Yuva Vani

BMM Yuva September 2020

How does the heart work?

By: Krish Raina, Krish Sharma, Krishan Patel, Sneha Nimkar, The GTF Group

Introduction

The heart is a muscular organ of the size of a fist situated on the left side of the chest cavity and is responsible for receiving and pumping blood from and to different parts of the body. In GTF, we always look at the various aspects of blood clots. Let us understand how the heart functions. We will take a look at the anatomy of the heart.

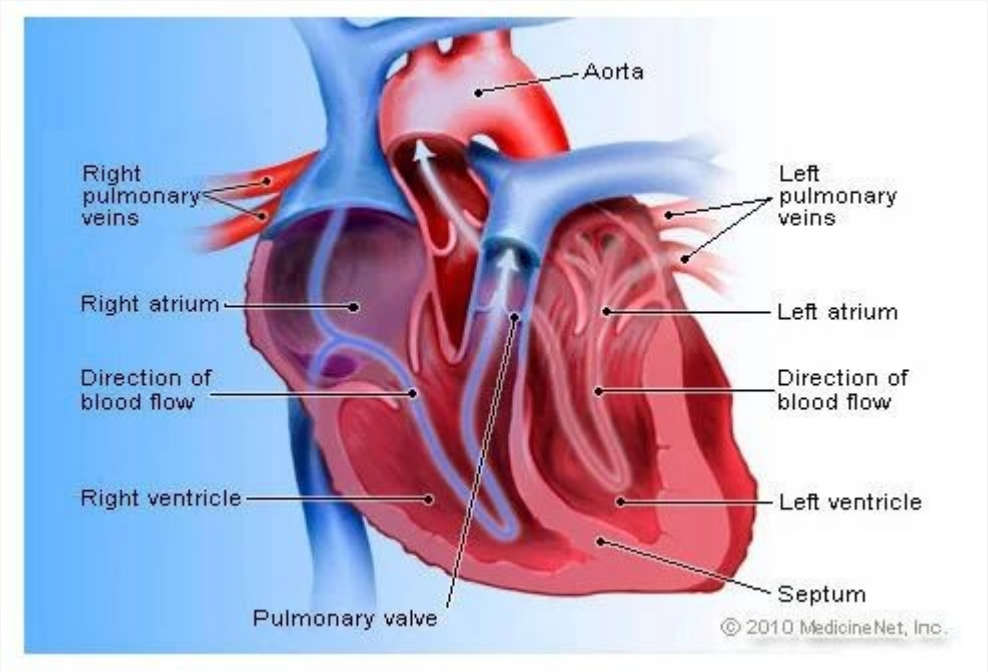
Anatomy of the heart (Figure 1)

The heart consists of four chambers: The two upper (left, and right atria), and the two lower (left and right ventricles). The atria and ventricles are separated from each other by a wall of muscle called the septum.

The heart has 4 valves that help ensure that the blood flows in one direction: the Aortic valve, the Mitral valve, the Pulmonary valve, and the Tricuspid valve.

The heart pushes oxygen-rich blood to the upper and lower sides of the body and transports oxygen-poor blood from the upper and lower extremities to the lungs for oxygenation. Blood comes into the right atrium from the body, moves into the right ventricle, and is pushed into the pulmonary arteries in the lungs. After picking up oxygen, the blood travels back to the heart through the pulmonary veins into the left atrium, to the left ventricle, and out to the body's tissues through the aorta.

The aorta and pulmonary arteries are the two types of arteries in the heart. The superior and inferior vena cava are veins that return impure blood to the right atrium.



Anatomy of the heart (Figure 1)

How does the heart contract?

The heart contracts continuously so that the body can function effectively. The contraction and relaxation of the heart are brought about by the conduction system present in the heart.

Conduction System of the heart (Figure 2)

The cardiac conduction system is a collection of nodes and specialized conduction cells that initiate and coordinate contraction of the heart muscle:

- The sinoatrial node (aka the pacemaker)
- Atrioventricular node
- Atrioventricular bundle (bundle of His)
- Purkinje fibers

All these tissues work in conjunction with each other to stimulate contractions of the atria and ventricles. The electrical events during one full contraction of the heart muscle follows a particular sequence:

- An excitation signal (an action potential) is created by the sinoatrial (SA) node.
- The wave of excitation spreads across the atria, causing them to contract.
- Upon reaching the atrioventricular (AV) node, the signal is delayed.
- It is then conducted into the bundle of His, down the interventricular septum.

- The bundle of His and the Purkinje fibers spread the wave impulses along the ventricles, causing them to contract.

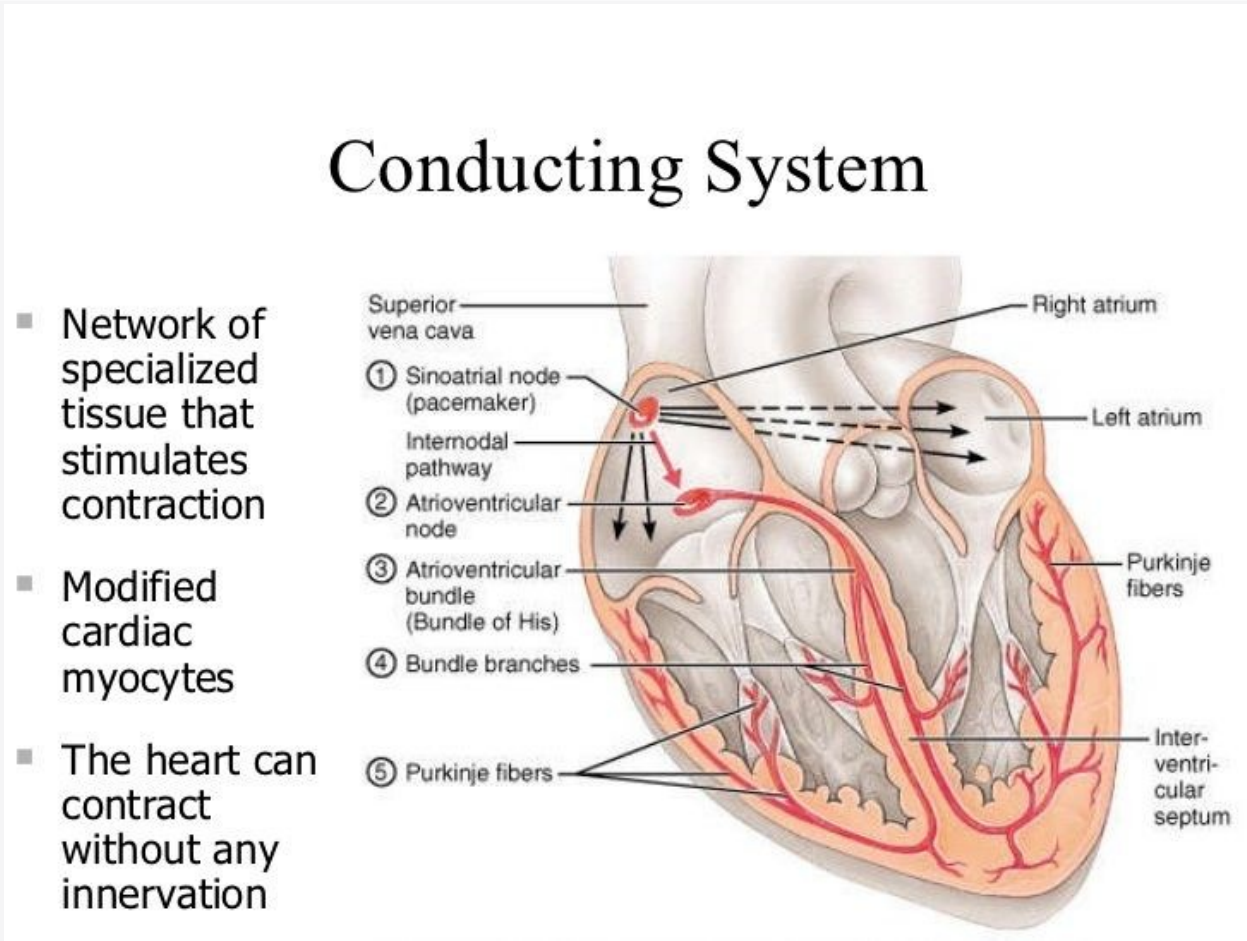


Figure 2: Conduction system of the heart

What happens when the heart's rhythm is disturbed?

In some cases, the rhythm is not maintained and results in a condition called arrhythmias, or abnormal or irregular heartbeats. These disturbances disrupt the heart's electrical signals and can cause the heart to beat too fast, too slowly, and may result in conditions called atrial flutter, atrial fibrillation, or ventricular fibrillation. Most of these irregularities are very serious, and often fatal, if not managed properly.

Atrial Fibrillation (AFib), a very common condition occurring mostly in elderly people, is caused by defects in the conduction system of the heart. It is estimated that by the year 2030, the U.S may have about 12 million people who suffer from AFib. AFib can result in complications such as blood clots, heart attacks, and strokes.
AFib is characterized by an irregular, often rapid heart rate that causes poor blood flow and increases the risk of strokes, heart failure, and other heart complications. AFib can also

cause blood clots to move in the body as emboli, and affect the human body in many negative ways. **Ventricular fibrillation** is a heart rhythm problem that occurs when the heart beats with rapid, erratic electrical impulses. This causes pumping chambers in your heart (the ventricles) to quiver uselessly, instead of pumping blood.

Disordered electrical activity causes the ventricles to quiver, or fibrillate, instead of contracting normally. This prohibits the heart from pumping blood, causing collapse and cardiac arrest. This type of arrhythmia is a medical emergency. It's life-threatening.

Conclusion

The heart is an important organ in the body, functions continuously, maintained by the conduction system of the heart is very unique and maintains the atria and the ventricles contracting in a synchronous manner. If the heart stops functioning or does not beat regularly, this can cause serious health issues that must be treated immediately.

GTF scholars conducting research

Several young members of the Global Thrombosis Forum (GTF, www.gtfonline.net) have been awarded Summer Internships to conduct research at the laboratories of the Albany College of Pharmacy and Health Sciences (ACPHS) under the mentorship of Shaker Mousa, Ph.D. and the department of Thrombosis and Hemostasis at Loyola University under the mentorship of Jawed Fareed, Ph.D.

Here is a display of two research projects by Akshay Kulkarni and Tej Shidhaye at the Symposium held at the Cardiovascular Research Institute, Loyola University, Chicago, ILL on April 2, 2019:

1. Akshay Kulkarni: Which is superior? DOAC's orcoumadin?

WHICH IS SUPERIOR? THE DOAC'S OR COUMADIN?

Akshay Kulkarni, Gwinnett School of Mathematics, Science and Technology
Global Thrombosis Forum, Atlanta, GA

INTRODUCTION

- Anticoagulants are the mainstay for treatment of thrombotic conditions.
- Prior to 2010, we had Heparin and Vitamin K antagonists such as coumadin.
- Recently, a new class of anticoagulants (Direct Oral Anticoagulants, DOAC'S) was introduced.
- This research was conducted to determine which of the two groups was superior.

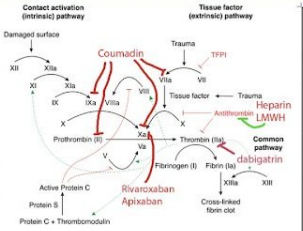
RESULTS

- Unlike DOAC'S, coumadin has a disadvantage in that INR levels must be checked, and the patient has dietary restrictions.
- A meta-analysis comparing apixaban, dabigatran, and rivaroxaban to coumadin in patients with non-valvular Atrial Fibrillation (AF) reported that DOAC's were more efficacious for the prevention of stroke and systemic embolism.
- The DOAC's have a decreased risk for intracranial bleeding and a favorable safety profile, making them promising alternatives to coumadin.
- In a separate meta-analysis, DOAC's were found to possess a comparable efficacy to that of coumadin, with a significantly lower risk of bleeding.
- Vitamin K has been used as a reversal agent for coumadin for a long time. For DOAC's, reversal agents have been recently developed (Coagulation Factor XA (Recombinant) inactivated zhzO for apixaban, aripazine as a universal DOAC antidote, and idarucizumab as an antidote for dabigatran).

INDICATIONS FOR DOAC's AND COUMADIN

- To reduce risk of non-valvular AF-related stroke.
- Prevent recurrence of DVT and PE.
- Reduce the risk of blood clots after hip and knee replacements.

COAGULATION CASCADE, SITE OF ACTION OF COUMADIN AND DOAC's



MECHANISM OF ACTION OF COUMADIN AND DOAC's

- Coumadin competitively inhibits the vitamin K epoxide reductase complex 1 (VKORC1), which is an essential enzyme for activating the vitamin K available in the body.
- Coumadin can deplete functional vitamin K reserves and therefore reduce the synthesis of active clotting factors.
- Dabigatran: Thrombin inhibitor.
- Apixaban, Rivaroxaban: Factor Xa inhibitors.

SAFETY

- FDA's Adverse Event Reporting System (FAERS) concluded that apixaban had the safest drug profile among anticoagulants.
- A proprietary algorithm based on six categories to calculate a risk-adjusted score, with 100 indicating the highest potential adverse event risk showed:
- Coumadin 67.56, Dabigatran 67.15, Rivaroxaban 67.08, Apixaban 39.45.

COMPARISON BETWEEN COUMADIN AND DOAC's

Coumadin vs. DOAC's

	Coumadin	DOAC's
Mechanism of Action	Interferes with Vitamin K and several clotting factors	Selectively blocks Factor Xa and Thrombin
Routine Blood Monitoring	INR Monitoring required	None
Dietary Restrictions	Avoid leafy vegetables containing Vitamin K	None
Reversal Agents	Vitamin K	AndexXa, Aripazine, Praxbind

COST

- First real-world, matched head-to-head study comparing all-cause healthcare costs and healthcare resource utilization (HCRU) among DOACs.
- Dabigatran (Pradaxa) was associated with lower all-cause costs compared to rivaroxaban (Xarelto).
- Compared to apixaban (Eliquis), dabigatran was associated with similar all-cause costs and hospitalizations, but higher all-cause outpatient and pharmacy HCRU.
- Based on differences in clinical event rates associated with use of each of the DOAC's when compared with coumadin, the annual medical cost avoidances associated with use of dabigatran, rivaroxaban, apixaban, and edoxaban were estimated at -$204, -$140, -$495, and -$340 per patient, respectively.
- Although coumadin cost on a per day basis is significantly lower than the DOAC's, the ultimate cost to manage complications of coumadin is very high.

CONCLUSION

- My research shows that DOAC'S are superior to coumadin due to lack of need for monitoring INR, fewer dietary restrictions, and fewer side effects.

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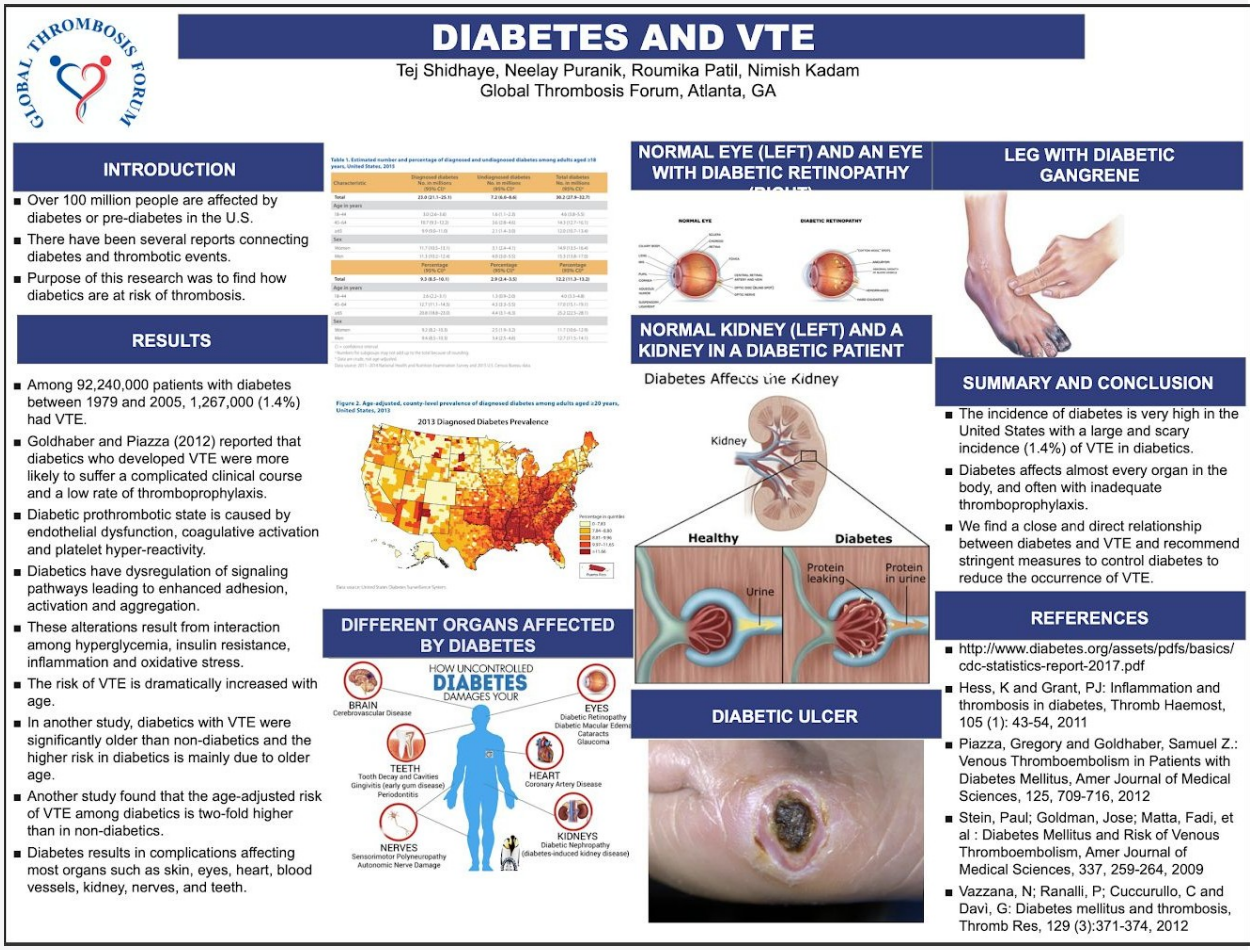

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The Pertinence of the Mahabharata

By: Janhavi Kulkarni

Opinion piece on the relevance of the epic of Mahabharata in the modern day.

One of the biggest pastimes when we were children was listening to stories from our grandparents. Unbeknownst to us, several of those stories were from the Mahabharata itself. From the great and loyal Krishna to the evil Duryodhan, the Mahabharata is embedded in our childhood. As children, we enjoyed the action packed storytelling without truly realizing the deeper meaning the stories possessed. Despite being conceived centuries ago, the importance of the Mahabharata is, to this day, enormous, and the stories, characters, plots, and themes are still immensely relevant.

The most relevant part of the Mahabharata is its biggest conflict: the struggle between good and evil. When we think of good versus evil in regards to the Mahabharata, we picture the Pandavas on one side and the Kauravas on the other side of the giant Kurukshetra battlefield. It isn't that simple, though. The good and evil portrayed in the Mahabharata don't necessarily fall under the categories of pure black and white. Most of the time, very realistically, the battles occur in the grey. Duryodhan's greed and jealousy laid the foundation for all of the mayhem, but, in a way, it was also justified. Towards the beginning of the story, there are instances where the elders or the teachers very blatantly favor the Pandavas. Duryodhan felt neglected. Neglection, therefore, caused angry and repressed feelings that many could sympathize with. The duality of good and evil was not easy back then, and is certainly not easy right now. In today's materialistic world, Duryodhan's shadow of greed and need for power blankets so many people. As technology advances, human beings can't help but be smitten with the elite and luxurious lifestyle.
Many times these same people commit questionable acts to achieve their purpose. It is very difficult to live in the modern world. As a result, like Duryodhan, it is easy to fall under the spell of power and avarice.

Along with the clash between good and evil, one of the most prominent aspects of Mahabharata is the brotherhood interlaced within the story. The brotherhood between the Pandavas is not just a great relationship, but a beautiful love story. From the beginning, the five brothers established a sense of undeniable loyalty, friendship, and respect for each other. They recognized each others' strengths and weaknesses. They supported each other. That bond drives the story, and several key decisions throughout the story. In today's world, as individualistic culture and thinking prevails, Mahabharata remind humans that connection, family, brothers, sisters, and friends are very important. Humans, today, are drifting father and farther apart because of jobs, hobbies, wealth, and so many times, misunderstandings. The pure love, understanding, and admiration the Pandavas elicit amongst each other teaches us the importance of family, friends, and the necessity of constructing a strong support system.

Accompanied by the brotherhood, the significance of loyalty in the Mahabharata is immensely powerful. The loyalty amongst the Pandavas is key to their relationship, however, the greatest example of sheer loyalty is the relationship between Karna and

Duryodhan. Despite being Pandavas real brother, Karna supported Duryodhan until the end because he had given his word; he had made a promise. Karna fulfilled his promise to stand beside Duryodhan even after he found out that his birth mother was Kunti. He truly believed that even if his obligation was to his brothers, his loyalty was to Duryodhan. In the modern world, the word "loyalty" has lost all of its meaning. Today, human beings take each for granted. Children neglect their parents at old age. Parents neglect their children for their careers. Families are betrayed for money. Friends are shunned for false popularity.
Our sense of loyalty has lost its purpose; its significance. The relationship between Karan and Duryodhan is a lesson and a reminder that the right amount of loyalty can create long lasting friendships.

The applicability of the Mahabharata in the modern world is astonishing, eye opening, and truly inspiring. The Mahabharata still, to this day, can help guide us through life. Like any other history, the Mahabharata warns us of the mistakes of the past, and addresses the human tendency to constantly repeat them. It advises on the need for improvement of our relationships. It teaches us the prominence of family and friends in our lives. The true beauty of the Mahabharata, however, are the universal themes, which can and do appeal to today's youth in order to learn from the past, persevere in the present, and improve the future.

"The Talk" in Indian Households

By: Ria Alurkar

"How are babies made?" This is a question that most parents have to beat around the bush until their children reach the right age. Yet oftentimes in Indian households, the right age is: never.

While society has become more modern, some traditional taboos still remain. Opponents of proper sex education for adolescents gave various reasons for their stance, claiming it would corrupt the innocent minds of youth and lead to inappropriate behavior. Many mothers find it a "dirty" topic, forbidding their children (especially daughters) to even raise the discussion in their home.

In the rural areas or slums of India, girls are married early and are not educated in matters of sex. They are then pressured into reproducing early. According to the National Family Health Survey, one in three women in rural areas (31.5 percent) are married before 18, and 9.2 percent of women aged 15 to 19 are pregnant or mothers. On the other hand, accidental pregnancies outside of wedlock are severely stigmatized. With no legal and medical abortions or contraceptives available to them, girls resort to unsafe abortions, child abandonment, or suicide. Lack of education in such rural areas can have appalling repercussions.

Well, what about the other end of the education spectrum? Contrastingly, in urban areas where sex education is being normalized and introduced into schools, only 17.5 percent of women are married before eighteen, and 5 percent are pregnant or mothers between ages 15 and 19. While these statistics are not perfect, they are a start. India's urban cities reveal that the discussion that modernization brings, in fact, lessens teen pregnancy

and underage marriages.

All in all, not only does breaking the taboo around sex education in Indian households encourage safe practices, but it creates a sense of open communication between parents and their children. Children will be more likely to trust their parents to talk about more sensitive topics, and parents will be happier with a stronger relationship. The first step to normalizing the matter is to start when the child is at a young age. Rather than giving one "talk," break it up into smaller, age-appropriate chunks to build a foundation.

NFHS Report: http://rchiips.org/NFHS/pdf/NFHS4/India.pdf

The Artists Nook

By: Yash Kankariya

Sunset over the Trees

Waning Sun in Pastel

Sunflower Silhouette

Brush Strokes of the Sky

BMM Marathi Shala Online Courses

BMM Marathi Shala Online school academic year 2020-2021 registration is open. Please register by clicking the link below:

https:// bmmshala.net/BMM%20Marathi%20Shala%20Online%20Courses

From this year, they are introducing conversational Marathi classes for adults- beginner level. See the flyers below.

Bound by You

By: Janhavi Kulkarni

A poem based on the patriarchal injustice and systematic abuse referenced in the novel A Thousand Splendid Suns *by Khaled Hosseini.*

With closed eyes, she raised her hand in *salaam,*
Averted them till he left the room, grunting.
Her *dil* betrayed her, making itself known to the world.
His breath, tobacco stained, still scratched her skin.
Body aching, belly empty,
The rhythms of her *dil*
ran as fast as her father's 1956 Buick Roadmaster.
The aroma of the *qurma* masked the metallic, iron stench,
Only barely.
Suddenly, a single cry broke through,
Shattering her *dil* into a thousand pieces of darkness.

Note from Editors

Hello readers,

As you can see, our Newsletter contains more than just typical fact-based articles. We are here to give you an opportunity to explore your creative side as well as give them a platform to voice their opinions. After this issue, we are opening the gates for all youth to submit their journal articles, creative writing, photography, or nonfiction writing . Every month, our team will choose the best from each category, and it will be displayed in the upcoming issue. So, simply put, even if you are a fierce advocate for change or someone who enjoys knitting together the threads of their vast imagination for fun, this newspaper has a place for you. Submit your work at the email provided below and we will try our best to incorporate your work into the Bruhan Maharashtra Mandal (BMM) Newsletter.

Thank you for reading,

Ria Alurkar, Pinak Chitnis, Yash Kankariya, Gargi Khadse, Janhavi Kulkarni

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