RESEARCH PAPER

# Microscopic Study of Diatoms in Lakes and Ponds of Jabalpur, Madhya Pradesh

**Vedika Garg[1], Renu Devi[2], Priyanka Soni[3*], Atul Kumar Dubey[3], Meghna Sharma[3], Darshitha D S[4]**

[1] M.Sc. Student, Nims School of Forensic Sciences, NIMS University Rajasthan, Jaipur

[2] Programme Incharge, Nims School of Forensic Sciences, NIMS University Rajasthan, Jaipur

[3] Assistant Professor, Nims School of Forensic Sciences, NIMS University Rajasthan, Jaipur (Corresponding Author)

[4] Research Scholar, Nims School of Forensic Sciences, NIMS University Rajasthan, Jaipur

**Received:** 12th Mar, 2026 | **Revised:** 24th Mar, 2026 | **Accepted:** 14th Apr, 2026 | **Available Online:** 30th Apr, 2026

**ABSTRACT**

The research paper titled "Microscopic Study of Diatoms in Lakes and Ponds of Jabalpur, Madhya Pradesh" was conducted in the Department of Forensic Science at NIMS University, Rajasthan, Jaipur. The study aimed to identify and analyze diatom species present in 16 stagnant water samples collected from different locations in the Jabalpur region. Diatom analysis plays an important role in forensic investigations, particularly in drowning cases, as it helps determine the cause of death and distinguish between ante-mortem and post-mortem drowning. In this study, water samples were processed using the centrifugation method without chemical treatment and examined under a light microscope at 40x magnification. Identification was based on the morphological features of the diatoms. A total of 22 diatom genera were identified from the samples, including Diatoma, Striatella, Aulacoseira, Navicula, Gomphonema, Diploneis, Petroneis, Triceratium, Amphora, Cyclotella, Achnanthes, Cocconeis, Fragilaria, Meridion, Didymosphenia, Melosira, Thalassiosira, Proschkinia, Coscinodiscus, Epithemia, Chaetoceros, and Gyrosigma. Among these, Navicula, Cyclotella, Cocconeis, Gomphonema, and Amphora were the most commonly observed genera.

**Keywords:** Diatoms, Forensic Science, Drowning Investigation, Stagnant Water Bodies, Microscopic Analysis, Centrifugation Method, Diatom Identification.

**How to cite this article:** Garg V, Devi R, Soni P, Dubey AK, Sharma M, Darshitha DS. Microscopic Study of Diatoms in Lakes and Ponds of Jabalpur, Madhya Pradesh. Int J Drug Deliv Technol. 2026;16(39s): 356-371. DOI: 10.25258/ijddt.16.39s.50

**Source of support:** Nil.

**Conflict of interest:** None

## 1. INTRODUCTION

Diatoms are unicellular and photosynthetic in nature. The special feature of these organisms is the frustule, which is composed of a silica-based cell wall divided into two parts known as theceae, which fit together in a manner akin to a sandwich. Based on frustule formation, diatoms are of two types: Centrales and Pennales. Centrales are symmetric in nature, whereas Pennales are bilaterally symmetric (Kurmi and Kohli, 2025).

Diatoms are unicellular algae of the class Bacillariophyceae of the kingdom Protista. These are found in both freshwater and saltwater. It has been estimated that there are over 200 genera and nearly 100,000 species of diatoms. Usually, similar types of diatoms are found in similar types of water. There are marked variations in the diversity of diatoms with seasonal changes. Climatic conditions play an important role in influencing the qualitative and quantitative distribution of diatoms (Verma and Kaur, 2020).

Diatoms are single-celled eukaryotic photosynthesizing autotrophic algae with a specific silica-based cell wall called frustules, which have specific patterns and arrangements. Diatoms belong to the class Bacillariophyceae of the kingdom Protista. It is believed

that there are over 200 genera and 100,000 species of diatoms (Kumari et al, 2023).

These characteristics are of significant use in the forensic investigation of drowning cases. Forensic biologists use diatoms in the investigation of drowning cases to determine whether the victim drowned before or after death, and the site of drowning. In order to give a positive opinion of ante-mortem drowning, the "criterion of concordance" was traditionally considered to be sufficient (Verma and Kaur, 2020).

**Drowning**

Drowning is defined as a condition in which a person's respiratory function is impaired or stopped by submersion or immersion in a liquid. The outcome of this condition can be in various forms, such as survival without injury, survival with injury and illness, and death. Globally, close to 1,000 fatalities occur daily as a result of this condition, and numerous fatalities also occur as a result of complications from it (Tipton and Montgomery, 2022).

Drowning is said to happen in a series of steps, beginning with an attempt by the person to keep their airway above water, followed by submersion and holding of breath. After this, inhalation of

water and loss of consciousness happen, and finally, extreme respiratory and cardiac complications occur (Tipton and Montgomery, 2022).

The identification of drowning cases continues to be a major challenge in forensic medicine and is often considered a diagnosis of exclusion. Traditionally, the diagnosis of drowning has been based on autopsy findings that are often supported by histological, microbiological, and biochemical investigations. In the past, medico-legal practice placed significant emphasis on the identification of external and internal features of the body of a victim of drowning. However, such an approach has its own drawbacks, as there are difficulties in differentiating between asphyxia and post-mortem changes caused by immersion in water. (Marella et al, 2019).

With the advent of advancements in forensic science, the conventional classification of drowning has been considered outdated. A scientific approach to the diagnosis of drowning would involve a detailed evaluation of the gross autopsy findings, which are later confirmed by detailed laboratory investigations (Marella et al, 2019).

Diatomology is the term used to refer to the study of diatoms and their applications in various fields. These fields include forensic science, environmental monitoring, water resource management, palaeoclimatology, and bioindications. In the field of forensic science, diatomology is of great significance when conducting an investigation of diatoms present in evidence from the human body. These include lung tissue, internal organs, bone marrow, especially when the body is found in water. The study of these microscopic life forms is of great significance since it helps forensic experts establish whether an individual had exposure to a particular aquatic environment (Dahiya et al, 2025).

The Jabalpur district is located in the central part of the Madhya Pradesh region and is included in the basin of the Narmada River. Various freshwater habitats, both lentic and lotic, such as freshwater lakes and parts of the Narmada River, are included in the district. These areas are differently affected by human activities and provide appropriate conditions for the investigation of the diversity and adaptations of the diatom flora.

The aim of this study is to conduct a microscopic examination of the diatoms in the water samples of the lakes and ponds in Jabalpur, Madhya Pradesh. This will help in understanding the diversity and distribution of these microscopic plants. In addition, it will provide information on their morphology. In this study, water samples are collected from the lakes and ponds of Jabalpur, Madhya Pradesh and are then examined microscopically. This will help in classifying the various species of diatoms based on their morphology, such as their frustule. Furthermore, this study aims to provide information on the potential use of these in the field of forensic science in relation to drowning.

**Structure and Features of Diatoms**

The cellular body of the diatoms is referred to as the protoplast, and they have a hard outer cover, referred to as the frustule, made up of silica. The hard outer cover is made up of two halves, and the larger half is located at the top, referred to as the epitheca, and the smaller half is located at the bottom, referred to as the hypotheca. The two halves have two parts each, the flat part referred to as the valve and the curved part referred to as the cingulum, which forms the margin. The central part where the cingula of the two halves meet is referred to as the girdle, thus providing structural support to the frustule (Chawla and Patel, 2020).

**Types of Diatom Symmetry**

According to the classification proposed by Chawla and Patel, diatoms have been classified into two types based on their symmetry:

Pennate diatoms - These types of diatoms have bilateral symmetry.

Centric diatoms - These types of diatoms have radial symmetry.

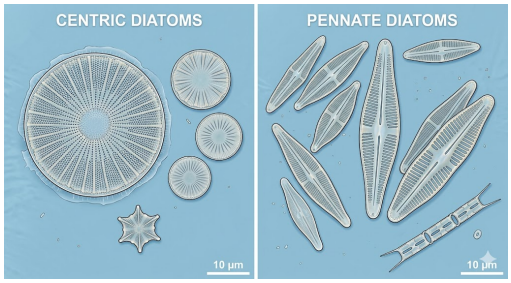



Figure 1: Centric and Pennate diatoms (Image Generated by Google Gemini)

**Motility and Special Structures**

Diatoms have a longitudinal slit-like structure, referred to as the raphe, for their motility. The raphe has a central nodule and the ends, referred to as the polar nodules (Chawla and Patel, 2020).

Diatoms are diverse tiny living things. There are about 100,000 to 200,000 kinds found over the world. They can live in different environments, which is why there are so many types.Diatoms are good at showing us if water is clean or not. They are very sensitive to changes in water. So we can tell if a lake or river is healthy by looking at the diatoms that live there. If there are different kinds of diatoms the water is probably clean. If there are not kinds, the water might be polluted.We can learn a lot about lakes and rivers by studying diatoms. We can see if the water is getting cleaner or dirtier over time. This helps us take care of our water.By looking at diatoms we can also learn about the past. They can tell us about the water a time ago. This is helpful for scientists who want to know how the environment has changed.Diatoms are, like little reporters that tell us about the water. They help us keep track of how healthy the water's (Kharbal and Chudiwal, 2024).

## 2. MATERIALS AND METHODOLOGY

The present study is conducted in 16 lakes and ponds in the western part of Jabalpur district.

Table 1: Sampling sites and their location/area.

| S No. | Sampling site | Location / Area (Jabalpur, MP) |
|---|---|---|
| 1. | Suraj Taal | Near Damoh Naka/Ranital area |
| 2. | Sangram Sagar Lake | Near Bajnamath Temple, Garha |
| 3. | Maharaj Taal | Near Adhartaal / Maharajpur |
| 4. | Dev Taal | Near Medical college/Madan Mahal Hill |
| 5. | Phool Sagar Lake | Near Garha/Madan Mahal area |
| 6. | Shaahi Lake | Near Ranital/Wright town area |
| 7. | Supa Taal | Near Medical college/Madan Mahal Hill |
| 8. | Imarti Taal | Near Garha area |
| 9. | Jalpari Lake | Near Khandari Reservoir/Dumna road |
| 10. | Pandu Taal | Near Gwarighat/Polipathar |
| 11. | Gulaua Taal | Near Garha Road/Labour colony |
| 12. | Kolha Taal | Near Jabalpur Cantonment/Sadar area |
| 13. | Ganga Sagar Lake | Near Garha/Purva area |
| 14. | Baal Sagar Lake | Near Garha area |
| 15. | Radha Kund | Near Gwarighat (Banks of Narmada) |
| 16. | Sneh Nagar Bawli | Sneh Nagar (Near Wright town/Madan Mahal) |

### 2.1 Sample Collection

At each sampling site clean, pre-sterilized plastic bottles with a 250 mL capacity are used to gather water samples from the near-shore and surface areas. To avoid contamination, the bottles are rinsed with the appropriate site water before being collected. The bottle is submerged just below the water's surface and allowed to fill completely in order to collect the samples.

GPS-enabled photos are taken at each of the six sampling locations after sample collection, along with the date, time, and location.


Figure 2: Sampling sites of lakes and ponds located in the West Jabalpur region of Jabalpur district, Madhya Pradesh, India.

These water bodies are well-known locations where numerous drowning incidents have been
reported over time, including cases of homicide, suicide, and accidental deaths.

### 2.2 Sample Processing

Narrow-mouthed bottles with a 250 mL capacity are used to directly collect water samples containing diatoms from water bodies. A standard protocol is followed when preparing samples. To do this, about 11–12 mL of the collected water sample is transferred into 15 mL centrifuge tubes and properly labeled.


Figure 3: Samples Transferred into centrifugation tubes.

### 2.3 Sample Isolation

The prepared samples transferred into centrifuge tubes are spun at 3000 rpm for 7–8 minutes. After centrifugation, the supernatant is carefully discarded to obtain the pellet. The pellet is then resuspended in the sample water and the process is repeated. Subsequently, the pellet is resuspended in distilled water and subjected to centrifugation under the same conditions for three additional cycles.


Figure 4: Centrifuge Machine

Finally, the concentrated pellet is retained at the bottom of the Eppendorf tube, while the remaining supernatant is discarded.

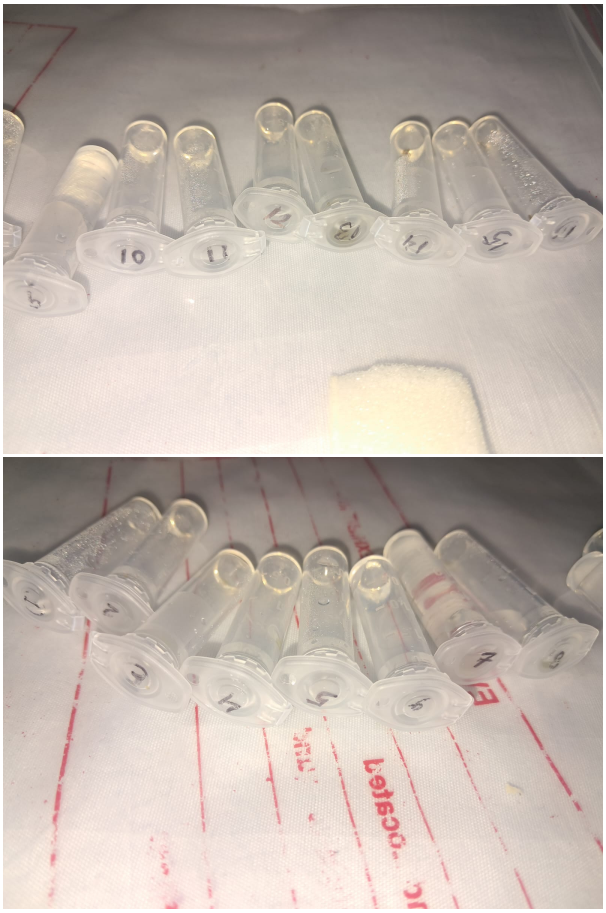


Figure 5: Centrifuged Sample Residue

**2.4 Preparation of Slides for Microscopic Analysis**

A drop of the centrifuged sample is applied to a clean microscope slide, and the sample is carefully covered with a cover slip to clearly see and identify the diatom structures.

**2.5 Microscopic Analysis**

The prepared slides are examined under a light microscope at magnification of 40x. To ensure accuracy and prevent cross-contamination, every step of the process, including sample preparation, extraction, slide preparation, and microscopic examination is completed independently for every water sample that is collected. Precise diatom mapping and analysis of their distribution patterns are made possible by this methodical approach, which enables thorough observation, identification, and comparison of diatom species found in various water bodies.

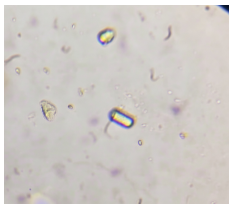
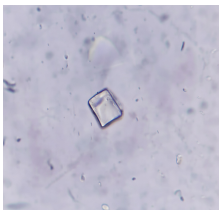
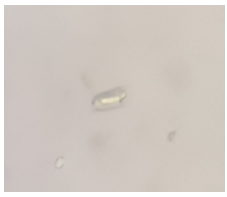
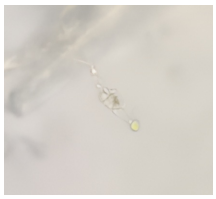
## 3. RESULT AND DISCUSSION

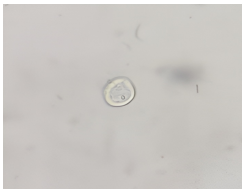
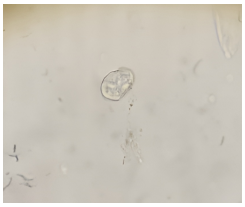
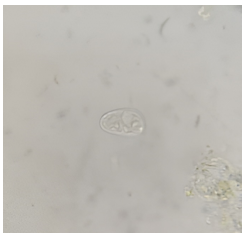
The study was carried out in the NIMS School of Forensic Sciences at NIMS University Rajasthan in the months of February and March 2026. The samples were collected from 16 different locations from the western region of Jabalpur. The samples were processed using the centrifugation method. The samples were analyzed using a light microscope.

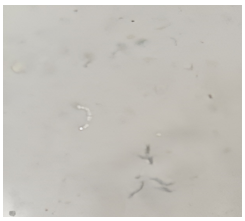
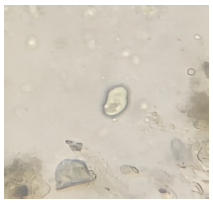
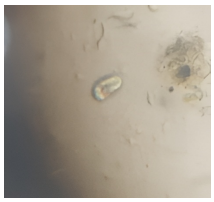
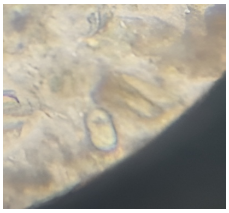
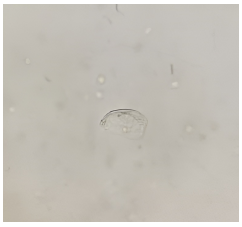
Table 2 shows the list of diatoms identified and characterized from various water bodies from Jabalpur, Madhya Pradesh.

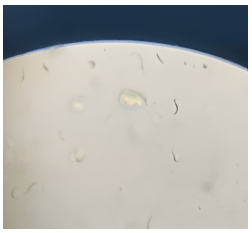
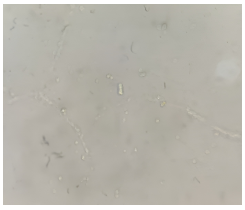
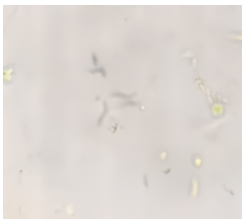
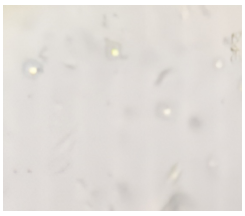
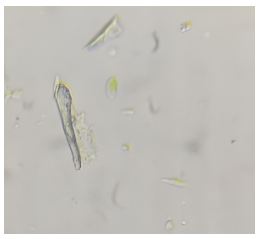
In the present study, 22 diatom genera were identified from 16 water bodies from Jabalpur, Madhya Pradesh, India. The diatom genera identified were *Diatoma, Striatella, Aulacoseira, Navicula sp, Gomphonema, Diploneis, Petroneis, Triceratium, Amphora, Cyclotella, Achnanthes, Cocconeis, Fragilaria, Meridion, Didymosphenia, Melosira, Thalassiosira, Proschkinia, Coscinodiscus, Epithemia, Chaetoceros, Gyrosigma*. Among the diatoms identified, the most common genera were *Navicula sp.*, *Cyclotella*, *Cocconeis*, *Gomphonema*, and *Amphora*.

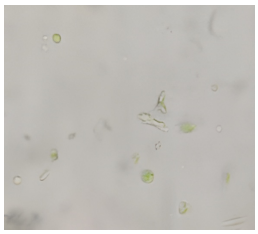
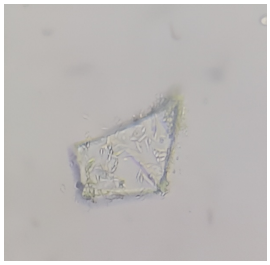
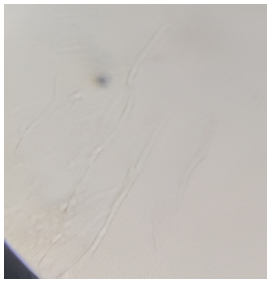
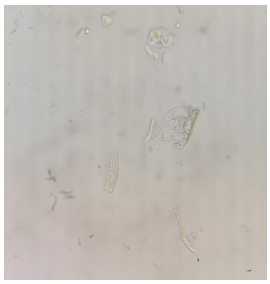
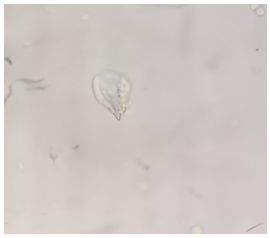
**Table 2: Study of Diatom Genera by Light Microscopy, employing morphological characterization through comparison with established images in literature (Spaulding et al., 2021; Fimbres-Castro et al., 2011; Pu et al., 2023).**

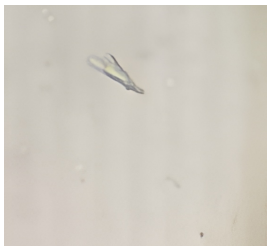
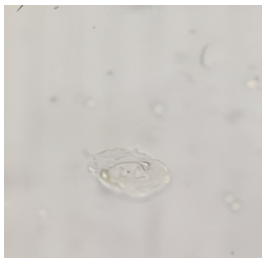
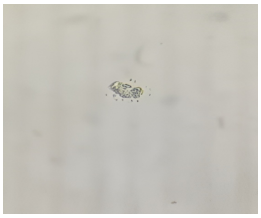
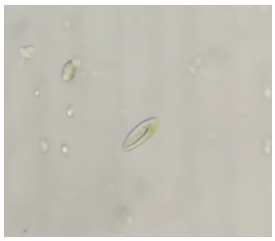
| S No. | Figure | Sampling site | Characteristics | Inference |
|---|---|---|---|---|
| **1.** |  | Suraj Taal | The frustules appear to be rectangular from the side. The valves are oval to slightly elongated with rounded ends. | According to the Morphological features this species appears to be: *Diatoma vulgare* |
| **2.** |  | Suraj Taal | The cells look rectangular and flat when seen from the side, with thin bands visible. | According to the Morphological features this species appears to be: *Striatella unipunctata* |
| **3.** |  | Suraj Taal | These cells are connected end to end and form long chains, resembling a tube. They are held together by strong special spines that fit together. The special spines can be flat, split, and even resemble an anchor. | According to the Morphological features this species appears to be from genus: *Aulacoseira colonies* |
| **4.** |  | Suraj Taal | The structure seems to be boat-shaped or spindle-shaped, which is symmetrical along its length. The body is covered with a transparent, glass-like shell that may be golden brown or yellowish in color due to pigments in the chloroplasts. | According to the Morphological features this species appears to be from genus: *Navicula* |
| **5.** |  | Suraj Taal | These colonies are forming a branched, tree-like shape, where each club-shaped cell is raised on a soft, sticky stalk. | According to the Morphological features this species appears to be from genus: *Gomphonema* colonies |

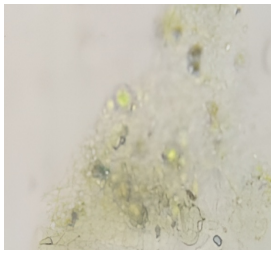
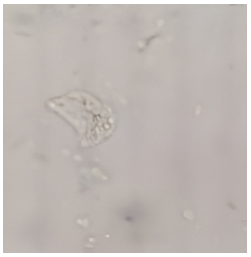
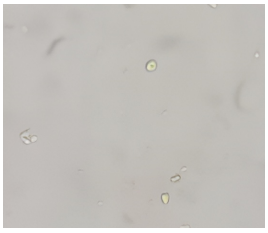
| | | | | |
|---|---|---|---|---|
| **6.** |  | Sangram Sagar Lake | Under a light microscope, these hollow areas appear as light bands adjacent to the centre. The cells are symmetrical in shape and resemble a neat oval or a long rectangle with rounded corners. | According to the Morphological features this species appears to be: *Diploneis pseudovalis* |
| **7.** |  | Sangram Sagar Lake | The structure is identified by the oval shape of the valves and the balanced and symmetrical frustule. The most striking feature is the raphe system, where the outer ends are positioned in special tear-drop shaped grooves. | According to the Morphological features this species appears to be: *Petroneis latissima* |
| **8.** |  | Sangram Sagar Lake | It appears to be a very small, triangular glass box with three clear corners. It appears like a triangle with straight or slightly curved sides, when viewed from the top. It appears like a thin rectangle or a very small box consisting of two parts that fit together when viewed from the side. | According to the Morphological features this species appears to be from genus: *Triceratium* |
| **9.** |  | Maharaj Taal | It appears to be a small, glass-like shell resembling a crescent shape or a thick slice. One side is rounded, and the other side is flatter with both ends pointed. Under a microscope, it appears to be clear with fine lines running across the top. It appears smooth unless under high magnification. | According to the Morphological features this species appears to be: *Amphora ectorii* |

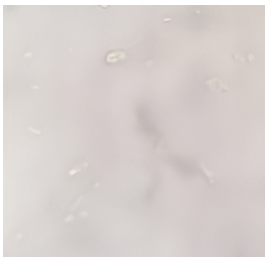
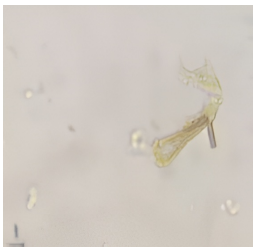
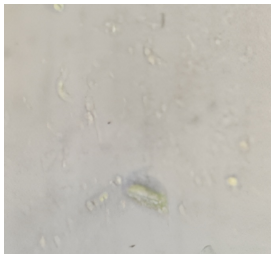
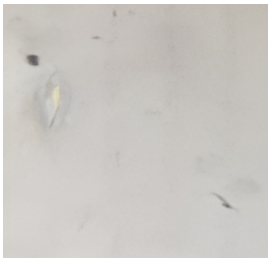
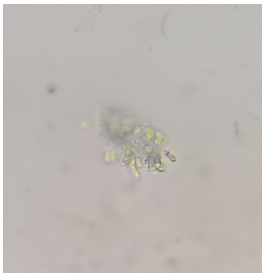
| | | | | |
|---|---|---|---|---|
| **10.** |  | Maharaj Taal | In this structure, short chains or curved groups of cells, which look like half circles, are formed, consisting of round, disc-shaped cells. Each cell in this chain is circular in shape. | According to the Morphological features this species appears to be from genus: *Cyclotella* |
| **11.** |  | Dev Taal | This structure has an irregular form, with one side curved and the other side flatter or even slightly inward, so that it somewhat resembles an irregular oval form. This cell also appears hollow or clear due to the large fluid-filled space and the glass-like exterior layer. | According to the Morphological features this species appears to be from genus: *Amphora* |
| **12.** |  | Dev Taal | In this structure, the irregular oval part at the center is a clear space. It usually appears irregular and oval-shaped, giving a hollow look to the cell when viewed through a microscope. The "line in the center" is the raphe, a slit along the middle of the cell to aid it in moving. | According to the Morphological features this species appears to be from genus: *Navicula* |
| **13.** |  | Dev Taal | This structure has long oval or simple oval shapes, with a small, clear pore or round thick spot near the ends. | According to the Morphological features this species appears to be from genus: *Achnanthes* |
| **14.** |  | Phool Sagar Lake | This structure has long, oval, and boat-shaped glass-like shells. Their surface has tiny pores or holes that look like small dots when viewed under a microscope. | According to the Morphological features this species appears to be from genus: *Navicula* |

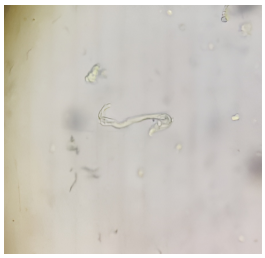
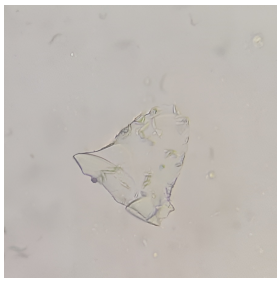
| | | | | |
|---|---|---|---|---|
| **15.** |  | Phool Sagar Lake | This structure has a boat-shaped or spindle-like body that is symmetrical. It is covered by a clear, glass-like shell that may look yellowish or golden-brown. | According to the Morphological features this species appears to be from genus: *Navicula* |
| **16.** |  | Shaahi Lake | In this structure, cells join together to form short chains or curved shapes like half circles. Each cell is round and disc-shaped. | According to the Morphological features this species appears to be from genus: *Cyclotella* |
| **17.** |  | Supa Taal | These colonies appear to be branched, tree-like patterns, where each club-shaped cell sits on a soft, sticky stalk. | According to the Morphological features this species appears to be from genus: *Gomphonema* |
| **18.** |  | Supa Taal | They appear to be round and flat like a petri dish. Under a microscope, they often have a clear, empty-looking center and appear yellow-brown or golden in color. | According to the Morphological features this species appears to be from genus: *Cyclotella* |
| **19.** |  | Imarti Taal | This structure is appear as oval or elliptical in shape and its appearance looks like a yellow-brown, slippery layer on submerged surfaces. | According to the Morphological features this species appears to be from genus: *Cocconeis* |

| | | | | |
|---|---|---|---|---|
| **20.** |  | Imarti Taal | These structures look circular and flat, similar to a petri dish. Under a microscope, they usually show a clear center and a yellow-brown or golden color. | According to the Morphological features this species appears to be from genus: *Cyclotella* |
| **21.** |  | Jalpari Lake | The diamond structures usually refer to the zigzag pattern formed by the cells. The cells are connected to one another with a sticky stalk that is released from one corner of the shell. | According to the Morphological features this species appears to be: *Striatella* colonies |
| **22.** |  | Jalpari Lake | They appear as long, hollow ribbon-like chains and use rounded, spoon-shaped spines to connect with nearby cells. | According to the Morphological features this species appears to be from genus: *Fragilaria* |
| **23.** |  | Jalpari Lake | These structures are boat-shaped and some form groups inside a soft, slimy covering. | According to the Morphological features this species appears to be from genus:<br>*Navicula* colonies |
| **24.** |  | Pandu Taal | An oval diatom with one pointed end and one rounded end is likely a heteropolar species, meaning the two ends of the cell are different in shape. | According to the Morphological features this species appears to be from genus: *Meridion* |

| | | | | |
|---|---|---|---|---|
| **25.** |  | Pandu Taal | It shows a V-shape or a pointed head end when viewed from the top, with a sharp edge and a complex, well-defined shell structure. | According to the Morphological features this species appears to be from genus: *Didymosphenia* |
| **26.** |  | Pandu Taal | The oval shape and two hollow yellow spots are typical features. It looks semi-oval or boat-like from the top, and from the side, it appears wedge-shaped. | According to the Morphological features this species appears to be from genus: *Amphora* |
| **27.** |  | Gulaua Taal | These are colonies that are made of strong, cylindrical or barrel-shaped cells joined end to end at their faces. | According to the Morphological features this species appears to be from genus: *Melosira* |
| **28.** |  | Gulaua Taal | This structure appears to be small, round diatoms that usually appear golden-brown or yellow-brown inside, with detailed, porous cell walls. | According to the Morphological features this species appears to be from genus: *Thalassiosira* |
| **29.** |  | Kolha Taal | This structure appears to be long, narrow lance-shaped valves with a small central pore. The surface has fine rows of tiny pores that are parallel in the middle and come closer together toward the ends. | According to the Morphological features this species appears to be from genus: *Proschkinia* |

| | | | | |
|---|---|---|---|---|
| **30.** |  | Kolha Taal | These are oval-shaped that usually appear dark brown because of chloroplasts and have a clearly visible outer shell (frustule). | According to the Morphological features this species appears to be from genus: *Cocconeis* |
| **31.** |  | Kolha Taal | These are centric in shape, which means they have a round shape with symmetry from the center, usually like a disc or drum. They contain a golden or yellow-brown pigment that appears to be bright yellow or golden-brown color. | According to the Morphological features this species appears to be from genus: *Coscinodiscus* |
| **32.** |  | Ganga Sagar Lake | They often appeared as D-shaped, crescent-shaped, or semi-oval when seen from the top. Their cell wall looks clear or glass-like under a light microscope. | According to the Morphological features this species appears to be from genus: *Epithemia* |
| **33.** |  | Ganga Sagar Lake | They appear oval or elliptical in shape and have a special structure where one side of the cell has a slit while the other side does not have it. | According to the Morphological features this species appears to be from genus: *Cocconeis* |
| **34.** |  | Ganga Sagar Lake | They look round and flat, like a petri dish. Under a microscope, they usually have a clear center and appear yellow-brown or golden in color. | According to the Morphological features this species appears to be from genus: *Cyclotella* |

| | | | | |
|---|---|---|---|---|
| **35.** |  | Ganga Sagar Lake | This structure has a boat-shaped or spindle-like body that is symmetrical. It is covered with a clear, glass-like shell and may appear yellowish or golden-brown in color. | According to the Morphological features this species appears to be from genus: *Navicula* |
| **36.** |  | Baal Sagar Lake | This structure forms chains. These chains appear to be straight, curved, or coiled into semicircles, with round or oval cells joined together. | According to the Morphological features this species appears to be from genus: *Chaetoceros* |
| **37.** |  | Radha Kund | These are oval-shaped structures. They look dark brown due to chloroplasts and have a distinct outer shell. | According to the Morphological features this species appears to be from genus: *Cocconeis* |
| **38.** |  | Radha Kund | This structure looks like a tiny glass piece or a narrow boat. It has a clear, hard shell. Under a strong microscope, it appears pointed at both ends and has a very thin slit running through the center. | According to the Morphological features this species appears to be from genus: *Proschkinia* |
| **39.** |  | Radha Kund | This structure forms groups or branches that appear as small, dense clusters when seen under low magnification. | According to the Morphological features this species appears to be from genus: *Gomphonema* |

| | | | | |
|---|---|---|---|---|
| **40** |  | Sneh Nagar Bawli | These structures have a clear S-shaped outline with a narrow middle area, a long central region, and golden-brown chloroplasts. | According to the Morphological features this species appears to be from genus: *Gyrosigma* |
| **41.** |  | Sneh Nagar Bawli | These structures have a unique boat-shaped form and usually exist as single cells, though some types can form groups or colonies inside a slimy tube-like covering. | According to the Morphological features this species appears to be from genus: *Navicula* colonies |

## 4. DISCUSSION

The present research work has been able to document 22 genera of diatoms in stagnant freshwater pools in Jabalpur, emphasizing the diverse diatom community inhabiting the lakes and ponds in the region. The findings of the study corroborate the past works done on central Indian water systems, demonstrating high planktonic and diatom diversity in relation to environment-dependent factors[1,10]. The preponderance of diatom genera such as Navicula, Cyclotella, Cocconeis, Gomphonema, and Amphora is in congruence with the past works, where these diatoms were considered as adaptable types of diatoms[4,10,16].

The differences in diatom genera in relation to location are supported by the works of Chawla & Patel (2020), wherein they have mentioned that diatoms differ in relation to their location. Hence, the use of diatoms as locational indicators holds true as well as forensically significant, since the current results will assist in preparing the regional diatom database.

The methods employed to extract and identify the diatoms by means of centrifugation and light microscopy in this experiment are consistent with the procedures described in literature concerning forensic and ecological research[5,22]. However, the identification of diatoms by morphology including valves and striations continues to be considered acceptable by many, while innovations like DNA methods have been recommended to improve this process[9,19,21].

It is established that environmental factors like pH levels, water chemistry, and geographical locations can affect the distribution of diatoms[4,13,16]. Diverse genera of diatoms occurring in stagnant water sources in this study may suggest differences in ecological settings of ponds/lakes. Similar observations have been made in other freshwater systems[8,14]. It highlights that diatoms can effectively be used for bioindications in water environments.

In relation to forensics, diatoms contribute significantly towards the diagnosis of drowning and establishing a relationship between the victims and the water source[6,7.19]. This study demonstrates how site-specific genera of diatoms can aid forensic investigations. Nevertheless, various problems like contamination and the lack of standardization persist in this field[21,23].

Furthermore, there is evidence that shows that various environmental factors such as toxic metals lead to changes in the morphology and distribution of diatoms[25] . The changes may impact the process of identifying the diatom types and using them in forensic cases. In summary, the results of this study have added to the body of literature regarding diatom diversity and highlight their ecological and forensic importance. Creating a database of diatoms within the region of Jabalpur will make forensic investigation more reliable.

## 4. CONCLUSION

Forensic diatomology plays a significant role in resolving the complexities of drowning cases. It also aids in the identification of the cause of death and the site of drowning. The presence of a sufficient number of diatoms in vital organs of the body can be considered as strong evidence for ante-mortem drowning. Moreover, the pattern of diatoms in different water bodies, when compared with the diatoms in the body of the victim, can help in determining the site of drowning.

The present study offers qualitative information on the distribution of diatoms in different water bodies in the western region of Jabalpur, Madhya Pradesh. This study also focuses on the importance of diatom diversity in forensic science in the context of drowning cases. In this study, 16 water bodies in Jabalpur were systematically analyzed, and different genera were identified, which included Diatoma, Striatella, Aulacoseira, Navicula, Gomphonema, Diploneis, Petroneis, Triceratium, Amphora, Cyclotella, Achnanthes, Cocconeis, Fragilaria, Meridion, Didymosphenia, Melosira, Thalassiosira, Proschkinia, Coscinodiscus, Epithemia, Chaetoceros, and Gyrosigma.

The results obtained from this region could be helpful in the creation of a reference database of diatoms, which could be important for ecological research as well as for identifying the drowning site of a victim of a crime. To make accurate observations, it is recommended to use a magnification of 100x. Advanced techniques such as Scanning Electron Microscopy and Transmission Electron Microscopy could further enrich this research by providing a better view of the diatom species and their structures, as well as a three-dimensional view of the frustules of the diatoms and their intricate structures. The research was carried out over a period of two months, from February 2026 to March 2026. Increasing the period of research and including samples from different seasons could lead to the discovery of more species.

## REFERENCES


Kurmi G, Thakre U. Diatomological Mapping of water bodies of Indore region for forensic consideration.

Verma P, Kaur J. Diatoms analysis of well water sample of different districts of Punjab region. *Int J Forens Sci.* 2020;5(3):000202.

Marella, G. L., Feola, A., Marsella, L. T., Mauriello, S., Giugliano, P., & Arcudi, G. (2019). Diagnosis of drowning, an everlasting challenge in forensic medicine: Review of the literature and proposal of a diagnostic algorithm. *Acta Medica Mediterranea, 35*, 919.

Dahiya, P., Makwana, M. D., Chaniyara, P., et al. (2024). A comprehensive review of forensic diatomology: Contemporary developments and future trajectories. *Egyptian Journal of Forensic Sciences, 14*, 2.

Kumari, P., Mishra, M. L., & Kesharwani, L. (2023). Diatom examination from Ganga River at Vindhyachal: A forensic approach. *17*(2), 114–119.

Kharbal, S., & Chudiwal, A. (2024). Assessment of effect of environmental factors on diatoms. *International Journal of Science and Research, 13*, 502–504.

Chawla, A., & Patel, D. (2020). Different types of diatoms seen in the River Narmada in India. *Indian Journal of Forensic Medicine & Toxicology, 14*(4).

Kumari, P., Mishra, M. L., & Kesharwani, L. (2023). Diatom examination from Ganga River at Vindhyachal: A forensic approach. *17*(2), 114–119.

Li, Y., Boonprakob, A., Gaonkar, C. C., Kooistra, W. H., Lange, C. B., Hernández-Becerril, D., ... & Lundholm, N. (2017). Diversity in the globally distributed diatom genus Chaetoceros (Bacillariophyceae): three new species from warm-temperate waters. *PLoS One*, *12*(1), e0168887.

Madhankumar, M., & Venkatachalapathy, R. (2023). Distribution of the diatoms and water quality assessment of the Thamirabarani River, Tamil Nadu, South India. *Journal of Geology, Geography and Geoecology, 32*(1), 124–137.

Mahilang, N. (2025). Forensic analysis of diatoms in different ponds at Durg rural area of Chhattisgarh. *Innovation and Integrative Research Center Journal, 3*(5), 1–13.

Marella, G. L., Feola, A., Marsella, L. T., Mauriello, S., Giugliano, P., & Arcudi, G. (2019). Diagnosis of drowning, an everlasting challenge in forensic medicine: Review of the literature and proposal of a diagnostic algorithm. *Acta Medica Mediterranea, 35*, 919.

Nunes, M., Adams, J. B., & Lemley, D. A. (2025). Characterising benthic diatom community responses to abiotic variability in a tropical Ramsar estuarine lake. *Wetlands Ecology and Management, 33*, 37.

Pardhi, S., Thiruvalan, K., Thacker, M., Alakananda, B., & Karthick, B. (2023). Diatoms (Bacillariophyta) of the world's highest aquatic environments from the Western Himalayas, India. *Oceanological and Hydrobiological Studies, 52*, 172–205.

Rahane, A., & Parkhe, D. (2025). Forensic analysis of diatoms with respect to drowning cases in the Western Ghats of Maharashtra. *International Journal for Research*

*in Applied Science & Engineering Technology (IJRASET), 13*(4). https://www.ijraset.com

Rana, A. S., Verma, P., & Mahajan, M. (2026). Forensic diatomology of Pong dam reservoir: Implications for drowning diagnosis and site identification. *Journal of Forensic and Legal Medicine, 118*, 103094.

Sharma, M. K., Sharma, A., Bhatt, A. K., Kaushik, N., Verma, S., Kumar, A., & Tyagi, N. (2022). A detailed study of diatoms (Bacillariophyta) community from Rewalsar and Prashar lakes of Himachal Pradesh, their bio-monitoring characteristics and forensic significance. *Ecology, Environment and Conservation*.

Sindhwal, S., Rinku, & Saxena, A., et al. (2026). Methodological advances in diatom research for aquatic biomonitoring and water quality evaluation. *Archives of Microbiology, 208*, 116.

Singh, S., Pal, S. K., Bhardwaj, N., & Ahluwalia, A. S. (2022). Diatomological mapping of water bodies of Delhi region for forensic consideration. *Indian Journal of Forensic and Community Medicine, 9*(4), 173–177.

Tandon, A., Dubey, S., & Pal, S. K. (2023). Identification of diatoms from different rivers in Chhattisgarh. *Indian Journal of Forensic and Community Medicine, 10*(2), 84–90.

Tipton, M., & Montgomery, H. (2022). The experience of drowning. *Medico-Legal Journal, 90*(1), 17–26.

Tiwari, A., & Pandey, A. (Eds.). (2025). *Diatoms and sustainable agriculture* (1st ed.). CRC Press.

Tiwari, S., Mishra, A. S., & Pandey, C. K. (2024). Eco-taxonomical studies of diatoms from a Central Indian river. *Journal of Mountain Research, 19*(2), 249–258.

Tyr, A., Lunetta, P., Zilg, B., et al. (2025). The medico-legal interpretation of diatom findings for the diagnosis of fatal drowning: A systematic review. *International Journal of Legal Medicine, 139*, 729–746.

Verma, K. (2013). Role of diatoms in the world of forensic science. *Journal of Forensic Research, 4*, 181.

Verma, P., & Thapliyal, K. (2023). Diatom analysis in thermophilic water bodies: A study on hot water springs of Madhya Pradesh. *Indian Journal of Forensic Medicine & Pathology, 16*(2), 133–143.

Vlaović, L., Lemonnier, C., Alric, B., Rimet, F., Ćirić, M., Miletić, S., et al. (2025). Diatom metabarcoding vs. morphology in monitoring freshwater and saline lakes in Serbia. *Frontiers in Ecology and Evolution, 13*.