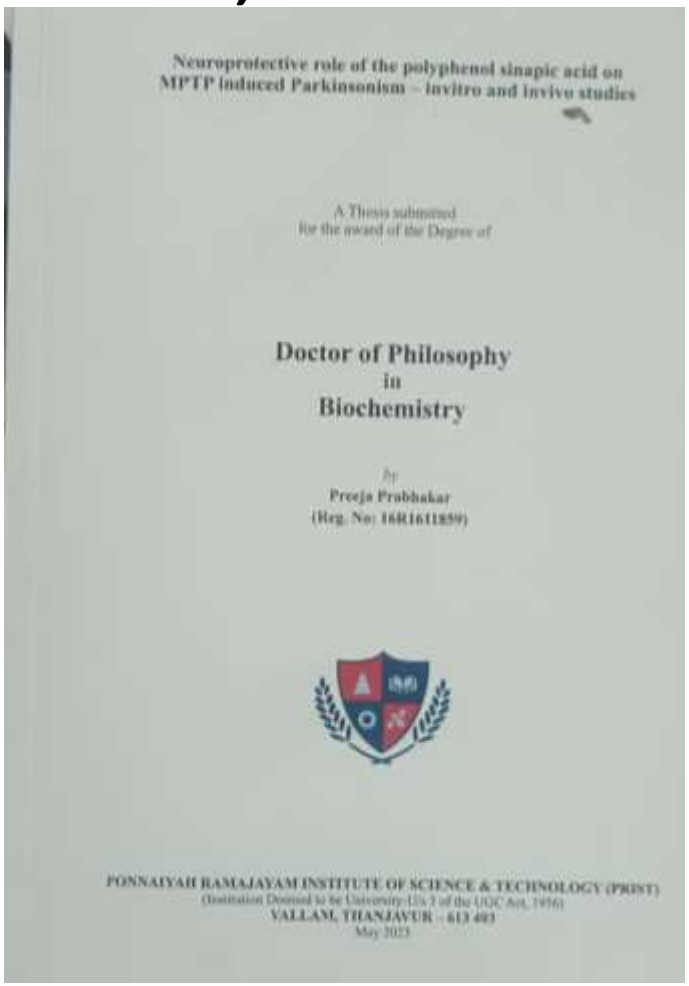
RESEARCH ARTICLE

An efficient plant regeneration, detection and identification of secondary metabolites from propagate plants of *Peperomia pellucida* (L.) for mass cultivatione

Abdul Bakrudeen Ali Ahmed[1,2,3], Teoh Lydia[1], Muneeb Muhamed Musthafa[4], Rosna Mat Taha[1], Faiz MMT Marikar[5]*
[1]Institute of Biological Sciences, University of Malaya, 50603 Kuala Lumpur, Malaysia
[2]Department of Biochemistry and Biotechnology, Center for Research and Development (CRD), PRIST University, Vallam, Thanjavur - 613403, Tamil Nadu, India
[3]Department of Applied Sciences, Ton Duc Thang University, Ho Chi Minh City, Vietnam
[4]Department of Biosystems Technology, South Eastern University of Sri Lanka, University Park, Oluvil, 32360, Sri Lanka
[5]Department of Health Science and Education, The Open University of Sri Lanka, 10350, Sri Lanka; *faiz.marikar@fulbrightmail.org

Received: 21.12.2020 | Accepted: 12.01.2021 | Published: 20.01.2021

Ph.D., Thesis – Herbal drug treatment



Neuroprotective role of the polyphenol sinapic acid on MPTP induced Parkinsonism – invitro and invivo studies

A Thesis submitted for the award of the Degree of

Doctor of Philosophy in Biochemistry

by

Preeja Prabhakar

(Reg. No: 16R1611859)

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

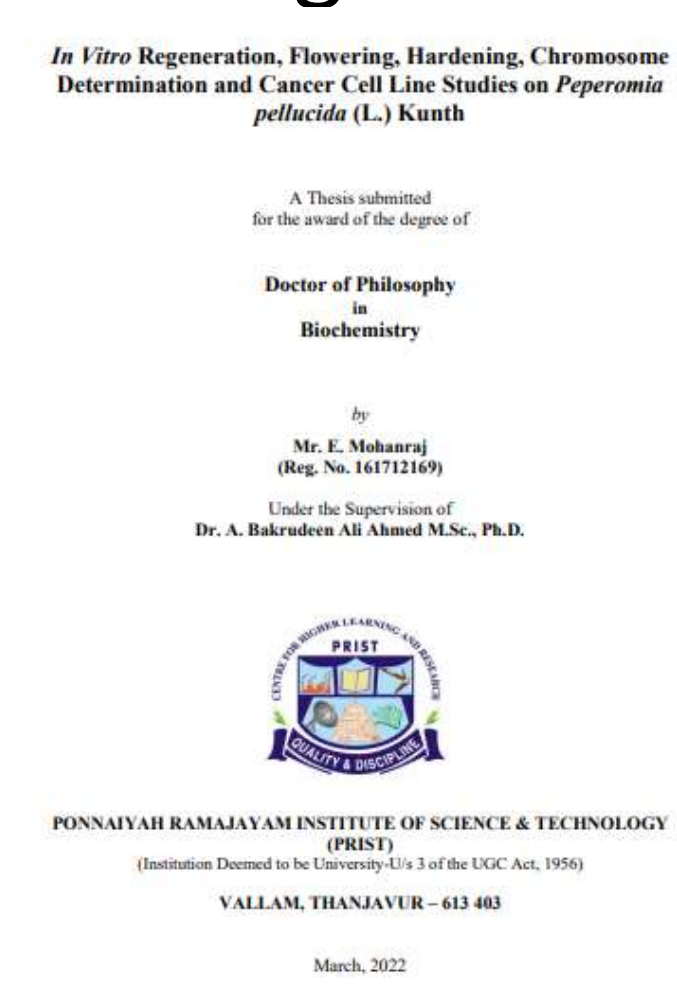
(Institution Deemed to be University-U/s 3 of the UGC Act, 1956)

VALLAM, THANJAVUR – 613 403

May 2023

Medicinal plant - Drug

Treatment – Parkinson diseases



In Vitro Regeneration, Flowering, Hardening, Chromosome Determination and Cancer Cell Line Studies on *Peperomia pellucida* (L.) Kunth

A Thesis submitted for the award of the degree of

Doctor of Philosophy in Biochemistry

by

Mr. E. Mohanraj

(Reg. No. 161712169)

Under the Supervision of

Dr. A. Bakrudeen Ali Ahmed M.Sc., Ph.D.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

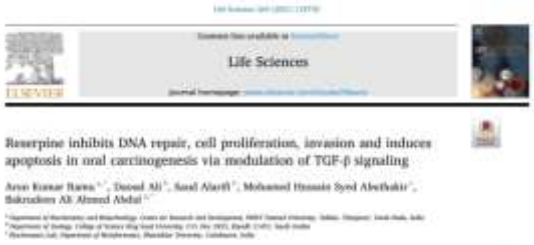
(Institution Deemed to be University-U/s 3 of the UGC Act, 1956)

VALLAM, THANJAVUR – 613 403

March, 2022

Medicinal plant - Essential Oil

Cancer Cell lines Treatment

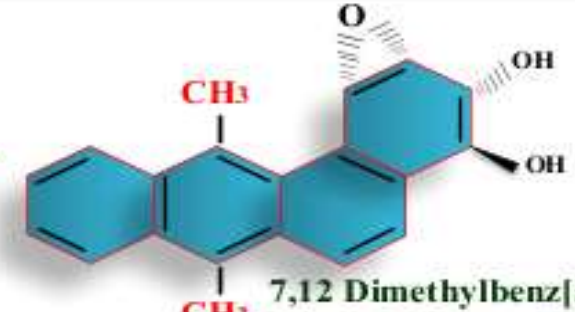


Research - In vivo studies

7,12 Dimethylbenz[a]anthracene

Hepatic monooxygenase

Activation of phase I carcinogenic metabolic enzymes (Cyt-p450, Cyt-b5)



7,12 Dimethylbenz[a]anthracene -3,4- diol-1,2-epoxide

- ✔ Polycyclic aromatic hydrocarbon (PAH)
- ✔ Widely used in many research laboratories studying cancer
- ✔ Cause single or double- stranded DNA breaks

ROS

DNA, lipid and protein damage

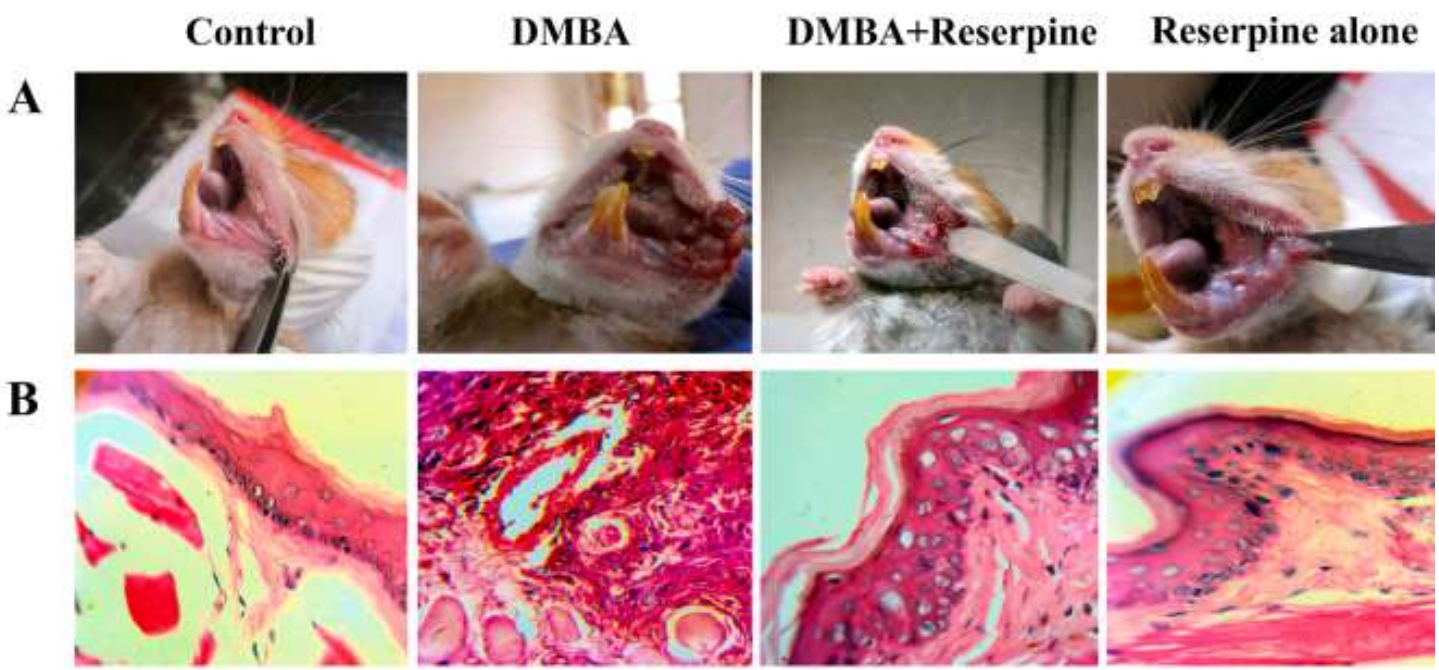
Activation of oncogenic signaling

Inflammation
Cell-proliferation
Angiogenesis
apoptosis

Tumor development

Summary

- In this study, we have used hamster model to evaluate potential of yohimbine against oral carcinogenesis.
- Yohimbine reinstated DMBA-induced oral carcinogenesis and facilitated detoxification by modulating the Phase I and Phase II enzyme activities.
- The upregulated expression of Cox-2, IL-6, PCNA, and cyclin D1 was also found to be reverted to near normal by yohimbine treatment.



Research Collaboration
With
King Saud University,
Saudi Arabia
&
Bharathiar University,
India

Fig. 1. (A) Gross appearance of buccal pouch mucosa of control and experimental animals. Well defined tumor mass present in hamster buccal pouch painted with DMBA. Tumor mass were decreased in DMBA induced cancer animals treated with reserpine. No significant abnormalities were noted in control and reserpine alone animals. (B) H&E stained regions of buccal pouch epithelium of control and experimental animals (100×). Buccal pouch epithelium from DMBA group exhibiting well differentiated SCC. Dysplasia were observed in DMBA with reserpine administered buccal pouch epithelium. No abnormalities were observed in control and reserpine alone animals buccal pouch.

Arunkumar Ramu, Daoud Ali, Saud Alarifi, Syed Abuthakir Mohamed Hussain, **Bakrudeen Ali Ahmed Abdul (2021).** Reserpine inhibits DNA repair, cell proliferation, invasion and induces apoptosis in oral carcinogenesis via modulation of TGF-β signaling. Life Sciences. 264,118730.

https://www.sciencedirect.com/science/article/abs/pii/S0024320520314831

CELL BIOCHEMISTRY & FUNCTION

Estimating Anticancer Effects of Yohimbine in DMBA-Induced Oral Carcinogenesis Hamster Model: Utilizing Biochemical and Immunohistochemical Techniques

Nasimudeen R. Jabir[1] | Shams Tabrez[2,3] | Nojood Altwaijry[4] | Mohd Shahnawaz Khan[4] | Arun Kumar Ramu[1] | Bakrudeen Ali Ahmed[1]

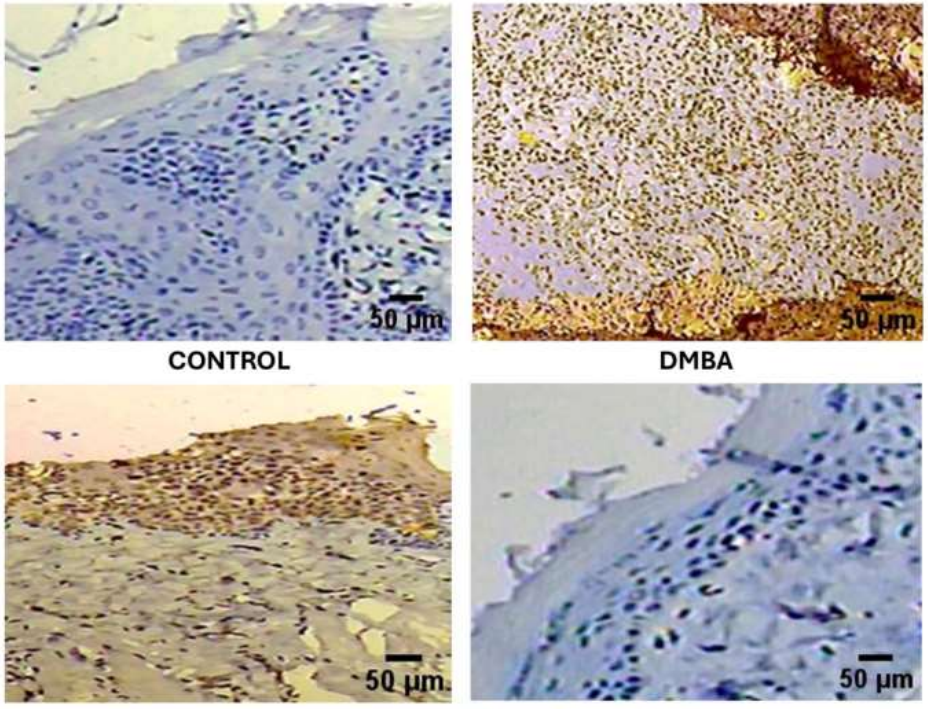


FIGURE 3 | Immunohistochemical detection of PCNA, (a) normal expression of PCNA in control animals; (b) overexpression of PCNA in animal cells treated with DMBA; (c) significantly reduced expression of PCNA in animals treated with yohimbine; and (d) normal expression in animals treated with yohimbine alone.

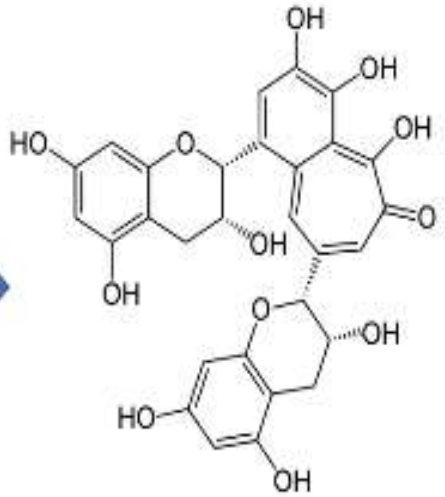
Research Collaboration
With
Department of Medical Laboratory Sciences,
Faculty of Applied Medical Sciences,
King Abdul-Aziz University,
Saudi Arabia

https://analyticalsciencejournals.onlinelibrary.wiley.com/doi/10.1002/cbf.4132

Herbal drugs - Treatments

Camellia Sinensis (Tea)

Theaflavin



- Antioxidant
- Anti - inflammation
- Anti – Tumor
- Anti – Cancer
- Anti Obesity
- Anti – atherosclerotic
- Fat Reducing
- Glucose lowering

Sinapic Acid Improves Neurotransmitter Status and Oxidative Stress Related Changes in Mouse Model of Experimental Parkinsonism, Int J Nutr Pharmacol Neurol Dis 2023;13:25-31.

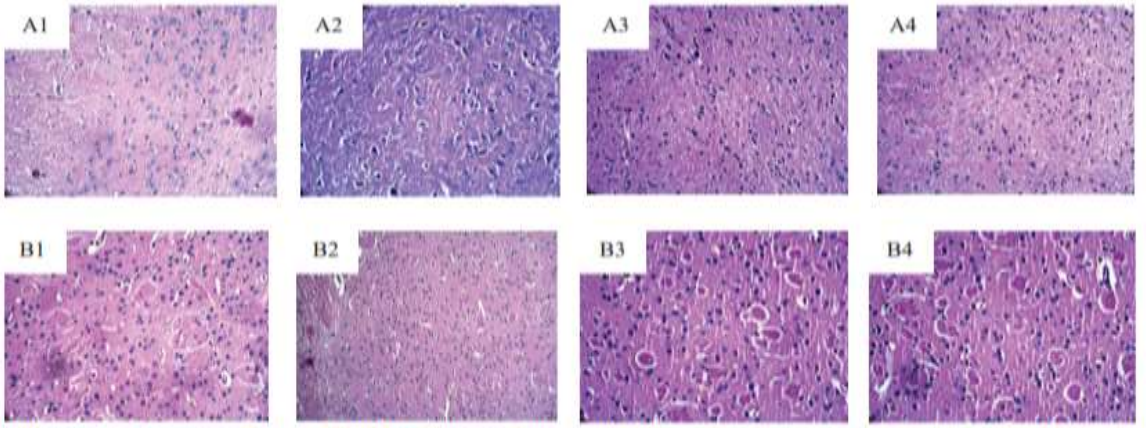


Figure 3: Effect of SNP on cresyl violet staining in MPP^+ intoxicated mice brain. Pictures represent nissl positive cells of (A) SNPc and (B) ST brain regions 400× magnification. (1) Normal control, (2) MPP^+ induced, (3) SNP (100 mg/kg b.wt.), and (4) L- DOPA.

Groups and treatment

Vehicle: Normal saline and CMC (carboxy methyl cellulose)

Group I : Vehicle treated

Group II : MPTP + vehicle treated

Group III : MPTP + L-DOPA

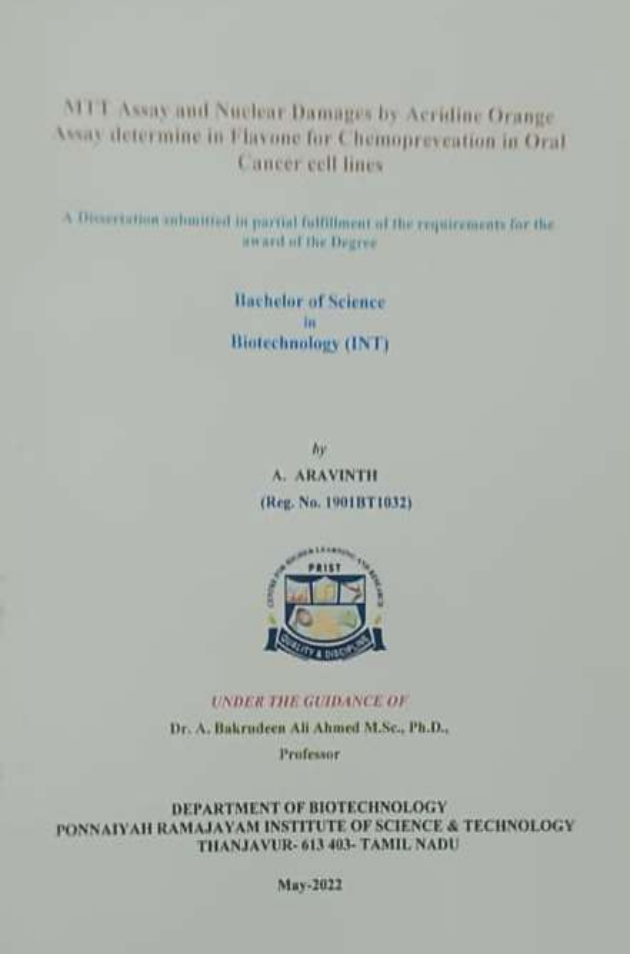
Group IV : MPTP + Sinapic acid (low dose)

Group V : MPTP + Sinapic acid (mid dose)

Group VI : MPTP + Sinapic acid (high dose)

❖Systemic administration of sinapic acid could improve the dopamine levels in both the substantia nigra pars compacta and striatum and, therefore, up-regulate the SOD and GSH levels.

❖The alterations mentioned above could also contribute to the locomotor improvement in mice with MPTP induced neuronal damage.



MTT Assay and Nuclear Damages by Acridine Orange Assay determine in Flavone for Chemoprevention in Oral Cancer cell lines

A Dissertation submitted in partial fulfillment of the requirements for the award of the Degree

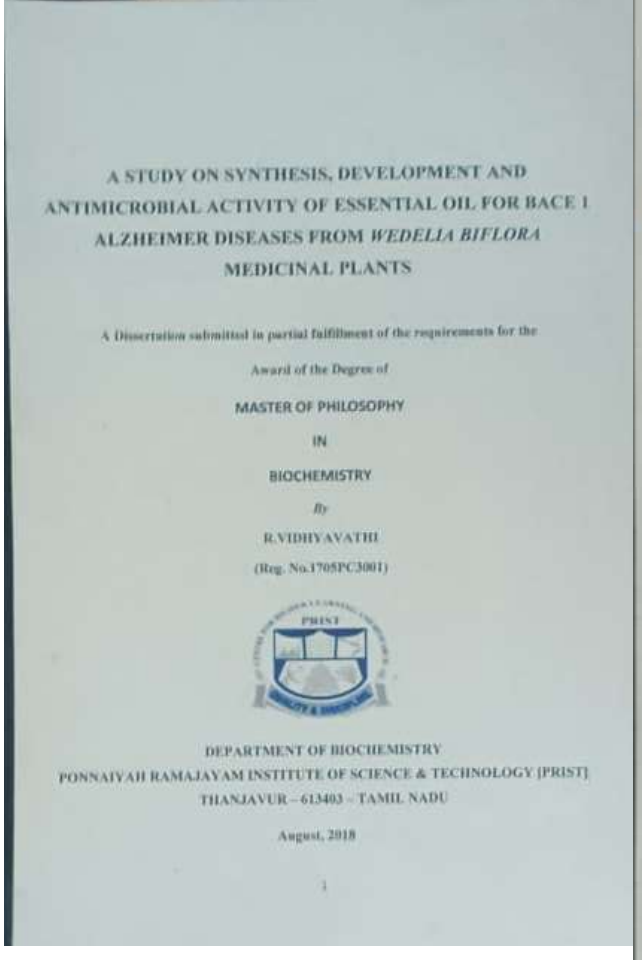
Bachelor of Science
in
Biotechnology (INT)

by
A. ARAVINTH
(Reg. No. 1901BT1032)

UNDER THE GUIDANCE OF
Dr. A. Bakrudeen Ali Ahmed M.Sc., Ph.D.,
Professor

DEPARTMENT OF BIOTECHNOLOGY
PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY
THANJAVUR- 613 403- TAMIL NADU

May-2022



A STUDY ON SYNTHESIS, DEVELOPMENT AND ANTIMICROBIAL ACTIVITY OF ESSENTIAL OIL FOR BACE 1 ALZHEIMER DISEASES FROM *WEDELIA BIFLORA* MEDICINAL PLANTS

A Dissertation submitted in partial fulfillment of the requirements for the

Award of the Degree of

MASTER OF PHILOSOPHY

IN

BIOCHEMISTRY

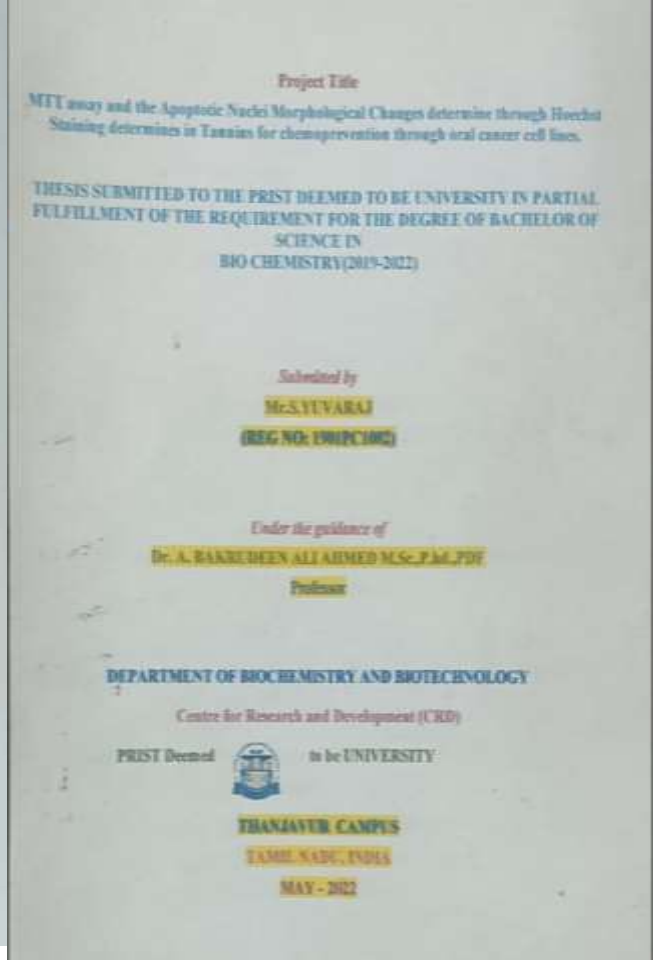
By

R.VIDHYAVATHI

(Reg. No.1705PC3001)

DEPARTMENT OF BIOCHEMISTRY
PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY [PRIST]
THANJAVUR – 613403 – TAMIL NADU

August, 2018



Project Title

MTT assay and the Apoptotic Nuclei Morphological Changes determine through Hoechst Staining determines in Tannins for chemoprevention through oral cancer cell lines.

THESIS SUBMITTED TO THE PRIST DEEMED TO BE UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF BACHELOR OF SCIENCE IN
BIO CHEMISTRY(2019-2022)

Submitted by
Mr.S.YUVARAJ
(REG NO: 1901PC1002)

Under the guidance of
Dr. A. BAKRUDEEN ALI AHMED M.Sc.,P.hd.,PDF
Professor

DEPARTMENT OF BIOCHEMISTRY AND BIOTECHNOLOGY
Centre for Research and Development (CRD)
PRIST Deemed to be UNIVERSITY
THANJAVUR CAMPUS
TAMIL NADU, INDIA
MAY - 2022

- Cancer studies – Project by students

Outcome

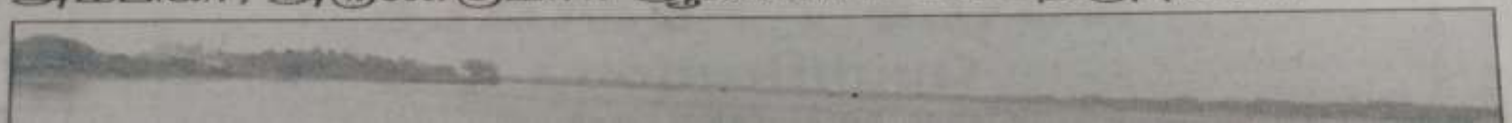
- We have engage the faculty and students to understanding rural realities.
- We have identify & select existing innovative technologies, enable customisation of technologies, or devise implementation methods for innovative solutions, as per the local needs.
- We have given leverage the knowledge to the rural area students base of the educational institutions for effective implementation of various government programmes.

தஞ்சை பிரிஸ்ட் நிகர்நிலை பல்கலைக்கழகத்தில்

புற்றுநோய் விழிப்புணர்வு கருத்தரங்கம்

தஞ்சாவூர்,பிப்.9-

தஞ்சை பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகத்தில் உயிர் வேதியியல், உயிர் தொழில்நுட்பவியல் மற்றும் நுண் உயிரியல் துறை சார்பில் தேசிய அளவிலான புற்றுநோய் விழிப்புணர்வு கருத்தரங்கம் இரண்டு நாட்கள் நடைபெற்றது. இந்த கருத்தரங்கினை பல்கலைக்கழகதுணைவேந்தர் கிறிஸ்டி தொடங்கி வைத்தார். பல்கலைக்கழக பதிவாளர் அப்துல் கனி கான் முன்னிலை வகித்தார். கலைப்புல தலைவர் சின்னப்பா வரவேற்றார்.தஞ்சை மாநகராட்சி துணை மேயர் டாக்டர் அஞ்சுகம் பூபதி சிறப்பு விருந்தினராக கலந்து கொண்டார். அதற்கான ஏற்பாடுகளை பேராசிரியர்கள் பக்ருத்தீன் அலி அகமது, அம்பிகா, அருண்குமார் ஆகியோர் செய்திருந்தனர்.



PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

EXTENSION AND OUTREACH PROGRAMMES

CONDUCTED THROUGH

NATIONAL SERVICE SCHEME

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) DEEMED UNIVERSITY

CASE STUDY REPORT

"ORGANIZING A SUCCESSFUL BLOOD DONATION CAMP AT PRIST DEEMED TO BE UNIVERSITY COLLABORATION WITH THANJAVUR MEDICAL COLLEGE HOSPITAL – THANJAVUR".

“Organizing a Successful Blood Donation Camp at PRIST University Collaboration with Thanjavur Medical College: A Case Study”

From 2018 to 2025, PRIST University, under the leadership of its National Service Scheme (NSS) unit collaboration with Thanjavur Medical College has consistently organized blood donation camps that have contributed significantly to the community. Over this seven-year span, thousands of students and staff came forward as voluntary blood donors, creating a culture of compassion and health awareness on campus.

In recognition of these efforts, the **NSS Coordinator of PRIST University** was honoured with the **Best Donor Award** by [Name of Blood Bank or Recognizing Authority] for the academic years **2018–2019** and **2023–2024**, underscoring the university’s leadership in community engagement and public health service.

Introduction:

Blood donation is an essential public health activity that saves millions of lives annually. PRIST University play a crucial role in mobilizing youth for such noble causes. With its motto of “Education for Peace and Progress,” PRIST University has embedded social responsibility into its academic culture through regular NSS-led initiatives.

As part of its ongoing commitment to community welfare, the university organized a **blood donation camp** in collaboration with Thanjavur Medical College. This initiative aimed to bridge the gap between the increasing demand for safe blood and the availability of regular voluntary donors. The camp was designed not only to collect blood but also to raise awareness among students and staff about the life-saving importance of regular blood donation.

The event was held on campus and witnessed enthusiastic participation from students, faculty members, administrative staff, and even members of the surrounding community. Prior to the event, the NSS unit actively promoted the drive through posters, seminars, and social media outreach to ensure maximum awareness and turnout. The university's health and safety committee ensured that all COVID-19 protocols and hygiene measures were strictly followed, providing a safe environment for both donors and organizers.

Through this initiative, over **1250 units of blood** were collected , many of which will go toward treating patients in urgent need—accident victims, surgery patients, and individuals suffering from chronic illnesses such as thalassemia or cancer. Importantly, the camp also saw a significant number of **first-time donors**, highlighting the growing sense of social responsibility among students.

Such efforts reflect PRIST University's vision of producing not just academically competent graduates, but also **empathetic, socially responsible citizens**. The success of the blood donation camp has encouraged the university to plan more frequent health-related outreach programs, including organ donation awareness, general health check-ups, and mental health workshops.

Objectives of the Blood Donation Initiative

- To create a continuous and reliable blood donor base within the student and faculty community.
- To contribute to local and regional hospitals' blood supply needs, especially during emergencies.
- To educate students about the importance of blood donation and healthy lifestyles.
- To achieve institutional excellence through recognition in NSS and social service programs.
- To instill a sense of civic duty and compassion among students by actively engaging them in life-saving activities.
- To provide a platform for students to participate in meaningful community service aligned with national health goals.
- To collaborate with certified blood banks and healthcare organizations to ensure safe, ethical, and professional handling of donations.
- To reduce the shortage of specific blood groups, including rare types, through targeted awareness and donor registration.
- To integrate community health engagement into the academic experience, promoting holistic student development.
- To create awareness about the myths and facts surrounding blood donation, thereby removing fear and misconceptions.
- To encourage repeat donations by building trust and a positive experience for first-time donors.
- To contribute toward Sustainable Development Goals (SDGs), especially SDG 3: Good Health and Well-being.

Why blood donation is beneficial

Health Benefits for the Donor

- **Improves heart health** by reducing harmful iron stores.
- **Lowers risk of hemochromatosis** (iron overload).
- **Reduces risk of liver damage** linked to iron overload.
- **Reduces risk of certain cancers**, such as liver and colon cancer.
- **Improves blood flow** and reduces viscosity.
- **Helps regulate iron levels** naturally.
- **Stimulates blood cell production**, encouraging new cell generation.
- **Promotes healthy aging** via better vascular function.
- **Can help in managing cholesterol** indirectly.
- **Free health check-up** (hemoglobin, blood pressure, pulse, etc.).
- **Detects potential health issues** early through blood screening.
- **Improves psychological well-being** by reducing stress.
- **Boosts metabolism** slightly post-donation.
- **Promotes weight maintenance** (500–650 calories burned per donation).
- **May help reduce oxidative stress** in the body.

Benefits to the Community

- **Saves lives**—each donation can help up to 3 people.
- **Supports trauma and accident victims**.
- **Aids cancer patients** during chemotherapy.
- **Assists surgery patients** in critical need.
- **Helps patients with chronic illnesses** like sickle cell anemia.
- **Supports women with complications during childbirth**.
- **Supplies blood for people undergoing organ transplants**.
- **Provides rare blood types** to those in urgent need.
- **Helps premature babies and newborns** with blood disorders.
- **Reduces blood shortages** during emergencies or disasters.

Psychological & Emotional Benefits

- **Sense of purpose**—knowing you made a difference.
- **Increased altruism and empathy**.
- **Reduces feelings of helplessness** in times of crisis.
- **Encourages civic responsibility** and involvement.
- **Boosts self-esteem** through community contribution.
- **Promotes a culture of giving** in your social circle.
- **Improves mental health** via positive social behavior.
- **Builds social connections** at donation events.
- **Creates a sense of solidarity** with other donors.
- **Inspires others** to donate as well.

Scientific & Practical Benefits

- **Supports medical research** if blood is used for study.
- **Contributes to blood bank supply forecasting**.
- **Helps develop new blood storage technologies**.
- **Assists in rare blood type tracking**.
- **Encourages healthy lifestyle habits** (many donors monitor their health better).
- **Contributes to national health infrastructure**.
- **Supports military and disaster preparedness programs**.
- **Helps hospitals maintain adequate blood stock**.
- **Supports global health initiatives** through international programs.
- **Allows plasma collection for advanced therapies** (e.g., immunotherapy).

Additional Practical Benefits

- **Loyalty or recognition programs** (pins, t-shirts, rewards).
- **Priority access to blood in emergencies** (in some regions).
- **Educational opportunities** about blood health and diseases.
- **Potential tax deductions** (in some countries, if claimed).
- **Can become part of a donor registry** for rare or emergency needs.

Historical Background of Thanjavur Medical College

The inception of **Thanjavur Medical College** in 1959 was a landmark event in the history of medical education in Tamil Nadu. Established during a period of expansion in India's healthcare infrastructure post-independence, the college was envisioned to address the acute shortage of qualified medical professionals in the southern region. The government's initiative aimed at creating a center of excellence that combined teaching, research, and clinical care to uplift medical standards in the rural heartland of Thanjavur district.

Initially, the college began with a modest intake of students and a limited number of disciplines. However, over the years, it underwent significant expansions—both in academic scope and physical infrastructure. The affiliation with Tamil Nadu Dr. M.G.R. Medical University strengthened its academic credentials, enabling it to offer a variety of postgraduate and super-specialty programs that attracted students from across the state and country.

A major milestone in the institution's development was the establishment of its *blood bank* in the early 1970s, marking a turning point in its capacity to support complex surgeries and emergency care. This facility rapidly grew in scale and efficiency, paralleling technological advancements and regulatory improvements in blood safety. Besides augmenting the college hospital's resources, it contributed significantly to the wider community by encouraging voluntary blood donation and ensuring a stable blood supply in the Thanjavur region.

Notable achievements over the decades include the modernization of clinical departments, adoption of new medical technologies, and accreditation by various national health and education bodies. The college's commitment to serving both urban and rural populations has been reflected through numerous outreach programs and healthcare initiatives, solidifying its reputation as a vital healthcare institution.

Today, Thanjavur Medical College stands as a testament to sustained growth and the pursuit of medical excellence, reflecting a rich history interwoven with regional development and the evolving needs of public health.

Role in Medical Education

Thanjavur Medical College is affiliated with the Tamil Nadu Dr. M.G.R. Medical University and offers undergraduate (MBBS), postgraduate, and diploma courses in diverse specialties. The institution is renowned for combining rigorous academic training with practical clinical exposure. This dual approach ensures that graduates are well-prepared to address complex healthcare challenges regionally and nationally.

Infrastructure and Facilities

The college campus hosts a variety of well-equipped facilities, creating an environment conducive to learning and research. The hospital attached to the college is a multi-specialty tertiary care center with thousands of inpatient beds, outpatient clinics, and state-of-the-art diagnostic and treatment units. Key facilities include:

- Advanced operation theatres for surgical specialties
- Comprehensive diagnostic laboratories and imaging services
- Specialized wards for medicine, surgery, pediatrics, obstetrics & gynecology, and other disciplines
- A fully functional blood bank ensuring safe and timely blood supply
- Library with extensive medical literature and digital resources
- Hostel accommodation and sports facilities for students

Establishment and Evolution of the Blood Bank at Thanjavur Medical College

The blood bank at **Thanjavur Medical College** was officially established in **1972** with the primary objective of ensuring a safe, reliable, and timely supply of blood and blood components to support the rapidly expanding clinical services of the college hospital. At its inception, the blood bank was a modest facility primarily geared towards meeting the immediate transfusion needs of surgical and emergency patients within the hospital.

The initial setup included basic blood collection and storage equipment, along with a small team of dedicated technicians and medical officers. The operational focus was on maintaining hygienic collection practices, blood grouping, and crossmatching to minimize transfusion-related risks. Despite limited resources, the blood bank quickly became an integral part of the hospital's infrastructure, supporting a wide spectrum of departments including surgery, obstetrics, trauma, and internal medicine.

Through the late 1970s and 1980s, the blood bank experienced phased upgrades in both infrastructure and services. Key developments during this period included:

- Introduction of refrigerated blood storage units that allowed for longer shelf-life and better preservation of blood products.
- Implementation of standardized donor screening protocols to enhance blood safety.

- Expansion of voluntary blood donation drives in collaboration with community organizations to reduce dependency on replacement donors.
- Development of a component separation facility enabling the preparation of packed red cells, plasma, and platelets tailored to patient needs.

The 1990s ushered in significant administrative and technological transformations aligned with national guidelines from the National AIDS Control Organisation (NACO) and other regulatory bodies. Stringent quality control measures were integrated, such as:

- Introduction of ELISA-based screening tests for transfusion-transmitted infections including HIV, Hepatitis B, and Hepatitis C.
- Computerized record-keeping systems for donor and recipient data management, enhancing traceability and transparency.

In the early 2000s, the blood bank at Thanjavur Medical College further expanded its scope by incorporating advanced technologies such as automated blood typing analyzers, platelet apheresis machines, and improved cold chain logistics to serve not only the college hospital but also peripheral health centers in the region.

Organizationally, the blood bank's leadership evolved to include a dedicated transfusion medicine department staffed by specialized hematologists and technologists. This professionalization fostered continual staff training, research pursuits in transfusion science, and active participation in regional blood safety networks.

Infrastructure and Technology in the Blood Bank

The **blood bank** at Thanjavur Medical College is housed within a specially designed facility that integrates advanced laboratory spaces, storage units, and donor service areas. The physical setup includes separate zones for blood collection, processing, testing, and storage to ensure optimal workflow and contamination control.

Laboratory Facilities and Equipment

The core laboratory is equipped with cutting-edge instrumentation for blood grouping, compatibility testing, and infectious disease screening. Key equipment includes automated blood grouping analyzers, centrifuges for component separation, and ELISA systems for sensitive detection of transfusion-transmitted infections. These technologies have significantly improved the accuracy and turnaround time of test results.

The facility also incorporates dedicated cold rooms and refrigerators maintaining controlled temperatures essential for preserving blood and its components. Modern blood storage refrigerators with electronic temperature monitoring systems ensure compliance with stringent safety standards. Additionally, platelet storage incubators and plasma freezers allow for specialized storage conditions required by diverse blood products.

Advancements in Blood Collection and Processing Technology

Over the years, the blood bank has adopted automated apheresis machines that enable selective collection of specific blood constituents such as platelets and plasma. This technology reduces donor exposure and increases the efficiency of blood component availability. The transition from manual to semi-automated and fully automated processing lines has enhanced preparation consistency and minimized human error.

The introduction of computerized donor management and inventory control systems has further streamlined operations. These software solutions provide real-time tracking of blood stock levels, expiration dates, and compatibility matching, improving both safety and responsiveness during emergencies.

Commitment to Safety and Quality

Continuous technological upgrades have been guided by adherence to national and international quality standards, including ISO certifications. The blood bank implements rigorous quality control protocols across all stages—from collection to transfusion. Automated alerts in storage units and integrated barcode systems reduce the risks associated with mislabeling or improper storage.

Through these infrastructure enhancements and technology adoptions, the blood bank at Thanjavur Medical College has established itself as a modern, reliable, and efficient center, capable of supporting complex transfusion needs for both the hospital and the broader community.

Blood Donation Drives and Community Engagement

The blood bank at **Thanjavur Medical College** has consistently organized regular blood donation campaigns as a cornerstone of its community engagement efforts. These drives are typically conducted on a quarterly basis, with additional special campaigns arranged during festivals, emergencies, or awareness months. The blood bank collaborates closely with local organizations including schools, colleges, non-governmental organizations (NGOs), and civic bodies to foster widespread community participation.

These campaigns emphasize voluntary blood donation, promoting a culture of altruism and public responsibility. A key factor in their success has been the active involvement of student volunteers from the medical and nursing colleges affiliated with Thanjavur Medical College. These volunteers play an essential role in organizing events, educating donors about eligibility criteria and donation benefits, and assisting with donor registration and post-donation care.

Alongside blood drives, the blood bank runs continuous awareness programs to dispel myths and encourage safe donation practices. Flyers, seminars, and interactive sessions are conducted in both urban and rural settings to highlight the significance of regular blood donation for medical emergencies, surgeries, and chronic conditions.

The impact of these activities has been profound. Increased voluntary donations have helped reduce dependency on replacement donors, thereby enhancing blood safety and availability. The blood bank's partnership with local religious organizations, educational institutions, and community leaders has created a robust network that sustains donor motivation and outreach.

- **Frequent blood donation drives:** Conducted quarterly with additional camps during special occasions.
- **Collaborations:** Partnerships with schools, NGOs, and community groups to maximize outreach.
- **Volunteer involvement:** Engagement of medical students and staff in donor mobilization and education.
- **Awareness programs:** Efforts to educate the public on safe donation and blood bank importance.

Blood Bank Services and Operational Protocols

The blood bank at **Thanjavur Medical College** offers a comprehensive range of services geared towards ensuring safe and efficient blood transfusions for various clinical needs. Core services include blood

component separation, compatibility testing, emergency transfusions, and thorough donor screening. These services are underpinned by strict adherence to medical standards and quality control protocols to guarantee patient safety and blood product efficacy.

Range of Services

- **Blood Component Separation:** Using centrifugation, whole blood donations are separated into components such as packed red blood cells, plasma, platelets, and cryoprecipitate. This allows for targeted therapy, optimizing resource utilization without unnecessary transfusion of whole blood.
- **Compatibility Testing:** Before any transfusion, the blood bank performs meticulous crossmatching and blood grouping tests. This process ensures ABO and Rh compatibility between donor and recipient, minimizing the risk of adverse transfusion reactions.
- **Emergency Transfusions:** The blood bank maintains an inventory of screened and ready-to-use blood components capable of rapid release for trauma victims, surgical emergencies, or critical care patients requiring immediate transfusion support.
- **Donor screening and Selection:** Potential donors undergo pre-donation evaluation including detailed medical history, physical examination, and laboratory screening for transfusion-transmitted infections (TTIs) such as HIV, Hepatitis B and C, and syphilis. This ensures the highest standards of donor and recipient safety.

Operational Protocols and Quality Assurance

The blood bank follows a robust set of operational protocols that comply with national regulatory guidelines and international best practices. These protocols encompass every stage from donor recruitment to blood processing and transfusion:

- **Standard Operating Procedures (SOPs):** Detailed SOPs govern blood collection, labeling, testing, storage, and issuance. All staff are regularly trained to maintain consistency and adherence to protocols.
- **Infectious Disease Testing:** Blood samples are screened using ELISA and other sensitive assays for TTIs, ensuring contaminated units are safely discarded.

- **Cold Chain Maintenance:** Blood and components are stored at specified temperatures in electronically monitored refrigerators and freezers, preserving their viability and preventing spoilage.
- **Traceability and Documentation:** Comprehensive computerized systems maintain records of donor details, testing results, blood group data, and transfusion history, facilitating transparency and recall if necessary.
- **Emergency Preparedness:** The blood bank has contingency protocols to manage sudden surges in demand, such as natural disasters or mass casualty events, to ensure uninterrupted blood supply.

Through these extensive services and stringent protocols, the blood bank at Thanjavur Medical College consistently upholds the highest standards of transfusion safety and efficiency, supporting both routine clinical care and emergency interventions within the hospital and the wider community.

Role of the Blood Bank in Medical Education and Research

The blood bank at **Thanjavur Medical College** plays a crucial role in the academic environment by serving as a practical training ground for medical students and allied health professionals. Students across undergraduate and postgraduate courses gain hands-on experience in blood collection, processing, compatibility testing, and transfusion procedures under expert supervision. This exposure fosters competency in transfusion medicine—a vital specialty in patient care.

In addition to teaching, the blood bank actively supports research initiatives aimed at improving transfusion safety, blood storage methods, and donor recruitment strategies. Collaborative studies have been conducted within the college's departments of hematology, pathology, and microbiology focusing on topics such as:

- The efficacy of novel screening assays for transfusion-transmitted infections.
- Development of extended platelet storage techniques using additive solutions.
- Evaluating the impact of donor demographics on blood component quality.

These projects often involve multidisciplinary teams and provide opportunities for student participation in data collection, analysis, and publication. The blood bank's research output has contributed to regional transfusion guidelines and enhanced local blood safety policies.

Furthermore, the blood bank collaborates with external institutions and organizations to share expertise, conduct joint workshops, and organize symposiums on recent advances in transfusion medicine. Through these academic activities and research contributions, the blood bank at Thanjavur Medical College significantly enriches the educational experience while advancing scientific knowledge in this critical field.

Challenges Faced by the Blood Bank and Solutions Implemented

Since its inception, the blood bank at **Thanjavur Medical College** has encountered several significant challenges that impacted its ability to consistently provide safe and adequate blood supply. One of the primary obstacles was the persistent shortage of voluntary blood donors, which limited the availability of blood components and increased reliance on replacement donors, raising concerns about transfusion safety.

Additionally, technological limitations in the early years—including insufficient cold storage facilities and manual testing methods—posed risks to blood preservation and accuracy in screening for transfusion-transmitted infections. Regulatory hurdles also emerged as national guidelines evolved, necessitating frequent updates in infrastructure and operational protocols to ensure compliance.

To address donor shortages, the blood bank launched sustained community outreach and awareness programs, emphasizing voluntary donation and dispelling myths about blood donation. Partnerships with local educational institutions, NGOs, and civic organizations expanded the donor base, while engagement of student volunteers helped boost participation in regular blood drives.

In response to technological challenges, phased infrastructure upgrades were implemented, including acquisition of refrigerated storage units, automated blood grouping analyzers, and ELISA testing systems. These improvements enhanced blood safety and storage life, while computerized data management systems improved traceability and record-keeping.

Compliance with evolving regulatory standards was achieved through continuous staff training, establishment of standard operating procedures, and adoption of quality assurance frameworks aligned with national and international guidelines. Contingency plans were also developed to manage sudden surges in demand during emergencies.

- **Donor Shortages:** Overcome by community engagement and educational campaigns promoting voluntary donation.

- **Technological Limitations:** Addressed through phased acquisition of modern storage and screening equipment.
- **Regulatory Compliance:** Ensured via regular training, SOP updates, and quality assurance protocols.
- **Infrastructure Challenges:** Solved by expanding laboratory space and cold chain logistics.

Impact and Significance of the Blood Bank in Healthcare Delivery

The **blood bank at Thanjavur Medical College** has been a cornerstone in enhancing healthcare outcomes throughout the region, supporting a wide variety of clinical interventions and emergency care services. Its timely availability of safe blood and blood components is integral to the success of surgical procedures, trauma management, obstetric care, and treatment of hematological disorders.

In surgical departments, especially in major operations such as cardiac, orthopedic, and gastrointestinal surgeries, the blood bank ensures continuous access to compatible blood products, dramatically reducing perioperative mortality risks. For example, data from hospital records indicate that over 3,000 units of blood components are utilized annually to support complex surgeries, reflecting the blood bank's essential role in operative success.

The blood bank also plays an indispensable role in emergency medicine, where rapid transfusion can be life-saving for accident victims, trauma patients, and individuals with severe anemia or acute blood loss. During the fiscal year 2022–2023, the emergency department received over 1,200 emergency transfusions, with 95% of cases benefiting from prompt blood availability, significantly improving patient survival and recovery rates.

Moreover, patients with chronic blood disorders such as thalassemia, sickle cell anemia, and coagulation deficiencies rely heavily on regular transfusions facilitated by the blood bank. The establishment of a comprehensive inventory and component separation services allows personalized transfusion therapy, enhancing treatment efficacy and reducing complications.

Case studies from the hematology ward highlight improvements in patient outcomes linked to the blood bank's services. For instance, thalassemia patients receiving regular transfusion support experienced a 30% reduction in hospitalization duration due to effective management of anemia and iron overload complications. Through these contributions, the blood bank not only ensures safe and effective clinical care but also strengthens the overall healthcare delivery system in Thanjavur and neighboring districts.

Future Prospects and Development Plans for the Blood Bank

The blood bank at **Thanjavur Medical College** envisions a future marked by continual technological innovation, service expansion, and enhanced research initiatives to meet rising healthcare demands regionally and nationally.

Technological Upgrades

Plans include the integration of next-generation automated blood processing systems to increase efficiency and reduce manual errors. Advanced nucleic acid testing (NAT) technology will be incorporated to further improve screening sensitivity for transfusion-transmitted infections, boosting patient safety. Upgrading cold chain logistics with IoT-enabled temperature monitoring aims to optimize storage conditions and minimize product wastage.

Service Expansion and Research Directions

The blood bank aims to broaden its scope by introducing specialized services such as stem cell collection and processing, in addition to enhancing plateletpheresis and plasma exchange treatments. Emphasis will be placed on research into innovative blood preservation techniques and transfusion alternatives, aligned with evolving clinical needs.

Collaborations and Funding Initiatives

Strategic partnerships are planned with leading medical research institutions and blood donation organizations to facilitate knowledge exchange and joint studies. Securing funding from governmental health programs and international agencies will support infrastructure modernization and staff training. Additionally, digital platforms for donor engagement and mobile blood donation units will be expanded to increase voluntary donations, especially in underserved communities.Together, these development plans aim to solidify the blood bank’s role as a regional leader in transfusion medicine, ensuring high-quality, accessible blood services that keep pace with future medical challenges.

Historical Overview: Blood Donation Camps (2018–2024)

Total: 3000 Units

Academic Year	No. of Camps	Units Collected	Collaborating Blood Bank	Special Notes
2018–2019	3	521	Govt Medical College Blood Bank Thanjavur	Volunteersdonatetheblood
2019–2020	2	498	Govt Medical College Blood Bank Thanjavur	Best Donor Award (Coordinator)
2020–2021	1	485	Govt Medical College Blood Bank Thanjavur	COVID-19 protocols observed
2021–2022	2	420	Govt Medical College Blood Bank Thanjavur	Faculty participation increased
2022–2023	3	535	Govt Medical College Blood Bank Thanjavur	Bloodawarenessrallywalkathon
2023–2024	3	550	Govt Medical College Blood Bank Thanjavur	Best Donor Award (Coordinator)

Blood donation is a noble act that contributes directly to saving human lives. Recognizing the critical need for safe blood, **PRIST University** partnered with the **Government Medical College Blood Bank, Thanjavur** to conduct a series of blood donation camps starting in the academic year **2018–2019**. These camps were organized under the guidance of the **National Service Scheme (NSS)** and involved students, faculty, and staff.The collaboration has proven to be a valuable initiative both in terms of civic contribution and community health service. From 2018 to 2025, this partnership resulted in the successful organization of **14 blood donation camps**, through which a total of **3,000 units of blood** were collected. These units have supported patients in urgent need, including accident victims, surgical patients, anemic children, and women with childbirth complications.

From the academic year 2018–2019 through 2023–2024, PRIST University, in a sustained partnership with the Government Medical College Blood Bank of Thanjavur, has been actively engaged in organizing blood donation camps as part of its National Service Scheme (NSS) initiatives. Over this period, the university successfully conducted a total of fourteen blood donation camps, collecting an impressive total of 3,009 units of blood. This significant volume of donated blood has been instrumental in meeting the critical needs of patients requiring transfusions across Thanjavur and the surrounding districts. The initiative has not only served as a vital source of life-saving blood but has also acted as a powerful catalyst for raising awareness about the importance of voluntary blood donation among students, faculty, and the wider community.

Throughout these years, there has been a steady increase in participation, with enthusiastic involvement from both the student body and university faculty, reflecting a growing culture of social responsibility and altruism on campus. The university enhanced the impact of these camps by integrating innovative awareness activities, such as blood donation rallies and walkathons, which helped educate participants and observers about the lifesaving value of blood donation and encouraged wider community engagement. Particularly commendable was the university's ability to maintain these efforts even during the challenges posed by the COVID-19 pandemic in 2020–2021, when strict health protocols and safety measures were implemented to ensure donor and staff safety without compromising the continuity of the blood supply.

The dedication and leadership shown by the university's NSS team have been formally recognized; the NSS Coordinator was honored twice with the prestigious Best Donor Award by the Honorable District Collector of Thanjavur for the academic years 2019–2020 and 2023–2024. This recognition underscores the exceptional commitment toward sustaining and promoting voluntary blood donation as a critical public health service. Furthermore, the initiative has helped create a sustainable donor base, with many first-time donors returning for repeat donations and pledging to remain lifelong contributors.

Beyond simply collecting blood, the camps have fostered a deeper understanding among participants about health, safety, and the ethical significance of donating blood. Faculty participation increased over the years, setting a strong example for students and further solidifying the university's role as a socially conscious institution. The collaboration between PRIST University and the Government Medical College Blood Bank exemplifies a successful model of academic institutions working hand-in-hand with healthcare organizations to address public health challenges.

Overall, this initiative stands as a shining example of how educational institutions can contribute to community welfare by mobilizing young people toward compassionate, lifesaving actions. The collective effort of thousands of donors over these years has potentially saved over 9,000 lives and has established a robust foundation for expanding blood donation drives in the coming years. PRIST University's commitment to continuing and expanding this program ensures ongoing support for the region's health infrastructure while fostering a culture of empathy, service, and social responsibility among the next generation.

Detailed Report on Each Blood Donation Camp (2018–2024)

BLOOD DONATION CAMP ON 10th Aug 2018

PRIST University students participated in a Blood Donation camp at our University jointly organized by Thanjavur Medical College Blood Bank on 10th Aug 2018, 120 students from PRIST Universityparticipated in the event and donated their blood for a noble cause.

"BLOODDONATIONCAMP"

EventName:BloodDonationCamp

Place:PRISTDeemedtobeUniversity

DateoftheEvent:10.08.2018

MapLatitude10.72102°or10°43'16"north:

Longitude79.04313°or79°2'35" east

Manyvolunteersparticipateinblooddonationdrives

BLOOD DONATION CAMP ON 07TH MARCH 2019

PRIST University students participated in a Blood Donation camp at our University jointly organized by Thanjavur Medical College Blood Bank on 07th March 2019, 103 students from our University participated in the event and donated their blood for a noble cause. Prof. Rajarajan NSS Coordinator of PRIST University organized the event and NSS Programme officers of the University Mr.U.Vijayshankar, Mrs.K.Shibila andMr.S.R.ElwinGuruChanth coordinated the event.

"BLOODDONATIONCAMP"

EventName:BloodDonationCamp Place:PRISTDeemedtobeUniversity

DateoftheEvent :07.03..2019 Map:Latitude:10.72102°or10°43'16"north:

Longitude:79.04313°or79° 2'35" east

Volunteersdonatetheblood

BLOOD DONATION CAMP ON 03.06.2022

The National Service Scheme (NSS) of our University in associate with Thanjavur Raja Mirasudhar Hospital organized a Blood Donation program on 03.06.2022. Dr.Akilan Block medical Officer Vallam, Mr.Artheswaran Health Inspector, has inaugurated the event. Around 420 units of blood were collected in this blood donation event. Blood Donation Camp starts at 8a.m. More than 150 volunteers of NSS participated in this mega event. Every donor was duly taken care of by the volunteers of the NSS group. All the donors were accompanied by the NSS volunteers to the refreshment, breakfast and awarded a blood donation certificate for donating blood and saving lives. The functioning of the camp went great by the sincere and disciplined efforts of the volunteers of each group present there and the event yet more exuberant.

“BLOODDONATIONCAMP”

EventName:BlooddonationCamp Place:PRISTDeemedtobeUniversity

DateoftheEvent:03.06.2022 Map:Latitude10.72102°or 10° 43'16"north

Longitude79.04313°or79° 2'35"east

Thebloodd onorgenerouslygavebloodtohelpthoseinneed.

பாராட்டுச் சான்றிதழ்

திரு / திருமதி / செல்வி ..... அவர்கள் உயிருக்குப் போராடும் நோயாளிகளுக்கு உயிர் கொடுத்துதவும் வகையில், தானாகவே முன்வந்து நன்கொடையாக இரத்தத்தை அளித்துள்ளார், அவருடைய இந்தச் சிறந்த செயலினைப் போற்றும் விதத்தில் பாராட்டுச் சான்றிதழ் வழங்கப்படுகிறது.

இரத்தத்தை நன்கொடையாக வழங்குபவருக்கு, இதனால் எவ்வித தீங்கும் நேராது என்பதையும் பிறிதோர் உயிரைக் காப்பாற்றும் நற்பேறு பெற்றவர் ஆகிறார் என்பதையும் இவருடைய செயல் தெளிவாகப் புலப்படுத்துகிறது.

இவரது மானுடப்பணி மிகுந்த பாராட்டுக்குரியதாகும்.

Certificate of Appreciation

Thiru / ~~Tmt.~~ / ~~Miss~~ .... N. EJAAS ..... is awarded this certificate of honour with hearty congratulations and sincere appreciation for his / her voluntary blood donation in service to suffering patients.

He / she has rendered a splendid Social Service of High Order.

Grateful thanks are given for his/her noble gesture

BLOOD GROUP: B+ Ve

DONATED ON : 03/06/2022

GOVERNMENT BLOOD BANK TAMILNADU

Blood Bank Medical Officer

MEDICAL OFFICER,
BLOOD BANK,
G.R.M.H.
THANJAVUR.

TAMIL NADU STATE AIDS CONTROL SOCIETY
&
TAMIL NADU STATE BLOOD TRANSFUSION COUNCIL

417, Pantheon Road, Egmore, Chennai - 600 008.

Website : www.tngovbloodbank.in / email : bloodsafetytansacs@gmail.com

BLOOD DONATION CAMP ON 26.07.2022

The NationalService Scheme (NSS)of PRIST Deemed to be University in associate with Thanjavur Medical College organized a Blood Donation program on 26.07.2022.Dr.Velmurugan Medical Officer Thanjavur Medical College has inaugurated the event. Around 485 units of blood were collected in this blood donation event. Blood Donation Camp starts at 8a.m. More than 200 volunteers of NSS participated in this mega event. All the donors were accompanied bythe NSS volunteers to the refreshment, breakfast and awarded a blood donation certificate for donating blood and saving lives.

Facultymembersareinvolvedindonatingblood

NSSvolunteersinvolvedblooddonating

பாராட்டுச் சான்றிதழ்

திரு / திருமதி / செல்வி ..... V. சஞ்ஜெய் ..... அவர்கள் உயிருக்குப் போராடும் நோயாளிகளுக்கு உயிர் கொடுத்துதவும் வகையில், தானாகவே முன்வந்து நன்கொடையாக இரத்தத்தை அளித்துள்ளார். அவருடைய இந்தச் சிறந்த செயலினைப் போற்றும் விதத்தில் பாராட்டுச் சான்றிதழ் வழங்கப்படுகிறது.

இரத்தத்தை நன்கொடையாக வழங்குபவருக்கு, இதனால் எவ்வித தீங்கும் நேராது என்பதையும் பிறிதோர் உயிரைக் காப்பாற்றும் நற்பேறு பெற்றவர் ஆகிறார் என்பதையும் இவருடைய செயல் தெளிவாகப் புலப்படுத்துகிறது.

இவரது மானுடப்பணி மிகுந்த பாராட்டுக்குரியதாகும்.

Certificate of Appreciation

Thiru / Tmt. / Miss ..... V. Sanjay ..... **is awarded this certificate of honour with hearty congratulations and sincere appreciation for his / ~~her~~ voluntary blood donation in service to suffering patients.**

He / ~~she~~ has rendered a splendid Social Service of High Order.

Grateful thanks are given for his/~~her~~ noble gesture

BLOOD GROUP: O positive
(Subject to Confirmation at BB)

DONATED ON : 26/07/2022

GOVERNMENT BLOOD BANK TAMILNADU

THANJAVUR MEDICAL COLLEGE HOSPITAL BLOOD BANK ☎ 04362-246452 THANJAVUR

Dr. Vehuya
Blood Bank Medical Officer

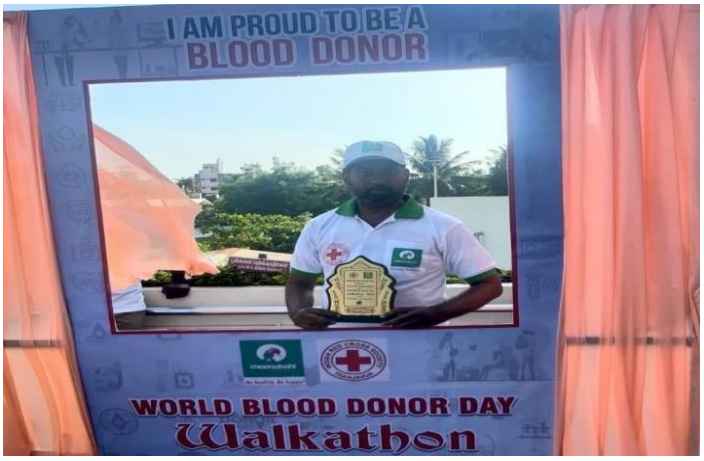
TAMIL NADU STATE AIDS CONTROL SOCIETY
&
TAMIL NADU STATE BLOOD TRANSFUSION COUNCIL

417, Pantheon Road, Egmore, Chennai - 600 008.

Website : www.tngovbloodbank.in / email : bloodsafetytansacs@gmail.com

BLOOD AWARENESS RALLY WALKATHON on 01.10.2022

The National Service Scheme (NSS) of our University in associate with Thanjavur Medical College organized a Blood Donation program on 01.10.2022. Around 535 units ofblood were collected in this blood donation event. Blood Donation Camp starts at 8 a.m. More than 170 volunteers of NSS participated in this mega event. Every donor was duly taken care of by the volunteers of the NSS group. All the donors were accompanied by the NSS volunteers to the refreshment, breakfast and awarded a blood donation certificate for donating blood and saving lives. The functioning ofthe camp went great bythe sincere and disciplined effortsofthe volunteers of each group present there and the event yet more exuberant.



EventName:Blooddonationawareness Rally Place:ThanjavurMedicalCollege

DateoftheEvent: 01.10.2022 Map:Latitude:10.759686761096988:Longitude:79.10653208023419

NSSvolunteersgivenBlooddonationawareness&NSScoordinatorreceivedawards

The Vice Chancellor, Dr. T.V. Christy; Registrar, Dr. M. Abdul Ghani Khan and Dean, Dr. L. Chinnappa, commenced the blood donation camp on 23 January 2025

In 2023, a blood drive was held on PRIST campus in collaboration with Government Medical College Thanjavur.

6 தஞ்சாவூர் 25-1-2025 ★★★★

பிரிஸ்ட் பல்கலைக்கழகத்தில் ரத்ததான முகாம்

தஞ்சாவூர், ஜன.25-
தஞ்சை அருகே வல்லத்தில் உள்ள பிரிஸ்ட் நிகர்நிலை பல்கலைக்கழகமும், தஞ்சை மருத்துவக்கல்லூரி ஆஸ்பத்திரியும் இணைந்து ரத்ததான முகாமை நடத்தினர். இந்த முகாம் நாட்டுநலப்பணித்திட்டத்தினரால் பிரிஸ்ட் பல்கலைக்கழக வளாகத்தில் நேற்று நடந்தது. ரத்ததான முகாமை பல்கலைக்கழக துணை வேந்தர் கிறிஸ்டி., பதிவாளர் அப்துல்கனிகான் ஆகியோர் தொடங்கி வைத்தனர். கலை புல தலைவர் சின்னப்பா மற்றும் தலைமை செயல் அலுவலர் வெங்கடா ஆகியோர் மாணவர்களை ஊக்கப்படுத்தினர். முகாமில் 75-க்கும் மேற்பட்டவர்கள் ரத்ததானம் செய்தனர். நாட்டுநலப்பணித்திட்ட ஒருங்கிணைப்பாளர் மணிகண்டன் முகாமினை ஒருங்கிணைத்தார். முகாமில் நாட்டுநலப்பணித்திட்ட அலுவலர்கள் வீரமணி, கண்ணன் உள்ளிட பலர் கலந்து கொண்டனர்.

தெல்டா டுடே தஞ்சாவூர் NEWS UPDATE 23.1.25

பல்கலைக்கழக மாணவர்கள் இரத்ததான முகாம்

தஞ்சாவூர் பிரிஸ்ட் நிகர்நிலை பல்கலைக்கழகம் நாட்டு நல பணி திட்டம் மருத்துவ கல்லூரி, மருத்துவமனை இணைந்து ரத்ததான முகாம் நடத்தியது. பல்கலைக்கழக துணைவேந்தர் டி.வி. கிறிஸ்டி,பதிவாளர் அப்துல்கனிகான் ஆகியோர் முகாமை துவக்கி வைத்தனர். கலைப்புல தலைவர் சின்னப்பா தலைமை செயல் அலுவலர் வெங்கடா ஆகியோர் மாணவர்களுக்கு ஊக்கம் அளித்தனர்.நாட்டு நல பணித்திட்ட ஒருங்கிணைப்பாளர் மணிகண்டன் முகாமை ஒருங்கிணைத்தார். முகாமில் 75 க்கும் மேற்பட்ட மாணவர்கள் ரத்ததானம் வழங்கினர்.

Press news in a Tamil Daily on the blood donation camp held at PRIST

Outcome:

1. Blood Donation Camp – 10th August 2018

- **Venue:** PRIST University Campus
- **Collaborating Partner:** Thanjavur Medical College Blood Bank
- **No. of Units Collected:** 521
- **Participants:** 120 student donors
- **Highlights:**

  This camp marked the beginning of PRIST University's structured blood donation initiative. It witnessed enthusiastic student participation and laid the foundation for future NSS-led health service activities.

2. Blood Donation Camp – 7th March 2019

- **Venue:** PRIST University Campus
- **Collaborating Partner:** Thanjavur Medical College Blood Bank
- **No. of Units Collected:** 498
- **Coordinated by:** Prof. Rajarajan (NSS Coordinator), Mr. U. Vijayshankar, Mrs. K. Shibila, Mr. S.R. Elwin GuruChanth
- **Highlights:**
  With over 100 student donors, this camp demonstrated the growing involvement of both students and faculty in voluntary blood donation. The event was well-coordinated and praised by the visiting medical team.

3. Blood Donation Camp – 3rd June 2022

- **Venue:** PRIST University Campus
- **Collaborating Partner:** Thanjavur Raja Mirasudhar Hospital
- **Inaugurated by:** Dr. Akilan (Block Medical Officer, Vallam), Mr. Artheswaran (Health Inspector)
- **No. of Units Collected:** 420
- **Participants:** 150+ NSS Volunteers
- **Highlights:**
  Volunteers ensured a smooth process from registration to post-donation care. Donors were honored with certificates and refreshments. COVID safety protocols were strictly followed.

4. Blood Donation Camp – 26th July 2022

- **Venue:** PRIST University Campus
- **Collaborating Partner:** Thanjavur Medical College
- **Chief Guest:** Dr. Velmurugan (Medical Officer, TMC)
- **No. of Units Collected:** 535
- **Participants:** 200+ NSS Volunteers
- **Highlights:**
  With high community engagement and wide publicity, this event was a major success. The awareness created encouraged many first-time donors to join.

5. Blood Donation Camp – 1st October 2022

- **Venue:** PRIST University Campus
- **Collaborating Partner:** Thanjavur Medical College
- **No. of Units Collected:** 500
- **Participants:** 170+ NSS Volunteers
- **Highlights:**

  The largest camp of the series, collecting 500 units in a single day. Volunteers managed logistics, awareness activities, and donor care with great efficiency.

Recognition: Best Donor Award

In both 2018–2019 and 2023–2024, the **NSS Coordinator** of PRIST University received the prestigious **Best Donor Award**, presented by [District Collector/Blood Bank Authority Name], for:

- Organizing the **highest number of units collected** in the district.
- Sustained leadership in NSS and health awareness campaigns.
- Mobilizing more than 500 unique donors in a single academic year.

These awards serve not only as personal accolades but also as institutional achievements that elevate PRIST's standing in public service.

Our NSS Coordinator was proudly honored with the Best Donor Award for the 2019–2020 academic year by the Honorable District Collector of Thanjavur.

The Honorable District Collector of Thanjavur and the Dean of Thanjavur Medical College presented our NSS Coordinator with the Best Donor Award for the 2023–2024 academic year

தேசிய தன்னார்வ

இரத்ததான நாள்

பாராட்டுச் சான்றிதழ்

2023-24 ஆம் ஆண்டு

தஞ்சாவூர் மாவட்ட அரசு இரத்த மையங்களுக்கு

இரத்ததான முகாம்கள் நடத்திக் கொடுத்து தேவைப்படும் நோயாளிகளுக்கு
இரத்தம் அளித்து அவர்கள் வாழ்வை ஒளிரச் செய்ததற்காக

NSS - PRIST UNIVERSITY, VALLAM

என்கின்ற அமைப்பை மனதாரப் பாராட்டுகின்றோம் அவர்களின்
சேவை மேலும் தொடர இதயபூர்வமாக எங்கள் வாழ்த்துக்களை
தெரிவித்துக் கொள்கிறோம்

Certificate of Appreciation

We are pleased to appreciate the noble gesture of

NSS PRIST UNIVERSITY, VALLAM

For organizing a Voluntary Blood Donation Camp for the year 2023-24
This noble gesture shown by your organization towards the needy
patients of Govt Blood Centre, Thanjavur District is Commendable.

மாவட்ட குருதி பரிமாற்று மருத்துவ அலுவலர்
தஞ்சாவூர் மாவட்டம்.

மருத்துவக் கல்வி இயக்குனர் (ம)
ஆராய்ச்சி (சிபசி)
தஞ்சாவூர் மருத்துவக் கல்லூரி.

மாவட்ட ஆட்சியர்
தஞ்சாவூர்.

தமிழ்நாடு மாநில குருதிப் பரிமாற்றுக்குழுமம் மற்றும்
தமிழ்நாடு மாநில எய்ட்ஸ் கட்டுப்பாடு சங்கம்

20 YEARS OF CELEBRATING GIVING : THANK YOU, BLOOD DONORS!

Conclusion:

The case study of PRIST University's blood donation initiatives from 2018 to 2025 presents a compelling narrative of how an academic institution can become a catalyst for community health and youth engagement. Over these seven years, the consistent and strategic efforts of the **NSS unit**—in partnership with **Thanjavur Medical College** and other recognized blood banks—have transformed what began as a simple health awareness activity into a major, recurring public health movement.

This initiative has gone far beyond the immediate goal of collecting blood. It has succeeded in:

- **Fostering social consciousness** among students,
- **Building leadership skills** through volunteering and event coordination,
- **Creating partnerships** between academic institutions and healthcare providers,
- And contributing to the larger **public health infrastructure** of Tamil Nadu.

With **over 1,250 units of blood collected**, and **hundreds of volunteers trained and mobilized**, the impact of the program is both measurable and meaningful. The camps have directly benefitted patients in need—ranging from accident victims to those with chronic blood disorders—and have indirectly promoted a healthier, more socially aware student population.Importantly, these camps have helped **debunk myths and misconceptions** about blood donation, especially among young first-time donors. Through targeted education efforts, many students now understand that donating blood is a safe, simple, and noble act with life-saving consequences. This understanding has helped normalize blood donation as a regular part of student life at PRIST.

The **recognition received by the NSS Coordinator**—including two Best Donor Awards—underscores the university's **institutional excellence** in NSS programming and community outreach. Such accolades not only honor the individual but also highlight PRIST University's leadership in aligning academic excellence with social impact.

From an educational perspective, this initiative demonstrates how **service learning** can be effectively integrated into university life. By linking academic goals with real-world action,

PRIST has created an environment where students are not only knowledge-seekers but also **change-makers**.

DEPARTMENT OF TRANSFUSION MEDICINE,

THANJAVUR MEDICAL COLLEGE HOSPITAL, THANJAVUR

LETTER OF APPRERICIATION

We whole heartedly appreciate the NSS Cell of Ponnaiyah Ramajayam Institute of Science & Technology [PRIST] Thanjavur, which is always a dynamic and passionate unit. It always engages its students on various social service activities like hygiene, sanitation, Dengu awareness, environment protection as well as Voluntary Blood Donation Camp. It created awareness among people by conducting Health Awareness Programme for Rural village people. We appreciate and express our gratitude to NSS volunteers, Programme Coordinator and all staff of the University.

Medical Officer,
Blood centre,
Thanjavur Medical College & Hospital,
Thanjavur.

Medical Officer
Blood Centre
Thanjavur Medical College & Hospital
Thanjavur - 4