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EDITORIAL

Family Adoption Program (FAP) by the National Medical Commission (NMC): A Strategic Initiative

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This issue contains the commentary article by Mishra et al., entitled "Is Family Adoption Programme as What It Seeks: A Resident's Perspective?" [1].

The authors observe that the program has been running in a few institutes across the country—a large level replication of the same with the objectives of giving public health exposure to medical undergraduates. However, while they voice some concerns, they consider it a welcome step and are optimistic about its future.

The Family Adoption Program (FAP) by the National Medical Commission (NMC) is a strategic initiative to integrate family-centered care and longitudinal patient relationships into medical education. The program provides medical students with hands-on experience in managing long-term patient relationships, enhancing their clinical skills and understanding of family dynamics.

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It provides holistic education, encourages a patient-centred approach, and fosters essential soft skills, such as communication, empathy, and teamwork, which are critical for effective medical practice.

Implementing and maintaining the FAP can be resource-intensive, requiring significant investment in terms of time, personnel, and financial resources. Managing sensitive information and ensuring confidentiality can be challenging, particularly with multiple participants and long-term interactions.

The FAP provides a chance for medical schools to innovate their curriculum and integrate new teaching methodologies that emphasize real-world experiences.

The FAP strengthens ties between medical institutions and the community by involving families in the educational process, potentially leading to better community health outcomes.

This area offers the potential for research into the effectiveness of family-centered medical education and patient outcomes, leading to evidence-based improvements.

Utilizing digital tools and telemedicine can enhance the program's reach and flexibility, allowing for virtual family interactions and broader participation.

Conducting long-term studies to evaluate the impact of the FAP on both medical students and patient care could provide data to support further development and refinement of the program.

In summary, the National Medical Commission's Family Adoption Program has significant potential to enhance medical education by focusing on family-centered care and longitudinal relationships. Addressing its challenges and leveraging its strengths and opportunities will be key to its successful implementation and future development.

Conflicts of interest

The authors declares that they do not have conflict of interest.

Reference

1. Anshita Mishra, Febida Beegum PK, Sahadev Santra and Bratati Banerjee, Is Family Adoption Programme as What It Seeks: A Resident's Perspective? Natl. Board Exam. J. Med. Sci., 2024;2(8); 842–846. doi: 10.61770/nbejms.2024.v02.i08.011.

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ORIGINAL ARTICLE

Clinical and Laboratory Profile of Leptospirosis in a Tertiary Care Hospital at Kolar

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Abstract

Introduction: Leptospirosis is an acute treponemal infection with high mortality and morbidity. Due to varied presentations in different geographical areas and unexpected seasonal patterns, clinical diagnosis is difficult. The present study aims to analyze the varied clinical presentations and epidemiological factors in correlation with laboratory diagnosis. **Materials and Methods:** A retrospective study was conducted among the clinically suspected cases of leptospirosis at R. L. Jalappa Hospital, Kolar, from January 2023 to December 2023. A total of 750 blood samples were tested for IgM ELISA leptospira test. All patient samples that tested positive for IgM antibodies were considered seropositive for Leptospira. The clinical history, laboratory parameters, management, course, and outcome of these patients were recorded. **Results:** The majority of the affected population were in the 41-60 year age group. Males were more affected than females. Due to unexpected rains, cases peaked in March. Thrombocytopenia was observed in 32 patients (34%), hyperbilirubinemia in 28 patients (30%), raised transaminases in 27 patients (29%), followed by low hemoglobin levels in 27 patients (28%). Severe acute respiratory illness (SARI) was the most common complication, seen in 24 patients (26%), followed by renal failure in 11 patients (12%). **Conclusion:** The morbidity and mortality due to leptospirosis can be reduced by better understanding environmental factors, by early detection through rapid tests, and predicting the severity of illness using laboratory parameters.

Keywords: Leptospira, ELISA, Thrombocytopenia, Rapid tests

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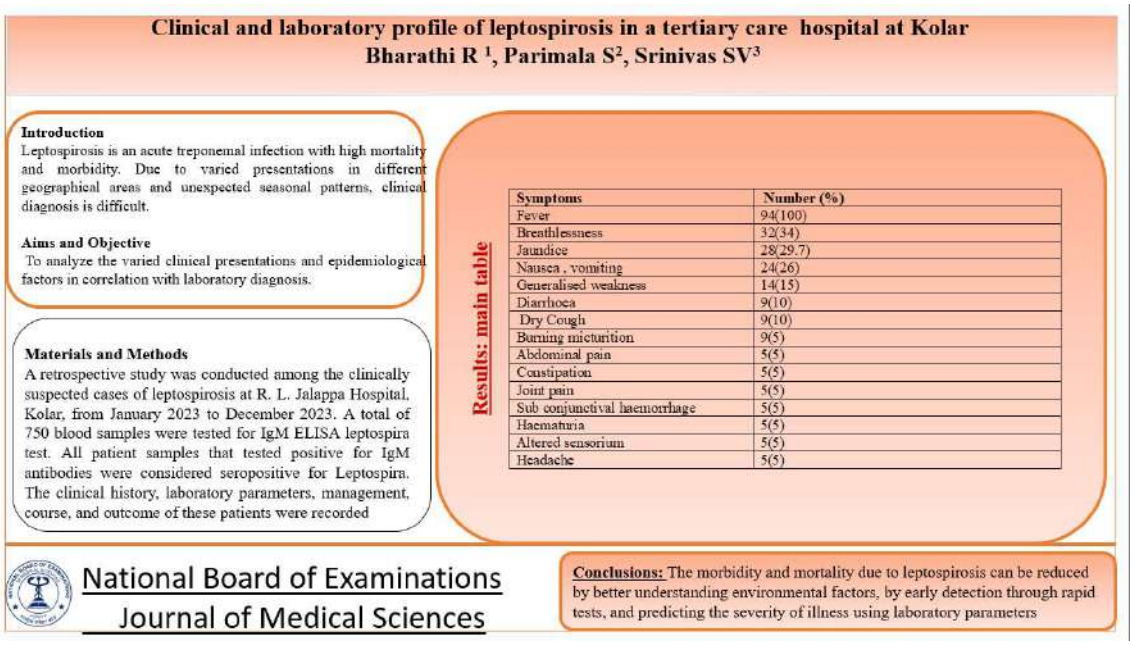
Graphical Abstract



Introduction

Leptospirosis is an acute infection that can be severe and fatal in some patients [1]. It is a zoonotic infection caused by Leptospira species [1]. The mode of transmission is through the ingestion of food and water contaminated with the urine of infected rats [2]. This infection is commonly found in sewage workers, farmers, and rice planters [2].

Leptospirosis exists in two forms: an asymptomatic anicteric form and a symptomatic icteric form [3]. In the asymptomatic anicteric form, a flu-like illness with fever, chills, abdominal pain, muscle pain, headache, and vomiting is observed[3]. In the severe form of leptospirosis, patients present with altered sensorium, acute renal failure, respiratory failure, hypotension, and arrhythmias [3].

Due to the varied clinical presentations, it is often misdiagnosed as scrub typhus, dengue, or goes undiagnosed [3]. If diagnosed at the right time, the prognosis of the disease is good. Serological tests are widely employed in the routine laboratory diagnosis of leptospirosis [4]. In view of the apparent re-emergence of leptospira cases, there is a need to analyze the varied clinical presentations and treatment modalities.

The present study aims to analyze the varied clinical presentations and epidemiological factors in correlation with laboratory diagnosis.

Materials and Methods

This is a retrospective study of leptospirosis cases diagnosed at R. L. Jalappa Hospital, Kolar, from January 2023 to December 2023. During the study period, from clinically suspected cases, a total of 750 blood samples were received for IgM ELISA testing for leptospira.

The test procedure was performed using the IgM ELISA kit (J. Mitra Lepto

IgM Microlisa, New Delhi, India). The test procedure was conducted according to the protocol provided with the kit. The results were interpreted according to the manufacturer's instructions, i.e., values ≤ 9 units were considered negative, 9–11 units equivocal, and ≥ 11 units positive. For samples showing equivocal results, another blood sample was drawn after a period of 10 days, and the test was repeated. Negative and positive controls were included with each test run.

Out of the total 750 blood samples tested, 94 patient samples were positive for IgM anti-leptospira antibodies. All patient samples that tested positive for IgM antibodies were considered seropositive for Leptospira. The clinical history, laboratory parameters, management, course, and outcome of these patients were recorded.

Statistics

Data processing included basic tests of descriptive statistics and was performed using SPSS software version 22.0 (SPSS Inc., Chicago, IL, USA).

Results

Out of the 94 serologically confirmed leptospira-positive cases, the majority were males (59.5%) (Figure 1). Most of the patients belonged to the age group of 41-60 years (45.7%). The most common symptoms were fever, cough, and myalgia. Other symptoms noted were subconjunctival hemorrhage, burning micturition, and syncopal attacks (Figures 2 and 3).

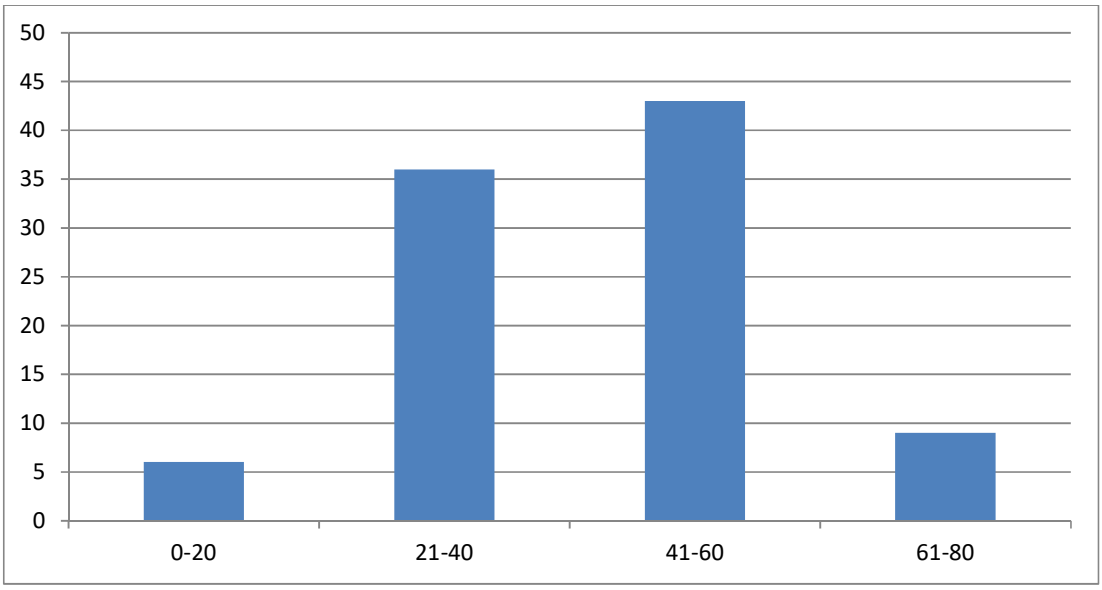


Figure 1. Age wise distribution of cases.
The majority of the patients were between 41-60 years of age, followed by those between 21-40 years of age

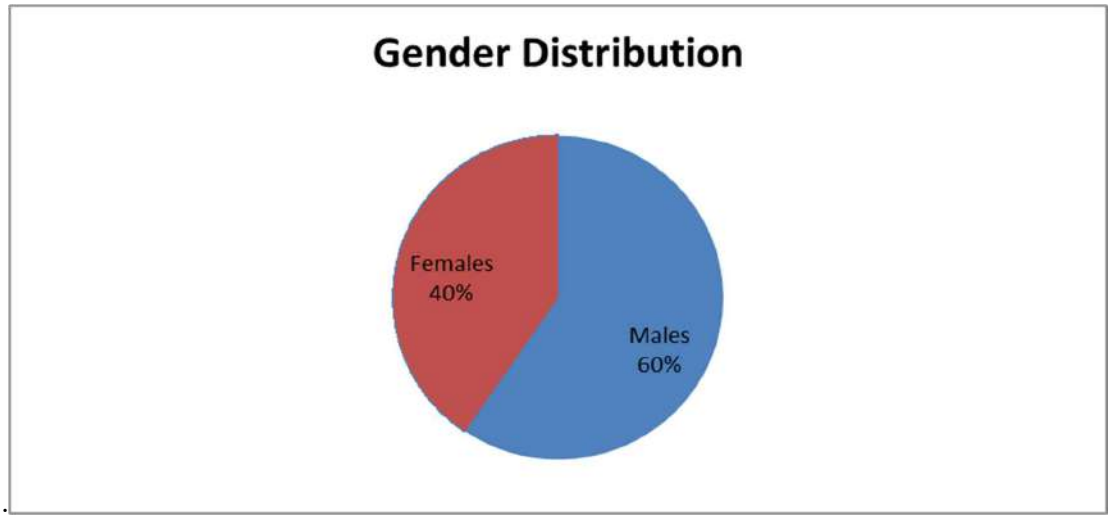


Figure 2. Gender wise distribution of seropositive leptospira cases

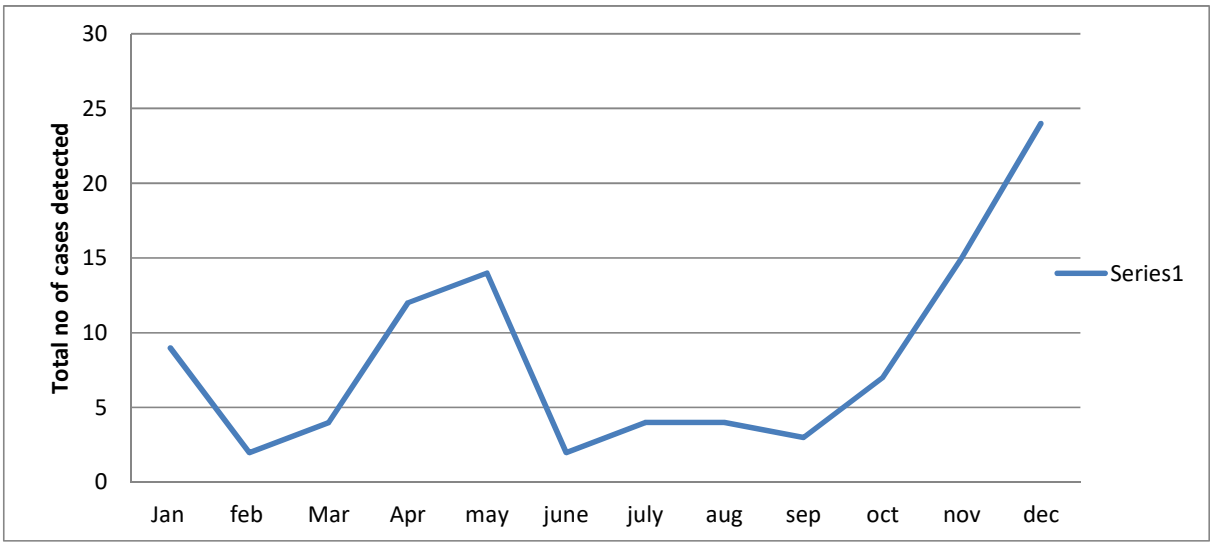


Figure 3. Seasonal distribution of leptospira cases over a year

The leptospira cases were at peak in the month of March, April, May. Decline in the cases in the months of June, July and August. Followed by sustained raise in the cases from September, October, November. Cases were at its peak in month of Decemnber (Table 1).

Table 1. Clinical presentation of 94 leptopsirosis cases

Symptoms	**Number (%)**
Fever	94(100)
Breathlessness	32(34)
Jaundice	28(29.7)
Nausea, vomiting	24(26)
Generalised weakness	14(15)
Diarrhoea	9(10)
Dry Cough	9(10)
Burning micturition	9(5)
Abdominal pain	5(5)
Constipation	5(5)
Joint pain	5(5)
Sub conjunctival haemorrhage	5(5)
Haematuria	5(5)
Altered sensorium	5(5)
Headache	5(5)

Fever (94/94 =100%) was the most common syptom, followed by breathlessness (32/94=34%), Jaundice (28/94 =30%). Nausea and vomiting 26%, Generalised weakness 15%, Diarrhoea 10%, Dry cough 10%, Burning micturition 5%, were other symptoms (Table 2).

Table 2. Laboratory findings of Leptospirosis cases

Lab parameters	**Number (%)**
Thrombocytopenia	32(34)
Hyperbilirubinemia	28(30)
Elevated AST, ALT	27(29)
Anemia <10.0	27(28)
Leukocytosis >11000/mm	24 (20)
Increased prothrombin time	16(17)
D-dimer positive	13(14)

The laboratory parameters seen among the seropositive leptospira cases were Thrombocytopenia 32(34%), Hyperbiluribinemia 28(30%), raised transaminases 27(29%) followed by low Hb levels 27 (28%).

Table 3. Complications seen among the patients diagnosed with Leptospirosis by IgM ELISA leptospira.

Complications	**Number (%)**
Total	51(54.2)
SARI	24(26)
Renal failure (Creatinie level >1.4mg/dl)	11(12)
Encephalopathy	8(9)
Conjunctivitis	8(9)

About 54.2% of the total leptospira positive cases had complications. SARI 24(26%) was common complication followed by renal failure 11 (12%).

Discussion

The reports of an increase in leptospira cases imply knowledge and awareness about leptospirosis. In rural settings, the diagnosis of leptospirosis was often by chance due to limited diagnostic facilities. The prevalence of leptospirosis in Kolar is 12.5% (94/750). This study was conducted in a rural area; it was observed that most of the patients were between 41-60 years of age, followed by those between 21-40 years (Figure 1). The study in the coastal part of Karnataka [5] has similar findings, whereas in Chennai, the 20-40 years age group was affected [6]. Our study findings imply that the working population involved in outdoor activities and the migratory population were the populations affected.

In the gender-wise distribution of cases, a male preponderance was seen in our study (Figure 2). Our findings are in concordance with the study done by Padma et al. [6]. The male preponderance is seen as they are more involved in agricultural activities, construction of buildings, and migratory activities to other areas for better job opportunities compared to females. Leptospirosis, a tropical disease, peaks between July and October [9] (Figure 3). The positivity rate of leptospirosis in South India is 25.6%, while 3.5%, 3.3%, 3.1%, and 8.3% were seen in the western, central, eastern, and northern parts of India, respectively [9]. In our study, an unusual rise in cases was seen in March with a peak in April and May. This pattern of rise is probably due to unexpected rainfall in March due to the effect of a cyclone. The rise in cases during July to October is similar to the findings of the study done in Chennai [6].

Fever was the usual symptom in our study (Table 1). This finding is in concordance with the studies done in South India [10] and North India [11]. Severe acute respiratory illness was the most frequent complication seen in our study. In 34% of the cases, breathlessness was the most frequent presentation. A similar study done by Ahmad N in North India [12] reports breathlessness in 33.3% of cases, but studies from the West report pulmonary involvement in 20-70% of cases [13]. The pulmonary manifestations in leptospirosis are probably due to vasculitis mediated by toxins and an exaggerated immune response [14].

Jaundice was a presenting complaint in 30% of cases. We found high bilirubin levels in 30% and raised transaminases in 34% of cases (Table 2). The study done by Sunil [11] reports

hyperbilirubinemia in 76.7% and raised transaminases in 81.4% of cases. The rise in transaminases is due to the disruption of cellular cohesion, plugging of bile canaliculi, and occasional acute inflammatory infiltrates [15]. Other gastrointestinal symptoms noted in the study were nausea and vomiting (26%), diarrhea (10%), and abdominal pain (5%). Haake et al. opine that these symptoms may be associated with raised transaminase levels or acute pancreatitis [16]. These symptoms contribute indirectly to dehydration, leading to acute renal failure if not treated in time.

A few neurological presentations like headache (5%), altered sensorium (5%), and encephalopathy (9%) were noted in our study (Table 3). In a similar study done in North India, altered sensorium (38.4%), headache (37.2%), and cases with focal neurological deficits (2.3%) were observed [11]. Leptospirosis contributes to aseptic meningitis in 5-13% of cases [11]. In endemic areas, neuroleptospirosis is included in the differential diagnosis in patients presenting with hepatorenal dysfunction [17].

About 5% of cases showed haematuria and subconjunctival haemorrhages were noted. (Table 2). Thrombocytopenia (29%), increased prothrombin time (17%), and D-dimer positivity (14%) shows the association of haemorrhagic manifestations with leptospirosis. The probable hypothesis for the haemorrhagic complications in leptospirosis is the effect of leptospira toxins on the vascular endothelium leading to increased permeability, the participation of cytotoxins, and the presence of disseminated intravascular coagulation [18]. Our findings were in consensus with the study done in coastal South India [10].

Decreased haemoglobin levels (<10 gm/dL) were observed in 28% of the study population. This finding was observed in 57% of patients in a study done in North India [11]. Anemia probably occurs due to endothelial damage and haemolysis [19]. From the literature review, it is evident that haemorrhage in leptospirosis showed a 71.75% risk of mortality [20].

The increase in WBC count in leptospirosis cases occurs due to increased bacterial counts and immunological reactions [21]. A similar report of WBC count >15,000 /µL was found more often in icteric leptospirosis than in non-icteric cases[19]. In our study, 20% of the cases showed an increase in WBC counts. A similar finding was noted in 62.5% of cases in a study done by Nadeem [12]. The case fatality rate due to leptospirosis varies from region to region. Out of 94 IgM ELISA-positive cases, 54% presented with complications, mortality was noted in 2%, and the rest recovered without complications. The study done in coastal South India reports a 3.5% case fatality rate [10].

The epidemiological and clinical patterns of infectious diseases evolve with time and place; this applies even to leptospirosis [22]. Hepatic and renal complications were the most common among the leptospirosis cases reported from Karnataka in 2004 to 2005 [23]. In our study, pulmonary complications were most common compared to hepatic or renal involvement. This implies changing patterns in the clinical presentation of leptospirosis over the years.

Conclusion

The unexpected changes in seasonal patterns have an influence on the sudden rise in leptospira cases. Decreased

haemoglobin levels, raised WBC count, and low platelet count can be considered in predicting the severity of leptospirosis. The morbidity and mortality due to leptospirosis can be decreased by a better understanding of environmental factors, early detection with rapid tests, and predicting the severity of illness using laboratory parameters.

Funding

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Conflicts of interest The authors declares that they do not have conflict of interest.

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ORIGINAL ARTICLE

Temporal Evolution of CT Findings in COVID-19 Patients: An Observational Study

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Abstract
Introduction: Coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), presents a broad spectrum of clinical manifestations, from asymptomatic cases to severe pneumonia and acute respiratory distress syndrome (ARDS). Chest computed tomography (CT) has become a critical diagnostic tool, especially in regions with high disease prevalence. This study aims to assess the common CT findings, patterns of lung involvement, and severity of disease in RT-PCR positive COVID-19 patients to better understand and manage this pervasive disease. **Materials and Methods:** This observational cross-sectional study was conducted at Dr. Kamakshi Memorial Hospital, Chennai, from 2020 to 2021. The study included RT-PCR positive COVID-19 patients aged 18 to 95 years who presented to the fever clinic or COVID casualty and were referred to the radiology department for chest CT evaluation. Exclusion criteria included pregnancy, age under 18 years, and refusal to consent. Non-contrast chest CT scans were performed using a TOSHIBA Aquilion Lightening 16-slice CT machine. Scans were acquired in a single inspiratory breath-hold from the lung apex to the costophrenic angle. CT findings were analyzed and reported by two experienced radiologists, with discrepancies resolved through consensus. **Results:** Out of 349 patients, 213 (61%) were male and 136 (39%) were female, with a mean age of 47.7 years. The distribution of CT findings showed significant variability among the four groups. Group A had the highest percentage of normal CT scans (22%) and ground-glass opacities (52%). Group B exhibited a reduction in normal CT scans (9%) and an increase in ground-glass opacities (57%). Group C showed further decrease in normal CT scans (10.6%) with increased crazy paving (17.3%) and reticulation (14.6%). Group D had similar normal CT scans (10.8%) but significantly higher incidences of reticulation (24.3%) and ground-glass opacities (64%). **Conclusion:** This study highlights the critical role of chest CT in monitoring the progression of COVID-19 pneumonia. The findings demonstrate a clear temporal evolution of lung involvement, from ground-glass opacities in the early stages to more complex patterns such as crazy paving and reticulation in later stages.

Keywords: COVID-19, Chest CT, Ground-glass opacities, Lung involvement, Disease progression

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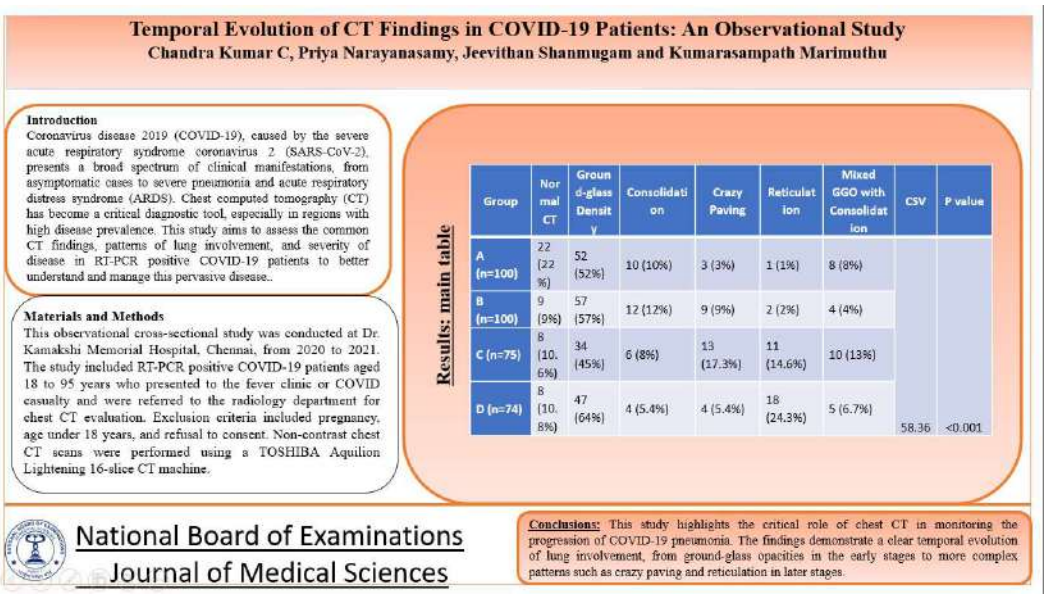
Graphical Abstract



Introduction

Coronavirus disease 2019 (COVID-19), caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in Wuhan, China, at the end of 2019 and rapidly escalated into a global pandemic. SARS-CoV-2 is an enveloped single-stranded RNA virus that leads to a spectrum of clinical manifestations, ranging from asymptomatic cases to severe pneumonia and acute respiratory distress syndrome (ARDS) [1-3]. The disease's incubation period ranges from 1 to 14 days, with a mean duration of 5 to 7 days, and peak viral shedding occurring before symptom onset, underscoring the potential for transmission from asymptomatic individuals [4-6].

Common symptoms include fever (80-90%), cough (60-80%), and dyspnea (18-46%), with other possible symptoms such as myalgia, fatigue, sore throat, nasal congestion, headache, nausea, vomiting, and diarrhea [7,8]. Diagnosis primarily relies on clinical symptoms and a positive reverse-transcription polymerase chain reaction (RT-PCR) assay [9]. The case fatality rate is higher in patients with comorbidities such as cardiovascular disease, diabetes, chronic respiratory disease, systemic hypertension, and cancer [10].

Chest computed tomography (CT) has become a critical tool for diagnosing and managing COVID-19, especially in regions with high disease prevalence. Typical CT findings include ground-glass opacities, consolidation, and patterns of bilateral and peripheral distribution [11]. Studies have shown that chest CT has a high sensitivity for detecting COVID-19 pneumonia, making it a valuable diagnostic tool, particularly in epidemic areas where rapid diagnosis and isolation are crucial [12, 13]. This study aims to assess the common CT findings, patterns of lung involvement, and severity of disease in RT-PCR positive COVID-19 patients, contributing to better understanding and management of this pervasive disease.

Materials and Methods

This observational cross-sectional study was conducted at Dr. Kamakshi

Memorial Hospital, Chennai, from 2020 to 2021. The study included RT-PCR positive COVID-19 patients aged 18 to 95 years who presented to the fever clinic or COVID casualty and were referred to the radiology department for chest CT evaluation. Patients were excluded if they were pregnant, under 18 years, or refused consent.

Non-contrast chest CT scans were performed using a TOSHIBA Aquilion Lightening 16-slice CT machine. Scans were acquired in a single inspiratory breath-hold from the lung apex to the costophrenic angle. Images were reconstructed into 1 mm thick slices and viewed in both lung and mediastinal windows. CT findings were analyzed and reported by two experienced radiologists. Disparities in reports were resolved through consensus.

Patients were categorized into four groups based on the day of presentation since symptom onset: Group A (1-7 days), Group B (8-14 days), Group C (15-21 days), and Group D (22-28 days). The CT images were evaluated for types of lung opacities, laterality, pattern of distribution, lobar involvement, and additional findings. Severity of lung involvement was assessed using a CT severity score based on the percentage area involved in each lobe.

Results

Out of 349 patients, 213 (61%) were male and 136 (39%) were female, with a mean age of 47.7 years. Table 1 shows the distribution of CT findings among the four groups of COVID-19 patients shows significant variability. Group A, consisting of patients in the first week of illness, had 22% with normal CT scans, 52% with ground-glass opacities, and lower incidences of other findings. Group B, patients in the second week, exhibited a reduction in normal CT scans to 9%, with a slight increase in ground-glass opacities (57%) and other findings. Group C, representing the third week of illness, showed a further decrease in normal CT scans (10.6%), with increased crazy paving (17.3%) and reticulation (14.6%). Group D, patients in the fourth week, had similar levels of normal CT scans (10.8%) but significantly higher incidences of reticulation (24.3%) and ground-glass opacities (64%). The statistically significant result suggests a clear progression and evolution of lung involvement in COVID-19 patients as the disease advances, highlighting the importance of CT scans in monitoring and managing the disease over time.

The distribution of presenting symptoms among the four groups of COVID-19 patients (Table 2) shows significant variability. Group A, consisting of patients in the first week of illness, had the highest percentage of fever (77.3%) and cough (60.0%), with lower incidences of dyspnea (18.0%) and other symptoms. Group B, patients in the second week, exhibited a slight increase in symptoms like fever (83.0%) and cough (80.0%), with a significant increase in dyspnea (46.0%) and sore throat (30.0%). Group C, representing the third week of illness, showed the highest incidence of dyspnea (70.0%) and sore throat (40.0%). Group D, patients in the fourth week, had a significant reduction in fever (24.3%) but an increased percentage of reticulation (24.3%) and lower incidences of other symptoms. The result is statistically significant. This suggests that the progression and presentation of symptoms in COVID-19 patients vary significantly over the course of the disease, highlighting the importance of continuous monitoring and tailored management strategies for different stages of the illness.

Table 1. Distribution of study population according to presence of CT findings

Group	Normal CT	Ground-glass Density	Consolidation	Crazy Paving	Reticulation	Mixed GGO with Consolidation	CSV	P value
A (n=100)	22 (22%)	52 (52%)	10 (10%)	3 (3%)	1 (1%)	8 (8%)		
B (n=100)	9 (9%)	57 (57%)	12 (12%)	9 (9%)	2 (2%)	4 (4%)		
C (n=75)	8 (10.6%)	34 (45%)	6 (8%)	13 (17.3%)	11 (14.6%)	10 (13%)		
D (n=74)	8 (10.8%)	47 (64%)	4 (5.4%)	4 (5.4%)	18 (24.3%)	5 (6.7%)	58.36	<0.001

Table 2. Distribution of symptoms with respect to duration

Symptom	Group A (n=100)	Group B (n=100)	Group C (n=75)	Group D (n=74)	CSV	P value
Fever	77 (77.3%)	83 (83.0%)	67 (88.8%)	18 (24.3%)		
Cough	60 (60.0%)	80 (80.0%)	50 (67.0%)	37 (50.0%)		
Dyspnea	18 (18.0%)	46 (46.0%)	52 (70.0%)	24 (33.0%)		
Myalgia/Fatigue	52 (52.0%)	47 (47.0%)	34 (45.0%)	18 (24.0%)		
Sore Throat	15 (15.0%)	30 (30.0%)	30 (40.0%)	7 (10.0%)		
Headache	18 (18.0%)	20 (20.0%)	22 (30.0%)	11 (15.0%)		
Nausea/Vomiting	5 (5.0%)	10 (10.0%)	15 (20.0%)	9 (12.0%)		
Diarrhea	4 (4.0%)	9 (9.0%)	9 (12.0%)	6 (8.0%)		
Loss of Smell/Taste	12 (12.0%)	15 (15.0%)	7 (10.0%)	4 (6.0%)	68.3	<0.001

The distribution of severity of lung involvement among the four groups of COVID-19 patients shows significant variability (Table 3). Group A, consisting of patients in the first week of illness, had the highest percentage of mild cases (54%) and no severe cases (0%). Group B, patients in the second week, exhibited a similar percentage of mild cases (53%) but had a higher percentage of moderate (34%) and severe cases (5%). Group C, representing the third week of illness, showed a lower percentage of mild cases (32%) but the highest percentage of severe cases (24%). Group D, patients in the fourth week, had an intermediate percentage of mild cases (48.6%) and a lower percentage of severe cases (8.1%) compared to Group C.The severity of lung involvement in COVID-19 patients varies significantly over the course of the disease, with an increase in severity observed in the later stages of the illness. The results are statistically significant. However the distribution of lobar involvement among the four groups of COVID-19 patients shows mild variability but does not reach statistical significance.

The mean CT severity score increases from Group A (first week of illness) to Group C (third week of illness), indicating a progression in the severity of lung involvement as the disease advances. Group D (fourth week of illness) shows a slight decrease in the mean CT severity score compared to Group C, possibly indicating the beginning of a resolution phase or the effects of medical intervention. The differences in mean CT severity scores among the groups are statistically significant. This suggests that the severity of lung involvement, as measured by CT severity scores, varies significantly over the course of the disease highlighting the importance of monitoring CT severity scores to assess the progression and management of COVID-19 pneumonia (Table 4).

Table 3. Association between CTSS score and Duration

Group	Mild (CTSS < 8)	Moderate (CTSS 9-15)	Severe (CTSS > 15)	CSV	P value
A (n=100)	54 (54%)	24 (24%)	0 (0%)		
B (n=100)	53 (53%)	34 (34%)	5 (5%)		
C (n=75)	24 (32%)	25 (33.3%)	18 (24%)		
D (n=74)	36 (48.6%)	19 (25.6%)	6 (8.1%)	42.29	<0.001

Table 4. Association between CT severity and duration

Group	Mean CT Severity Score	Standard Deviation	F value	P value
A (n=100)	4.9	4.1		
B (n=100)	7.4	4.7		
C (n=75)	10.4	6.9		
D (n=74)	6.9	6.2	9.33	< 0.001

Discussion

This study provides a detailed analysis of CT findings in COVID-19 patients, highlighting the progression and patterns of lung involvement over the course of the disease. In the early stages (Group A), ground-glass opacities were the predominant finding, while later stages (Groups B and C) showed an increase in consolidation, crazy paving patterns, and reticulations. The findings align with previous studies that reported similar CT manifestations in COVID-19 patients [14-16]. Bilateral lung involvement with a peripheral and posterior distribution was common across all groups, with a notable lower lobe predilection. This distribution pattern is consistent with the literature, which emphasizes the typical peripheral subpleural involvement in COVID-19 pneumonia [17].

The predominant findings of ground-glass opacities and their peripheral distribution align with the results of previous studies by Yoon et al. [18] and Cheng et al. [19], which reported similar CT features in COVID-19 patients. The observed progression from ground-glass opacities to crazy paving and reticulation patterns corresponds with findings from Wang et al. [20], indicating a typical temporal evolution of CT changes in COVID-19 pneumonia.

The presence of bilateral involvement and lower lobe predilection is consistent with the systematic review by Ojha et al. [21], which found a high incidence of bilateral and peripheral lung involvement. The occurrence of consolidation and mixed patterns, particularly in the second and third weeks of illness, parallels the findings of Zhao et al. [22], who noted similar patterns in their multicenter study.

The study also corroborates the high sensitivity of chest CT in detecting COVID-19 pneumonia, as demonstrated by Ai et al. [12], who reported a sensitivity of 97% for chest CT compared to RT-PCR. This emphasizes the utility of chest CT as a rapid and effective diagnostic tool, especially in epidemic settings where timely isolation and treatment are critical.

In comparison to early-phase disease, the advanced-phase disease was characterized by increased frequencies of consolidation, crazy paving patterns, and reticulation. This pattern of progression from ground-glass opacities to more complex lesions has been observed in other studies, such as those by Pan et al. [23] and Xu et al. [24], supporting the notion that CT findings can provide valuable insights into

the temporal evolution of lung involvement in COVID-19 patients.

Moreover, the severity of lung involvement as assessed by the CT severity score (CTSS) in this study showed a clear correlation with the clinical severity of the disease. Similar correlations between CTSS and clinical severity have been reported by Francone et al. [25] and Li et al. [26], suggesting that CTSS could be a useful parameter for risk stratification and management of COVID-19 patients.

Conclusion

This study highlights the critical role of chest CT in monitoring the progression of COVID-19 pneumonia. The findings demonstrate a clear temporal evolution of lung involvement, from ground-glass opacities in the early stages to more complex patterns such as crazy paving and reticulation in later stages. The significant correlation between CT severity scores and clinical severity underscores the potential of CT as a valuable tool for risk stratification and management of COVID-19 patients. These insights can aid clinicians in making informed decisions regarding patient care. Future research with larger sample sizes and longitudinal follow-up will be essential to further validate these findings and explore the long-term implications of COVID-19 on lung health.

Statements and Declarations

Conflicts of interest

The authors declares that they do not have conflict of interest.

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Human and animal rights

This article does not contain any studies with human participants or animals performed by any of the authors.

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ORIGINAL ARTICLE

Comparison of Different Hemodialysis Frequencies per Week on Adequacy Parameters Including Electrolytes in Patients on Chronic Hemodialysis

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Abstract

Introduction: Due to the limitations in finding the right donor, the majority of patients with renal failure (chronic kidney disease stage 5) are treated with hemodialysis. In literature, we have extensive evidence of different hemodialysis prescriptions based on different frequencies per week and duration of each session. We tried to assess the impact of different hemodialysis frequencies on the adequacy of dialysis based on nutritional parameters, electrolyte imbalances and quality of life (QoL) parameters. **Material and Methods:** It was a single center, prospective, observational study conducted over three consecutive months on patients on hemodialysis and their biochemical, and QoL parameters were recorded. We could enroll 29 patients for this study. The objective was to assess the effect of different hemodialysis frequencies per week on hemodialysis adequacy parameters and QoL indices. **Results:** The baseline characteristics were uniform with respect to age (p=0.761) and commonly associated co-morbidities like obesity (BMI p=0.971), hypertension (p=0.927), diabetes mellitus (p=0.822). The serum albumin was observed to be similar in patients receiving either thrice weekly or twice weekly hemodialysis (p=0.736). The URR and kt/v were marginally higher in patients receiving thrice weekly dialysis but with no statistical significance (p=0.938 for URR & p=0.615 for kt/v). **Discussion and Conclusions:** The biochemical indices of nutrition along with electrolyte imbalance and quality of life parameters observed with different frequencies of hemodialysis per week were identical over three consecutive months.

Keywords: Dialysis adequacy, dialysis frequency, dialysis nutrition

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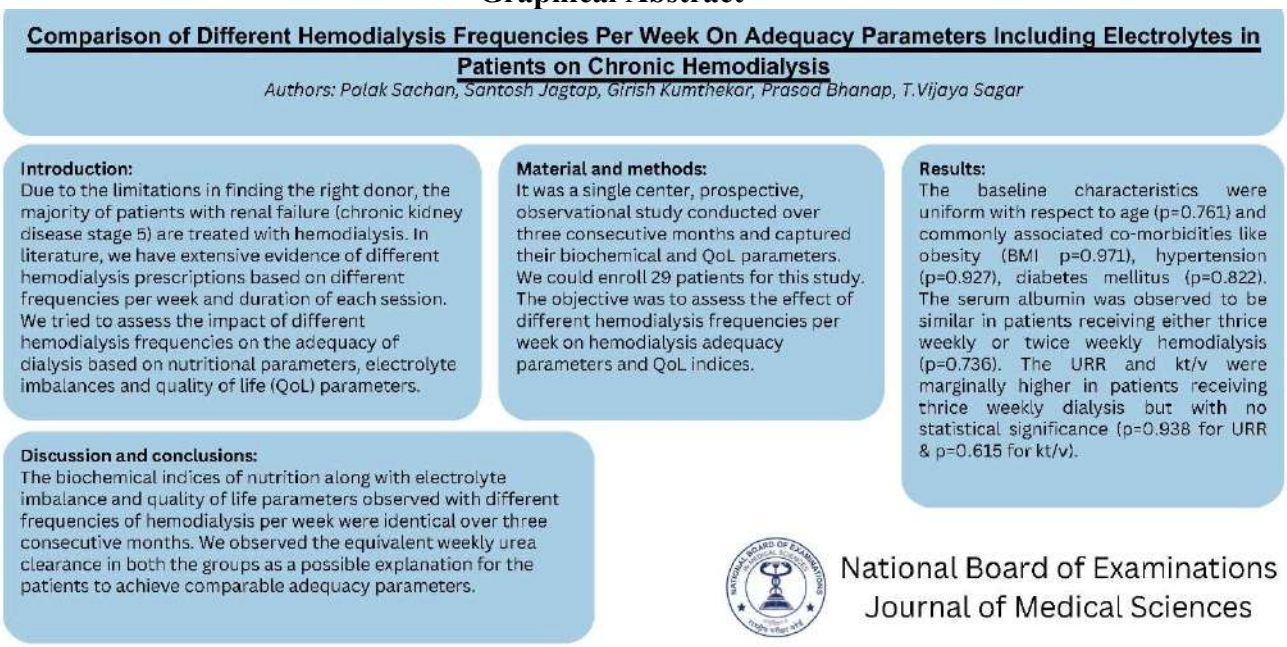
Graphical Abstract



Abbreviations

CKD - Chronic Kidney Disease
ESRD- End Stage Renal Disease
URR- Urea Reduction Ratio
Kt/V- (Daughards formula) where k is dialyzer clearance, t is time and V is distribution volume of urea
RKF- Residual kidney function
QoL- Quality of Life
HD- Hemodialysis
MHD- Maintenance Hemodialysis
NKF-KDOQI - National kidney foundation-kidney disease outcomes quality initiative
MH-Mental Health
PS- Psychological Health
PH- Physical Health
KID- Kidney Induced Diseases

Introduction

Kidneys are responsible for maintaining electrolyte and fluid balance in the body and removal of toxic waste products. Injury to kidneys results in derangements in electrolytes and fluids due to accumulation of uremic toxins. Uremic Syndrome is a result of accumulation of fluid and substances normally excreted by the kidney.

Patients suffering from renal failure Chronic kidney disease (CKD 5) are treated with hemodialysis, peritoneal dialysis or kidney transplantation. Due to the limitations of finding the right donor most of the patients are receiving chronic hemodialysis [1]. Since the beginning, hemodialysis therapy has two essential goals: to control the signs and symptoms of uremia and rehabilitation. de Palma et al. defined hemodialysis as adequate when it allows a satisfactory nutritional intake, be fully rehabilitated, maintains normal blood pressure and hemoglobin levels and prevents neuropathy.

Hemodialysis is a procedure to remove waste products and water from the blood with the help of a dialysis machine and

a dialyzer. The therapy is given to patients with a glomerular filtration rate of less than 15 ml/min which is also known as CKD stage 5 or end stage renal disease (ESRD). Hemodialysis is an approach to provide patients with a stable life to ensure total physical, social, and mental well-being. In literature, we have extensive evidence of different hemodialysis prescriptions of different frequencies i.e. once/twice /thrice a week or daily and durations i.e. 3/4/5 hours. It is a therapy to support the metabolic needs of the patient's body. Hemodialysis adequacy is paramount in achieving desired goals. The adequacy parameters commonly used are hemoglobin concentration, urea concentration, URR (Urea Reduction Ratio), and Kt/V.

Three hemodialysis sessions are usually the most common method adopted at most dialysis centers. It is presumed that more frequent dialysis per week leads to better adequacy parameters and higher quality of life indices in these patients. Various studies in the United States and Germany have drawn an association between shorter dialysis periods and poorer results [2-4]. Urea Reduction Ratio (URR), is the measure of proportionate reduction in the level of blood urea nitrogen over the process of hemodialysis.

The National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) 2015 guidelines recommended a target single pool Kt/V (spKt/V) of 1.4 per hemodialysis session for patients treated thrice weekly (minimum delivered spKt/V of 1.2). For hemodialysis schedules other than thrice weekly, NKF-KDOQI suggested a target standard Kt/V of 2.3 volumes per week (minimum delivered dose of 2.1). These calculations must be based on the contributions of ultrafiltration and residual kidney function for individual patients. NKF-KDOQI suggested in-center short frequent hemodialysis as an alternative to conventional in-center thrice weekly hemodialysis based on patient preferences, quality of life (QoL) indices and clinical benefits, and the risks involved [12].

The objective of this study is to assess hemodialysis therapy adequacy based on the adequacy parameters rather than adopting empirical dialysis prescription for all patients. The study also aims to identify the problems affecting the treatment and thereby affect the adequacy parameters and the frequency and duration of therapy.

Material and Methods

The present study was a single center, prospective, observational study carried out over a period of 3 consecutive months. The study involved patients receiving hemodialysis treatment at the dialysis unit of Symbiosis University Hospital and Research Centre in Pune, Maharashtra, India for more than three months. We selected the target population based on those fulfilling the inclusion criteria of the study. We analyzed records for three consecutive months i.e. June, July, and August of 2022. We followed the patients for 3 consecutive months and captured the biochemical and QoL parameters. We could enroll 29 patients for this study.

Primary objective:

To evaluate the effect of hemodialysis frequency per week on hemodialysis adequacy parameters and QoL indices.

Secondary objectives:

1. To assess the well-being of hemodialysis-dependent patients with differing dialysis frequencies.
2. To assess electrolyte imbalances (sodium, potassium, chloride, calcium, phosphorus) in patients receiving different duration and frequencies of hemodialysis.

Inclusion criteria:

1. hemodialysis-dependent patients above the age of 18 years and undergoing hemodialysis for more than 3 months.

Exclusion criteria

1. Patients below the age of 18 years
2. Patients not consenting to participate and uncooperative patients.

Data was collected via Google sheets. We used Quality of life (KDQOL ™ - 36) questionnaire for assessing the quality of life score (QoL). Continuous variables were represented as mean and standard deviation where data follows the normal distribution, or median with range. Categorical variables are represented as mean, frequency and percentage. The statistical significance of the difference in the outcome variables between the groups was Fisher exact test, chi-square test, t-test, and ANOVA. We analyzed data using the SPSS program.

Approval from the Independent Ethics Committee (IEC) of Symbiosis International University (SIU) was taken before starting the study (Reference Number: SIU/IEC/425). Informed consent was taken from the patients participating in the study at time of filling the questionnaire for assessing their quality of life (QoL) and calculating QoL score. Out of the 5 possible ways of doing chronic maintenance dialysis, we included twice a week 4 hours HD and thrice a week 4 hours HD for the present study. Standard eKt/V was calculated using the Daugirdas formula. Out of the total 29 patients, those receiving twice a week (2/7) dialysis were 12 and thrice a week (3/7) dialysis were 17 (Table 1).

Results

Table 1. Baseline features of patients on chronic hemodialysis (CKD stage 5D).

Dialysis Frequency	**2/7(4 hours)**		**3/7(4 hours)**		**P value**
AGE (Mean ± SD)	51.00±16.398		52.76±15.073		0.761
GENDER Male(M) Female(F)	M(8)	F(4)	M(14)	F(3)	0.403
BMI (Mean ± SD)	24.483 ±4.2065		24.431±3.3775		0.971

DIABETES MELITUS	8	12	0.822
HYPERTENSION	9	13	0.927
Dialysis Vintage (Mean ± SD)	38.636 ± 7.991	40 ± 18.303	0.285
Residual Kidney Function (Mean ± SD) ml/min	15.217 ± 11.633	6.909 ± 6.59	0.0185

M: Male
F: Female
SD: Standard deviation
BMI: body mass index

We could categorize patients based on dialysis frequency and session length. Patients were receiving either twice weekly or thrice weekly dialysis with 4 hours as a uniform dialysis session length. The baseline characteristics were uniform with respect to age (p=0.761) and commonly associated co-morbidities like obesity (BMI p=0.971), hypertension (p=0.927), diabetes mellitus (p=0.822).

The vintage dialysis was identified as time spent on chronic maintenance hemodialysis in months. We found that patients with thrice weekly hemodialysis (40 months) had similar dialysis vintage compared to those having twice weekly hemodialysis (38.6 months).

Residual kidney function (RKF) in patients with end-stage renal disease (ESRD) undergoing hemodialysis (HD) therapy is the ability of the native kidneys to excrete water and uremic toxins. We observed lower RKF in patients requiring thrice weekly dialysis (6.90 ml/min) and higher RKF in patients on twice weekly hemodialysis (15.21 ml/min). These observations were registered in those patients with a native kidney output of 100 ml/day or more. We observed these observations being statistically significant (p=0.01) (Table 2).

Table 2. Nutritional adequacy parameters

Dialysis Frequency		2/7(4 hours)	3/7(4 hours)	P value
Hemoglobin (Mean ± SD)	1 ST MONTH	8.675±1.9864	9.700±2.2564	0.217
	2ND MONTH	8.767±2.1296	10.275±2.0773	0.071
	3RD MONTH	8.950±1.807	10.013±2.68	0.168
Albumin (Mean ± SD)	1 ST MONTH	3.133±0.916	3.200±0.589	0.736
	2ND MONTH	3.267±0.379	3.194±0.493	0.673
	3RD MONTH	3.225±0.4413	3.131±0.5986	0.652

SD: Standard deviation

We observed higher hemoglobin in patients receiving thrice-weekly hemodialysis compared to those receiving twice-weekly hemodialysis. This was seen in all the three months follow up (p=0.071). The serum albumin was observed to be similar in patients receiving either thrice weekly or twice weekly hemodialysis (p=0.736) (Table 3).

Table 3. Urea clearance in different categories of patients on maintenance hemodialysis

Dialysis Frequency		2/7(4 hours)	3/7(4 hours)	P value
URR (Mean ± SD)	1 ST MONTH	0.6950±0.8555	0.712±0.06865	0.553
	2ND MONTH	0.6900±0.11394	0.7035±0.05809	0.678
	3RD MONTH	0.7017±0.10008	0.7047±0.10308	0.938
Kt/V (Mean ± SD)	1 ST MONTH	1.7808±0.34447	1.9519±0.39482	0.242
	2ND MONTH	1.9033±0.49778	1.9694±0.36439	0.688
	3RD MONTH	1.8500±0.39655	1.9318±0.44579	0.615

SD: standard deviation; URR: Urea reduction ratio; Standard Kt/V: K – standard, t – time spent on dialysis, V – Volume removed on dialysis (measure of ultrafiltration)

Urea kinetic modeling is a commonly used tool to assess the dialysis adequacy to clear small molecular uremic toxins. Standard Kt/V was calculated using various parameters. Urea clearance is also postulated to be higher in patients receiving more frequent dialysis translating into higher urea reduction ratio (URR) and higher kt/v. We observed near equivalent urea clearance with twice and thrice weekly MHD. The URR and kt/v were marginally higher in patients receiving thrice weekly dialysis but with no statistical significance (p=0.938 for URR & p=0.615 for kt/v) (Table 4).

Table 4. Patient generated quality parameters in different categories of patients on maintenance hemodialysis

Dialysis Frequency	2/7(4 hours)	3/7(4 hours)	P value
QoL (MEAN±SD) PH	63.2738±14.92340	62.9174±16.64324	0.951
QoL (MEAN±SD) MH	53.6111±11.63958	57.5327±12.03530	0.194
QoL (MEAN±SD) KID	73.1720±4.58490	70.7116±5.84387	0.117
QoL (MEAN±SD) PS	66.2868±8.10503	66.4430±10.85596	0.483
QoL (MEAN±SD) Total	64.0859±8.64886	64.4012±8.01651	0.920

MH-Mental Health
PS- Psychological Health
PH- Physical Health
KID- Kidney Induced Diseases
QoL- Quality of Life
SD: Standard deviation

We assessed scores of patient generated quality of life indices (QoL) using the Kidney Disease and Quality of life (KDQOL ™ - 36) questionnaire and compared the QoL score among patients receiving twice and thrice weekly dialysis. We found identical scores in all the four domains of the QoL questionnaire (p=0.920). In the domain of mental health (MH), patients receiving thrice weekly dialysis had higher scores (57.53) but it was found not to be statistically significant (p=0.194) (Table 5).

Table 5. Electrolyte disturbances in different categories of patients on maintenance hemodialysis

Dialysis Frequency		2/7(4 hours)	3/7(4 hours)	P value
CALCIUM (Ca) mEq/L	1 ST MONTH	7.913±1.1243	8.500±1.10480	0.240
	2ND MONTH	7.860±1.1472	8.200±0.6772	0.360
	3RD MONTH	8.300±1.16858	8.369±0.6829	0.884
POTASSIUM (K) mEq/L	1 ST MONTH	5.222±1.1077	5.231±0.6824	0.982
	2ND MONTH	5.509±0.8215	5.347±0.8733	0.635
	3RD MONTH	5.575±1.1913	5.219±0.6921	0.361
CHLORIDE (Cl) mEq/L	1 ST MONTH	106.11±2.713	103.31±3.816	0.073
	2ND MONTH	104.73±3.409	102.13±3.461	0.070
	3RD MONTH	105.00±3.891	102.25±3.357	0.086
SODIUM (Na) mEq/L	1 ST MONTH	137.78±3.153	135.54±3.072	0.112
	2ND MONTH	135.82±2.960	134±3.359	0.165
	3RD MONTH	135.25±3.359	134.38±2.986	0.517
PHOSPHORUS (P) mEq/L	1 ST MONTH	4.837±1.6422	4.823±1.5589	0.984
	2ND MONTH	4.520±1.5526	4.781±1.6857	0.696
	3RD MONTH	4.545±1.2832	4.856±1.6717	0.608

Electrolyte imbalance is a commonly encountered situation in patients undergoing dialysis. We tried to assess the extent of abnormalities in commonly measured electrolytes like sodium, potassium, chloride, phosphorus and calcium. The calcium levels were higher in patients belonging to thrice weekly dialysis compared to patients belonging to twice weekly dialysis. This association was not statistically significant (p=0.884). Potassium levels were near identical on all the three occasions among patients belonging to either group (p=0.361). Chloride levels were lower in patients receiving thrice weekly dialysis compared to patients receiving twice weekly dialysis. We observed higher phosphorus levels in patients belonging to thrice weekly dialysis than patients on twice weekly dialysis on all the three occasions. Nonetheless, this association was not observed to be statistically significant (p=0.608).

Discussion

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) are important global health issues with prevalence of 11–13% and 0.1% respectively [7]. The definition of CKD is based on the presence of kidney damage (i.e. Albuminuria) or decreased kidney function (i.e. Glomerular filtration rate <60 mL/min/ 1.73 m2) for 3 months or more. The term “end- stage renal disease” (ESRD) generally refers to CKD stage 5 treated with either dialysis or transplantation. Standard hemodialysis (HD) consists of three sessions a week with a duration of about four hours per session. Patients receiving chronic hemodialysis treatment have high hospitalization rates associated with higher mortality and morbidity. The age-adjusted incidence rate of ESRD in India has been estimated to be 229/million population [8]. The survival rates have not improved in this group of patients due to multiple issues which includes inadequacy and unavailability of renal replacement therapies [9,10].

Quality of Life

Likewise, the patient QoL indices could not follow the expectations set by the massive burden of resources required for managing CKD patients on dialysis. Previous studies showed a poorer QoL in patients with ESRD than those with other chronic diseases including cancer [13].

Hemoglobin and serum albumin are commonly used nutritional parameters to assess dialysis adequacy. It has been proven that an adequate dialysis improves appetite, reduces systemic inflammation, mitigates bone marrow suppression and erythropoietin resistance. An adequate dialysis improves anemia due to preventing GI blood loss and sequestration of iron under the influence of hepcidin [14].

Patients with higher frequency HD per week would have an improved QoL due to better nutritional intake [11]. The shorter intradialytic period and longer dialysis duration observed during HD could be expected to alleviate the complications of malnutrition to a certain extent, thus making the patient more functional, which contributes to an objectively improved QoL.

This study compared two categories of patients receiving maintenance hemodialysis. It included patients with twice weekly dialysis and thrice weekly dialysis.

We expected that the patients receiving more frequent dialysis (thrice weekly) would have better clearance of phosphate, urea and potassium. This was as per the prevailing logic of more dialysis translating into higher clearance rates. Consequently, higher clearances of small molecules like urea and electrolytes would translate into better quality of life (QoL) indicators. If we would put everything together, more frequent dialysis would also generate better nutritional parameters in these patients. But, this traditional thinking was not supported in our study.

Electrolytes

We observed equivalent serum levels for phosphorus (p=0,69), potassium (p=0.982) and calcium (p=0.884) in patients who received twice weekly and thrice weekly hemodialysis. The small molecule urea was used to measure dialysis adequacy. The dialysis adequacy was identical for both groups with the urea reduction ratio (p=0.678) and Kt/V (p=0.688) not being statistically different. The mean URR calculated for twice weekly dialysis (0.69) and for thrice weekly dialysis (0.70) were found to be nearly identical. Similar observations were made for Kt/V in twice weekly (Kt/V 1.8) and thrice weekly (Kt/V 1.9) dialysis.

Urea Clearance

As the weekly urea clearance and electrolyte levels were similar, the nutritional parameters were also near similar in these two groups. We found a slightly elevated hemoglobin in patients who received thrice weekly dialysis in the second month of follow up (p=0.071) but it was not statistically significant. In the first (p=0.21) and third month (p=1.68) the hemoglobin levels were nearly the same in patients who received either frequency of dialysis. We also measured serum albumin as a nutritional parameter in both the groups. The mean serum albumin in patients who received twice weekly dialysis was 3.13 gm% and 3.20 gm% in those on thrice weekly dialysis (p=0.67).

It is a well-known fact that better nutrition and small molecular clearances reflect in better quality of life (QoL) for patients on chronic hemodialysis. We tried to capture the QoL indicators in three consecutive months of the study. We could use a well validated scale using physical health, mental health and personal health included into the questionnaire. It indicated a nearly equivalent QoL in both the groups.

Thus, the two different frequencies of dialysis per week had no effect on the nutritional status, Quality of Life indices (QoL) and clearance parameters. The age groups, gender distribution and BMI were identical (p=0.76, p=0.40, p=0.97 respectively) to nullify a selection bias**.** This could be a thought provoking exercise for larger trials comparing the thrice and twice weekly dialysis schedules head-on. Although we had a smaller sample size, we presumed the equivalent weekly urea clearance in both the groups rendered the patients achieve comparable adequacy parameters.

Residual Kidney Function

Residual kidney function (RKF) is less frequently used for haemodialysis (HD) patients in routine clinical care. Residual

kidney function (RKF) in dialysis patients is defined by the ability of the native kidneys to excrete water and uremic solutes [15]. We observed that the patients with higher residual kidney function had lesser frequency of dialysis per week but equivalent QoL parameters, nutritional and electrolyte parameters. This prompted us to presume frequency of hemodialysis per week be based on the RKF provided the standard Kt/V remains at par with patients receiving higher frequency dialysis per week. We could not analyze interdialytic weight gain due to extensive intra- and interpersonal variations. The vintage dialysis was found to be almost identical in two groups and hence was not a statistically significant variable (p=0.28).

Conclusion

The biochemical indices of nutrition along with electrolyte imbalance and quality of life indices (QoL) in patients receiving different frequencies of hemodialysis per week were identical over three consecutive months. It indicated that nutritional indices and QoL indices were comparable irrespective of the frequency of hemodialysis per week. Different dialysis frequencies per week with near identical small molecular clearance (kt/v & URR) correlated with identical nutritional and QoL indices. Patients with higher residual kidney function had the similar benefits of thrice-weekly dialysis possibly due to similar small molecular clearances (std Kt/V).

Limitations

Small sample size could be a limitation for the present study though it could prove useful as a pilot study.

Future Research Recommendations

We recommend having a higher sample size to look into interactions between residual kidney function and urea kinetic modeling. This might shed some light on prescribing dialysis based on residual kidney function as a standard of care. It could be interesting to assess the effect of middle molecular weight uremic toxins clearance by the native kidneys contributing to lesser requirement of hemodialysis for individuals with higher RKF.

Conflicts of interest

The authors declares that they do not have conflict of interest.

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ORIGINAL ARTICLE

Pre-Operative and Post-Operative Breast Volume Measurement: Predicting Residual Breast Tissue and Cancer Recurrence: A Pilot Study

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Abstract
This cross-sectional observational study aimed to correlate preoperative breast volume with mastectomy specimen volume to predict residual breast tissue and cancer recurrence. Fifty female patients with unilateral breast carcinoma undergoing mastectomy were included. Preoperative volume was measured anthropometrically using a specific formula, while postoperative volume was assessed by water displacement (Archimedes principle). Volumes ranged from 220 cc to 820 cc, with postoperative measurements being more accurate. A significant correlation was found between the two methods ($p<0.05$). The findings suggest that accurately measuring the mastectomy specimen volume can help in determining residual breast tissue and assessing the risk of cancer recurrence.

Keywords: Breast volume, Carcinoma breast, Mastectomy, Recurrence

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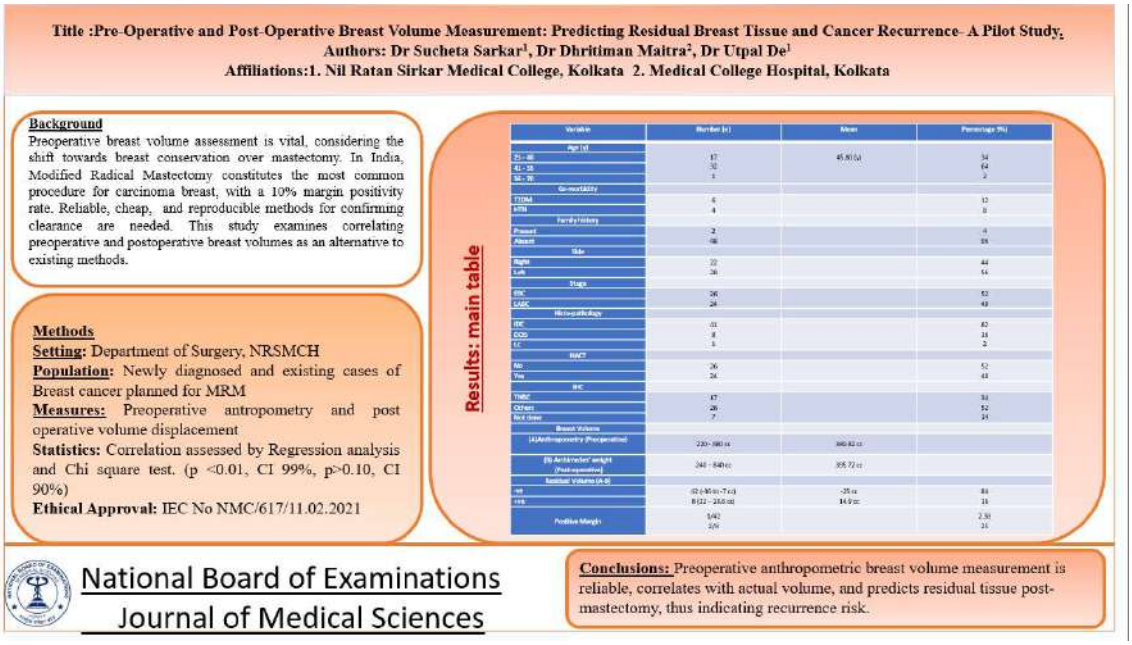
Graphical Abstract



Introduction

Preoperative breast volume assessment is crucial for all breast surgeries, especially with the shift from mastectomy to breast conservation and reconstruction [1]. In India, most breast surgeries address carcinoma, with Modified Radical Mastectomy (MRM) being the most common [2]. Ensuring complete removal of breast tissue is essential to prevent local recurrence, but due to the breast's unencapsulated nature, achieving total excision can be challenging, resulting in a 10% margin positivity rate [3]. Limited access to frozen sections necessitates a reliable method for confirming adequate clearance. Comparing preoperative anthropometric measurements of the diseased breast with the postoperative specimen volume offers a dependable, cost-effective, quick, and reproducible solution. This study aims to examine the correlation between preoperative breast volume estimates using anthropometry and the actual specimen volumes in MRM patients, measured by volume displacement.

Patients and Methods

A cross-sectional observational study was conducted in the Department of General Surgery in a tertiary referral centre after approval by the Institutional Ethics Committee. Fifty female patients, aged 25 to 80 years, diagnosed with unilateral sporadic breast carcinoma (BC) and attending the surgery outpatient department between December 2020 and February 2022, were included in the study. This encompassed both newly diagnosed and existing cases, regardless of stage or neo-adjuvant treatment, all planned for MRM and willing to give consent. Bilateral, recurrent, and familial BC were excluded. Patients with pregnancy and breast cancer, male breast cancer, bilateral breast cancer, hereditary breast cancer, and patients willing to undergo breast conservation and oncoplastic reconstruction were also excluded from the

study. Data was collected on a predesigned and pretested standard case record form.

In the preoperative setting, breast volume measurement was done by the anthropometric method using the formula (Vpre) = 1/3 × π × MP² × (MR + LR + IR –MP) [5], where V_{pre} is the preoperative volume, MP is the mammillary projection, MR is the medial radius of the breast, LR is the lateral radius of the breast, and IR is the inferior radius of the breast. The measurements were taken with a Vernier calliper in a warm room with subjects in an erect position with arms placed by their sides. To increase the reproducibility of the data, all the measurements were taken by two investigators, and the average of these measurements was taken for each subject (Figure 1).

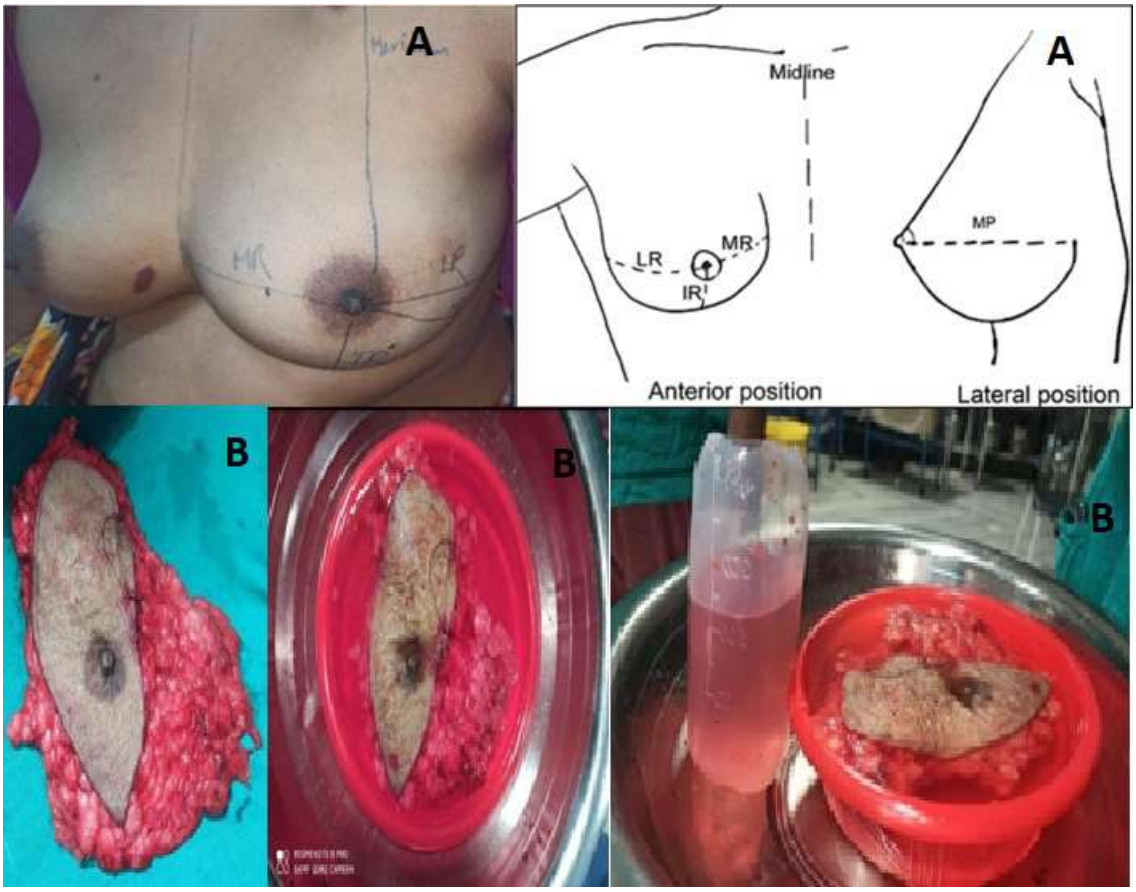


Figure 1. **A**: Anthropometric measurement of breast volume; **B**: Postoperative breast specimen volume measurement by liquid displacement

In the postoperative setting, a small vessel filled with water was placed inside a larger, empty vessel. The specimen of the mastectomy was submerged completely in the water contained in the smaller vessel. The volume of water displaced by the specimen of the mastectomy was measured, which revealed the actual postoperative volume (Vpost) of the excised breast (Figure 2).

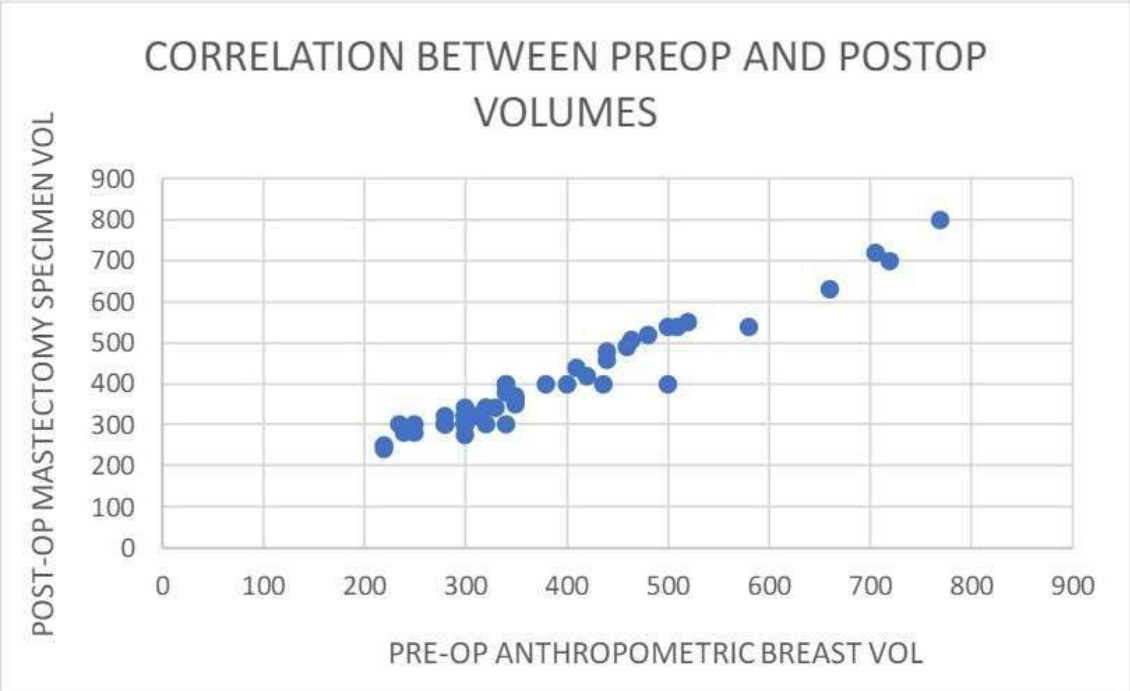


Figure 2. Correlation between preoperative and postoperative breast volumes

Residual breast tissue (V_{res}) left after mastectomy was estimated by subtracting post-operative volume from pre-operative volume (Vres = Vpre – Vpost)

The collected data was compiled using a Microsoft Excel worksheet. The preoperative and postoperative breast volumes were evaluated based on the mean and standard deviations. The correlation was studied by regression analysis. For other correlations, a chi square test was performed and a p value was calculated. For a p-value <0.01, the confidence interval was 99%, and for a p-value < 0.10 confidence interval was 90% (Table 1).

Results

Fifty female patients in the age range of 25 to 80 years with unilateral breast cancer, irrespective of stage, and planned for MRM were selected as study participants. Seventeen (34%) patients were aged 25–40 years, 32 (64%) were in the age group 41–55 years, and 2% (1 patient) were between 56–70 years, respectively. The youngest patient was 27 years old, and the oldest patient was 65 years old. Twenty six (52%) patients had early breast cancer, 24 (48%) patients had locally advanced breast cancer. Twenty four patients with locally advanced breast cancer received neoadjuvant chemotherapy (NACT) to downstage the tumour and qualify for modified radical mastectomy (MRM)

Table 1. Table showing demographic profile and variables of the patients (n=50)

Variable	Number (n)	Mean	Percentage 9%)
Age (y)			
25 - 40	17	45.80 (y)	34
41 - 55	32		64
56 - 70	1		2
Co-morbidity			
T2DM	6		12
HTN	4		8
Family history			
Present	2		4
Absent	48		96
Side			
Right	22		44
Left	28		56
Stage			
EBC	26		52
LABC	24		48
Histo-pathology			
IDC	41		82
DCIS	8		16
LC	1		2
NACT			
No	26		52
Yes	24		48
IHC			
TNBC	17		34
Others	26		52
Not done	7		14
Breast Volume			
(A)Anthropometry (Preoperative)	220 - 880 cc	380.82 cc	
(B) Archimedes' weight (Post-operative)	240 – 840 cc	395.72 cc	
Residual Volume (A-B)			
-ve	42 (-36 to -7 cc)	-25 cc	84
+ve	8 (12 – 28.6 cc)	14.9 cc	16
Positive Margin	1/42 2/8		2.38 25

Only two (4%) patients had a positive family history of breast cancer. 41 (82%) patients were diagnosed with infiltrating ductal carcinoma (IDC), 8 (16%) had ductal carcinoma in situ (DCIS), and only 1 (2%) patient had lobular carcinoma. 10 patients had comorbidities, of which diabetes mellitus (DM) was present in 6 patients and hypertension (HTN) in 4 patients. Seven patients had triple negative breast carcinoma (TNBC).

The range of preoperative breast volumes measured anthropometrically was

220 cc to 820 cc (average 380.82 cc). The range of postoperative breast volumes was 240 cc to 840 cc (average 395.72 cc). The majority of patients (42, or 84%) had negative residual volumes in the range of –36 cc to –7 cc, indicating the specimen volume was greater than the estimated breast volume, and 8 (16%) patients had residual breast tissue (positive Vres) left after mastectomy. The mean residual breast tissue volumes were 14.9 cc, respectively.

The correlation between postoperative mastectomy specimen volume and preoperative anthropometric breast volume was significant ($p < 0.05$). The anthropometric method of breast volume measurement correlated with the water displacement method (using Archimedes' principle) in terms of accuracy ($p < 0.05$).

Two out of eight (25%) patients with positive Vres had positive margins compared to one out of 42 (2.38%) patients with negative Vres. All these patients underwent revision surgery with a negative margin on repeat histology. Chi-square test was performed to assess the correlation between residual breast volume and post-operative margin status ($p < 0.0135$). Hence, we can conclude that residual volume after mastectomy was associated with the margin status postoperatively. So, the less residual breast tissue there is after mastectomy, the higher the chances of a post-operative negative margin on histopathological examination. The patients were sent to medical oncology for further adjuvant treatment.

At one year follow-up, all the patients are doing well.

Discussion

Accurate breast volume measurement is crucial for effective breast reconstruction after cancer surgery and in benign breast conditions. [4,5,6]. With the increasing trend towards breast conservation and oncoplastic reconstruction, precise volume assessment is essential. Currently, surgeons often rely on visual estimation, which is subjective, unreliable, and prone to inter-observer variability [7]. This study evaluates the accuracy, reproducibility, and practicality of correlating preoperative breast volume measured by the anthropometric method with specimen volume using the volume displacement technique, addressing the need for a clinically useful, objective breast volume assessment method [8-10].

Since Modified Radical Mastectomy (MRM) remains the most common breast surgery in India (79.1%) [2, 5] and at our institute, we compared preoperative volume with specimen volume to assess the technique's completeness and potentially predict recurrence due to incomplete removal.

Our study found that preoperative and postoperative breast volume measurements can estimate residual breast tissue after a modified radical mastectomy, though the anthropometric technique often underestimates volume in hypertrophic breasts. Additionally, the volume displacement technique proved to be cost-effective and convenient.

The chi-square test showed a significant correlation between residual breast volume and postoperative margin status ($p < 0.01$), indicating that less residual tissue after mastectomy is associated with higher chances of a negative margin and reduced local recurrence.

Volumetric breast measurement in our study had two key findings: a) Anthropometric volume estimation accurately predicted breast volume, and b) The difference between preoperative anthropometric volume and postoperative specimen volume could predict positive margins. Additionally the study offers significant benefits by enhancing surgical precision, optimizing cosmetic outcomes, and reducing healthcare costs, particularly in settings where resources are limited. By providing an alternative to resource-intensive techniques and improving the planning and execution of breast conservation surgery, it supports better patient outcomes and advances in breast cancer treatment. The major drawback of our study was the small number of patients and short follow-up.

Conclusion

Preoperative anthropometric breast volume measurement is reliable, correlates with actual volume, and predicts residual tissue post-mastectomy, thus indicating recurrence risk.

Authors Contribution

The manuscript has been read and approved by all the authors and the requirements for authorship as stated in this document have been met, and each author believes that the manuscript represents honest work.

Ethical Approval

Ethical approval received from the institute. The number IEC No- NMC/ 617 dated 11.02.21

Conflicts of interest

The authors declares that they do not have conflict of interest.

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ORIGINAL ARTICLE

Prevalence of Posterior Capsular Rent in Mature Cataract During Manual Small Incision Cataract Surgery

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Abstract

Introduction: Manual small incision Cataract surgery (MSICS) is the most common intraocular surgery performed worldwide and has advanced technically in recent years. However, as in all surgeries, complications continue depending on the surgeon, surgical technique, and patient. In order to reduce the complications in cataract surgery, many studies have been carried out to detect ocular and systemic risk factors and to take precautions against them. **Materials and Methods:** Mature cataract patients who can perceive light or hand motion with preoperative vision make up the study population. Preoperative assessments, including comprehensive ophthalmic evaluations and demographic data collection, are performed for every patient who is enrolled. **Results:** Among the 60 cases that underwent manual small-incision cataract surgery, there were 13 instances of posterior capsular rent (PCR). In general, the people who had PCR were 63.86 years old. PCR happened for various reasons. **Conclusion:** The study found a notable occurrence of posterior capsular rent (PCR) in patients who underwent manual small-incision cataract surgery, with 13 cases out of 60 surgeries. Potential risk factors for PCR included phacodonesis, zonular dialysis, small pupils, a history of trauma, and high myopia. These findings demonstrate the significance of understanding and managing the risk factors for posterior capsular rent (PCR) in manual small incision cataract surgery to enhance patient safety and surgical outcomes.

Keywords: Manual small incision cataract surgery, Posterior capsular rupture, Mature cataract, Phacodonesis, Small pupil

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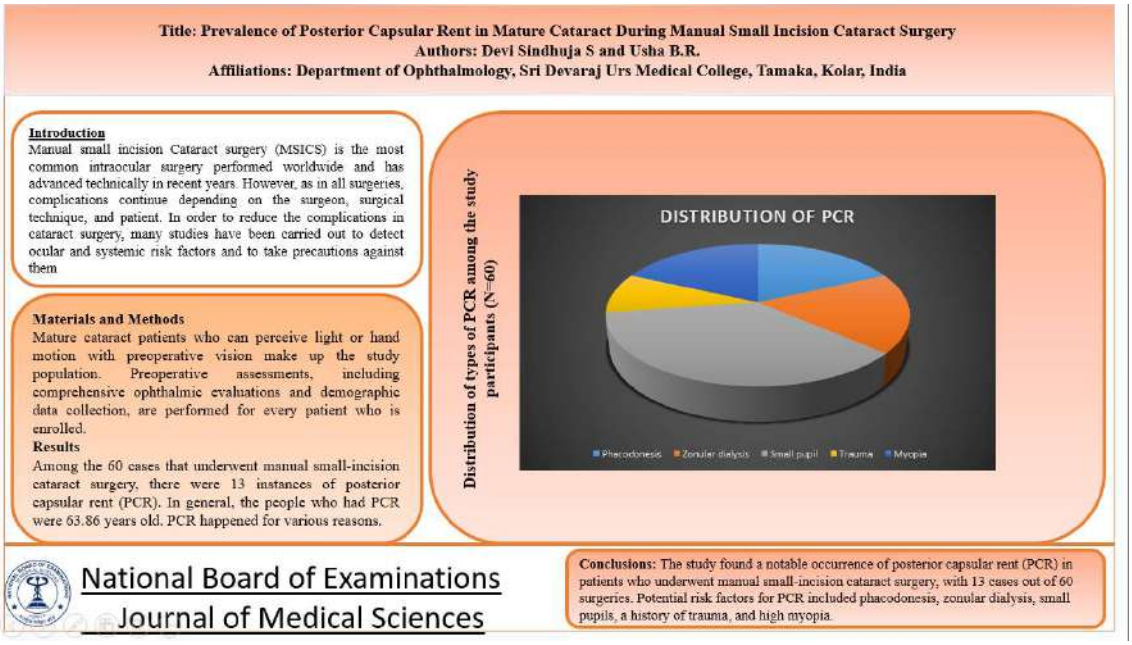
Graphical Abstract



Introduction

Manual small incision cataract surgery (MSICS) is one of the most frequently performed surgical procedures globally, significantly improving the quality of life for millions of patients each year. MSICS offers the benefit of a wound that seals itself without the need for sutures Given limited resources, MSICS has several advantages over phacoemulsification, including shorter surgery times, less reliance on high-tech equipment, and lower overall costs. A mature cataract, characterized by a completely opaque lens, poses additional challenges during surgery. The increased lens density and compromised zonular support in mature cataracts can make intraoperative management more difficult, raising the risk of posterior capsule rent (PCR) [1-3].

This complexity can result in a series of negative events, such as the loss of vitreous, the dropping of nuclei, and impaired visual outcomes, which in turn require additional surgical procedures and longer recovery periods. Surgery becomes more challenging when dealing with a mature cataract, which is identified by a lens that is completely opaque. A mature cataract can make intraoperative management harder because the lens is denser and the zonular support is weaker which can increase the risk of PCR. In addition, the risk of PCR increases in mature cataract surgery compared to normal cataract surgeries due to the absence of retroillumination, the fragile capsule, the obstruction of vision by liquefied cortical material, and the weak zonules [4] .With so many cases of PCR in older cataract patients, it is clear that careful planning and technique are needed during surgery to lower these risks [5].

Understanding the prevalence of PCR and identifying the risk factors

associated with it during mature Cataract surgery are crucial. As an example, it can help surgeons figure out which cases are high-risk and how to best treat them by changing their protocols and preoperative assessments Secondly, recognising the predictors of PCR can lead to the development of targeted interventions and training programmes aimed at reducing the incidence of this complication Lastly, having a thorough understanding of the prevalence of PCR can help healthcare professionals and patients set realistic goals, make better decisions, and provide better overall patient care. Our research aims to find out how common PCR occurs in mature cataracts during cataract surgery.

Material and Methods

This study employs a cross-sectional design to assess the occurrence rate of PCR during manual small incision cataract surgery (MSICS) in patients with fully mature cataracts. The institutional review board has granted ethical approval for the study. The purpose, methods, risks, and benefits of the study are explained to all participants before they provide their written consent.

The sample size is calculated based on the prevalence of PCR in mature cataracts, estimated at 10%. Using the formula for sample size calculation ($Z2aP(1-P)/L2Z^2$ α P (1-P)/ L2Z2aP(1-P)/L2), where ZZZ is the Z-value (1.96 for a 95% confidence level), a alpha is the significance level, PPP is the estimated prevalence, and LLL is the margin of error (5%). the sample size is determined to be 60 patients. The study is carried out for a duration of six months, providing ample time to enlist the necessary number of participants and gather extensive data on their surgical outcomes. The eligibility criteria for this study consist of adult patients who have mature cataracts and those who have preoperative vision at the level of hand motion or light perception.

The exclusion criteria encompass patients with immature cataracts and individuals with other notable ocular conditions such as glaucoma, diabetic retinopathy, or macular degeneration, as these factors could potentially complicate the study results. Once written informed consent is obtained from patients who meet the inclusion criteria, they are enrolled in the study.

Comprehensive preoperative assessments are conducted for all enrolled patients, including collecting demographic data and performing detailed ophthalmic evaluations. In the slit-lamp examination, pterygium, corneal scarring in the 6-mm central cornea, cornea guttata, leukoma adherence, posterior synechiae, presence of small pupil (pupil diameter ≤6 mm despite maximal pharmacologic dilation), presence of phacodonesis, degenerative disease of the vitreous (asteroid hyalosis, synchysis scintillans), and diabetic retinopathy in any eye were noted. Also, the risk factors were evaluated, including manifest sunken globe, strabismus (exotropia or esotropia >10 prism diopters misalignment), and history of trauma, glaucoma, and vitrectomy. Risk factors were determined according to whether PCR developed during the surgery or not.

Axial length (AL) of eyes assessed by using a 11-MHz probe of A-scan ultrasonography with applanation after instillation of proparacaine hydrochloride 0.5%. The mean values of these measurements will be retrieved from the patients medical records. All cases will be operated by same surgeon using manual small incision cataract surgery by making

superior 6mm sclerocorneal tunnel. Topical tropicamide 0.8% drops will be stilled preoperatively for pupil dilatation. There was either peribulbar or subtenon anaesthesia used in all of the surgeries. Patients undergo follow-up visits post-surgery to assess their final outcomes and address any potential post-operative complications. These follow-up visits are essential for assessing the short-term and long term success of the surgeries and managing any issues that arise postoperatively.

Results

Among the 60 cases that underwent manual small incision cataract surgery, there were 13 instances of PCR. The mean age of the patients who experienced PCR was 63.86 years. In general, the people who had PCR were 63.86 years old. PCR happened for various reasons. More precisely, PCR with phacodonesis was observed in two cases (15.38%), as did PCR with zonular dialysis in two cases (15.38%), and PCR with a tiny pupil was the most common, occurrence in six cases (46.15%). Furthermore, PCR with a history of trauma was found in one case (7.69%), while PCR wih extreme myopia was noted in 2 cases (15.38%) (Figure 1). Iris retractors were used in 6 cases (10%), capsular tension rings were used in 7 cases (11.6%). Two patients (15.3%) out of 13 PCR cases had sulcus IOL implantation, two (15.38%) underwent optic capture of IOL and one patient (7%) received iris claw IOL implantation.

These results highlight the diverse presentations and significant prevalence of PCR in mature cataract surgeries, emphasizing the need for careful intraoperative management and tailored surgical techniques to mitigate these risks. The age groups 45-75 years each accounted for 62% of the cases, showing a significant prevalence of PCR among middle-aged and early senior patients. About 51% of the patients had Type 2 Diabetes Mellitus (T2DM), while 49% had hypertension. This near-equal distribution suggests that both hypertension and T2DM are common comorbidities in patients undergoing cataract surgery and experiencing PCR.

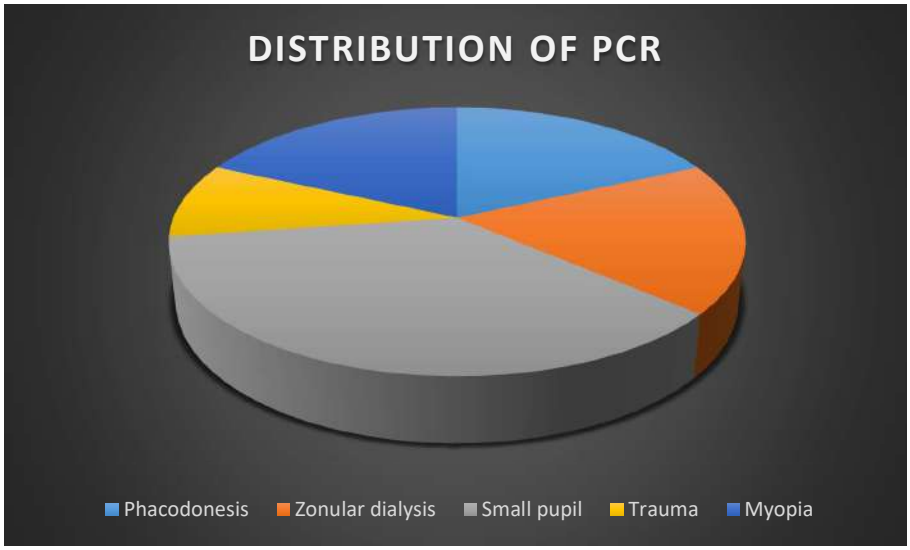


Figure 1. Distribution of types of PCR among the study participants (N=60)

Visual Outcome in Patients with and without PCR

Post operative day 1 vision in patients who underwent SICS without incidence of PCR was found to be good with 90% achieving >6/12 (Figure 2). Whereas in patients with PCR, Postoperative day 1 vision was low , with only 40% achieving >6/18 vision, and 54% of the individuals needed more than one topical drug and were started on oral steroids (Figures 3 and 4). During followup visits, vision improved to >6/12 in 90% of the patients with PCR.

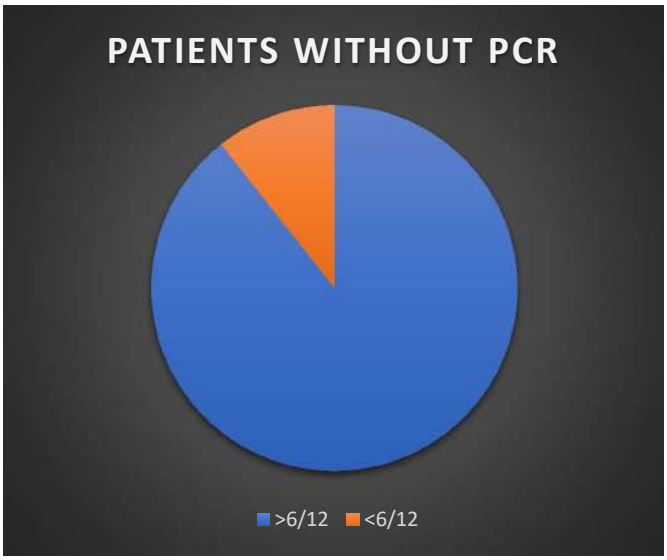


Figure 2. Visual Outcome in Patients without PCR

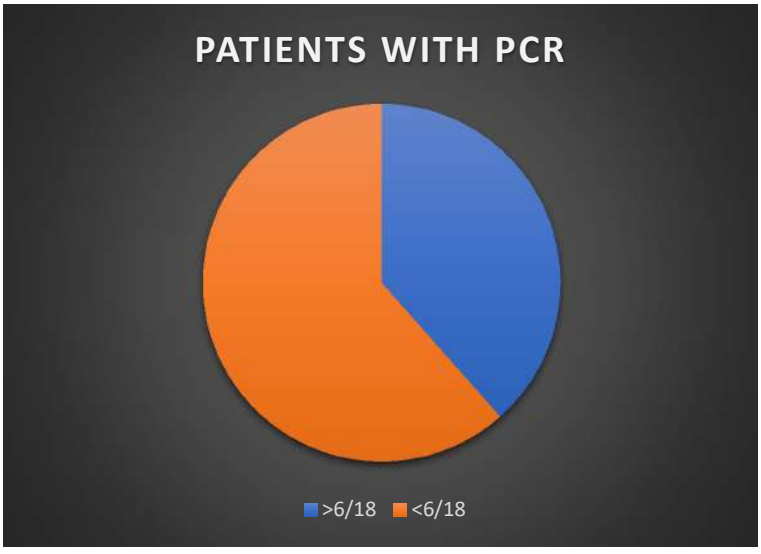


Figure 3. Visual outcome in patients with PCR

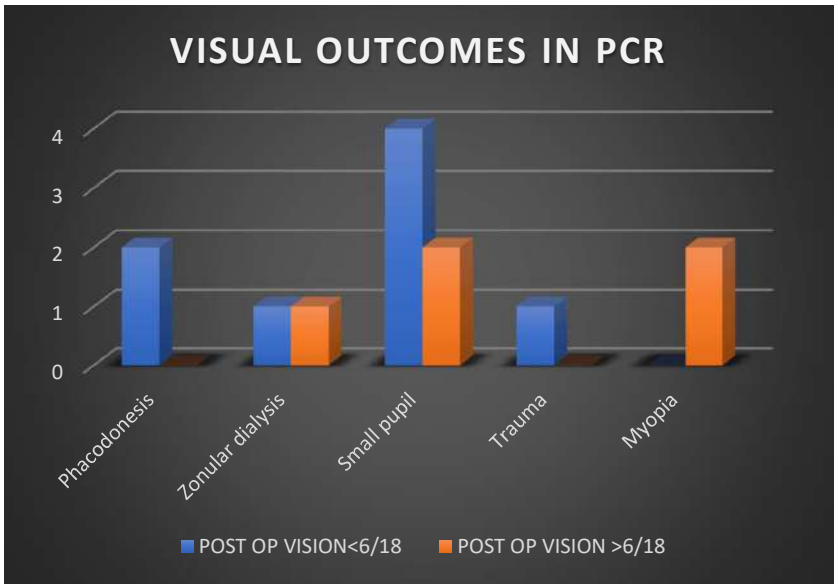


Figure 4. Visual outcome according to different causes of PCR

Discussion

The study found prevalence of posterior capsular rent (PCR) in patients undergo monial small in cataract surgery, with 13 cases observed out of a total of 60 surgeries This highlights the importance of understanding and managing this complication during cataract surgery. The mean age of patients experiencing PCR was 63.8 years. The finding suggests that age may be a factor influencing the risk of PCR, although further analysis would be needed to determine any significant correlation. The observed prevalence of PCR in this study is significant, as it underscores the inherent risks associated with cataract surgery particularly in patients with advanced cataracts. The fact that the mean age of patients with PCR was 63.8 years aligns with the typical age demographic for cataract surgery but also indicates that older patients may be at higher risk [7]. .Age-related changes in the lens and zonules, as well as comorbid conditions, might contribute to the increased susceptibility to PCR in this age group, PCR was observed in 2cases (15.38%) with phacodonesis, indicating a potential association between lens instability and PCR, Phacodonesis, which involves the trembling of wobbling of the lens, is a sign of zonular weakness or dehiscence. This condition complicate cataract surgery by making the lens more prone to movement during phacoemulsification, thereby increasing the risk of PCR. The significant occurrence of PCR cases with phacodonesis suggests that careful preoperative zonular fibers from their attachments, compromises the stability of the lens capsule. This can lead to an increased risk of PCR during cataract surgery as the mechanical forces exerted on the lens capsule can cause it to rupture more easily. Similarly PCR was observed in 2 cases wirh zonular dialysis (15.38%) Zonular dialysis has been linked to a number of negative outcomes, including early or late in-the-bag IOL dislocation and progressive asymmetrical capsular contraction, leading in IOL decentration. The strong correlation between zonular dialysis and PCR observed in this study

reinforces the need for surgeons to be vigilant in identifying and managing zonular weaknesses preoperatively. About 6 cases (46.15%) of PCR occurred in patients with a small pupil, suggesting that pupil size may contribute to the risk of PCR during surgery. A small pupil can limit the surgeon's view and access to the cataract, making it more challenging to perform manual small incision cataract surgery. Safety Techniques such as pupil expansion devices to dilate the pupil can help mitigate this risk. The high prevalence of PCR in patients with small pupils in this study highlights the necessity of addressing pupil size preoperatively to reduce the incidence of this complication [7].

PCR was noted in 1 case (7.69%) with a history of trauma, indicating that ocular trauma may predispose patients to PCR during cataract surgery. Previous ocular trauma can weaken the structural integrity of the lens capsule and zonules, making them more susceptible to rupture during surgery. The presence of a traumatic history as a risk factor for PCR suggests that thorough patient history and careful surgical planning are essential for these cases. Similarly, 2 cases (15.38%) of PCR were observed in patients with high myopia, which could be a potential risk factor for PCR High myopia is associated with elongation of the eyeball and thinning of the sclera and other ocular tissues, including the zonules. This anatomical alteration can increase the fragility of the lens capsule, making it more prone to rupture during cataract surgery. The association of high myopia with PCR in this study points to the need for special considerations and techniques when operating on myopic eyes.

Conclusion

The study found a notable occurrence of posterior capsular rent (PCR) in patients who underwent manual small-incision cataract surgery, with 13 cases out of 60 surgeries. Potential risk factors for PCR included phacodonesis, zonular dialysis, small pupils, a history of trauma, and high myopia. These findings demonstrate the significance of understanding and managing the risk factors for postoperative complications (PCR) in cataract surgery to enhance patient safety and surgical outcomes.

Statements and Declarations

Conflicts of interest

The authors declares that they do not have conflict of interest.

Funding

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CASE REPORT

Wu Type GRIA3 Mutation Associated X-Linked Syndromic Intellectual Developmental Disorder: A Case Report

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Abstract

Background: A Wu type X-linked syndromic intellectual developmental disorder is caused by mutations in the GRIA3 gene This disorder is characterised by autistic features, hyporeflexia, intellectual disability and facial dysmorphism. **Case report:** The patient, a 4 year old male child, came with chief complaints of runny nose and tooth ache for 5 days. There was a past history of frequent falls, myoclonic jerks, tongue fibrillation, shudder attacks and delayed developmental milestones. The child at presention did not have myoclonic jerks or frequent falls. Family history is significant for maternal aunt presenting with similar complaints. On examination, protruding tongue, depressed nasal bridge, high arched palate, short fingers, right eye divergent squint, cafe-au-lait spot on the right knee, deep tendon reflexes- sluggish on both upper and lower limbs, power of 3/5 and hypotonia was observed in all four limbs with plantar- extensor bilaterally. **Conclusion:** On DNA testing, a missense mutation of GRIA 3 gene was noted. He was treated on a multi-disciplinary approach and was admitted in a special school where occupational therapy, speech therapy, behavioural therapy and physiotherapy was given.

Keywords: Intellectual disability, Refractory seizure, delayed developmental milestones, multidisciplinary approach

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Introduction

Wu type X linked GRIA 3 mutation associated Intellectual Developmental Disorder is a rare, X-linked syndrome characterised by mild to severe ID caused by mutations in the GRIA3 gene (1).This disorder is characterised by autistic features, hypotonia, hyporeflexia, ID and facial dysmorphism [1]. The phenotype is X-linked recessive. In some cases, GRIA 3 mutations can also occur de novo [2]. Here we present a case of Wu type X linked syndrome which had manifested with developmental delay. This is the 20th case ever reported of GRIA 3 mutation causing ID.

Case report

A four year old male child born of a non-consanguineous marriage came with complains of runny nose and right upper anterior tooth pain for the past five days for Paediatric opinion and oral rehabilitation.

He had a history of frequent falls at two years of age, fell down four times in 10 months while walking and running, sudden muscle jerks (three episodes within six months at two years of age for which there was no hospitalisation done prior and the child is not on any antiepileptic drugs), involuntary movements of the upper extremities which occur during normal activities without impairment of consciousness (shudder attacks) and history of not attaining age appropriate milestones.

He was born at term with a birth weight of 2.7 kg and cried immediately after birth. He was not admitted to the neonatal intensive care unit and there was no history of neonatal seizures. There was no significant antenatal history.

Developmental history

GROSS MOTOR MILESTONE

Head control	eight months
sitting with support	one year
standing without support	one year nine months
walking without support	two years

Fine motor milestones:

Mature pincer grasp	three years
scribbling	three years six months

Language milestones: Bisyllables at four years

Social milestones: Shares toys and group play at four years

In summary, moderate global developmental delay was present with a developmental age of two and a half years at the chronological age of four years.

Family history:

The maternal aunt has Intellectual Disability (ID) and Seizures. Phenotypically, she has a depressed nasal

bridge, short fingers and a café au lait spot on her abdomen. Parents are normal. Informed consent for publication was obtained from the parents of the patient.

Examination

Weight- (11.6kgs= -2 to -3 SD), head circumference (46cm= -2 to -3 SD),

The child is conscious, mouth open and tongue protruding out with depressed nasal bridge, high arched palate, short fingers, right eye divergent squint, cafe-au-lait spot on the right knee.

Oral examination- Dental caries present in all upper teeth and 74, 75, 73, 84, 85 according to the Federation Dentaire Internationale notation tooth numbering system of primary teeth.

B/L pupils- Equal, round, reactive to light. Hypotonia was observed in all four limbs with power of grade 3 in ech limb.

The biceps, triceps, knee and ankle reflexes were diminished bilaterally with extensor plantar response bilaterally.

Investigation:

DNA test report: GRIA3 gene (glutamate ionotropic receptor AMPA type 3) on Exon 13, hemizygous, variant of unknown significance - chrX:g.123464886G>A which results in amino acid substitution p.Glu700Lys gene was done using whole mitochondrial exome sequencing - targeted gene sequencing and confirmation via Sanger sequencing of exon 13. Average Sequencing depth – 208. *Average on target sequencing depth – 118.88*. This was done because the maternal aunt was diagnosed with X linked ID because of GRIA3 mutation.

SPINAL MUSCULAR ATROPHY MUTATION DETECTION - mutation not detected.

DNA test report of the parents-mother (asymptomatic)- similar GRIA3 gene detected(heterozygous), using targeted gene sequencing and confirmation via Sanger sequencing of exon 13. This was absent in the normal father.

DNA test report of the *affected aunt* - similar GRIA3 gene detected (heterozygous), was detected using whole mitochondrial exome sequencing - targeted gene sequencing and confirmation via Sanger sequencing of exon 13.

MRI Brain with MRS	no significant abnormality detected.
EEG	no epileptiform waves
EMG	Normal
Thyroid function tests-	
TSH	5.35, - (0.8 – 8.2 µg/dL)
Total T3	174.0 - (105 – 245 µg/dL)
Total T4	9.89 (7.8- 16.5 µg/dL)
Total CPK	150 (25 – 172 U/L)

Management

Child is treated in a multi-disciplinary approach at a special school in Chennai, where the child is given the following therapies every month since 2 years of age.

Occupational therapy:
Joint compression
Neutral warmth
Proprioceptive and vestibular input
Hand-eye coordination

Speech and language therapy:

For the initial 6 months, child was taught to match primary colours and shapes, match common fruits and vegetables with their names.

6 months later child was taught on:

Comprehension of body parts

Following simple one step command

Physiotherapy: given intermittently to improve the muscle tone and power.

Total mouth rehabilitation under general anaesthesia was done for the child three months later after visiting our OPD.

Discussion

GRIA3 gene codes for GLUA 3 subunit which is a part of the AMPA receptor (AMPAR) subunit. In the brain, this GLUA 3 heterodimerises with GLUA 2 forming a Calcium impermeable AMPAR. The GLUA3_R660T mutant as said by Sun et al [3], decays the mini Excitatory Post Synaptic Current (mEPSC) at AMPAR.

Philips et al [4] noted that a missense mutation in c.1888G > C (p.Gly630Arg) causing substitution of Arginine instead of glycine (neutral) in one of the familial variants. This caused a decreased inotropic glutamate receptor function associated with moderate ID as these mEPSCs are essential for long term potentiation for forming memory.

Patients with missense mutations (p.Arg631Ser) which lies right next to glycine, is associated with dysmorphic facies [5]. Chinoyobu et al [6] reported a copy number gain in Xq25 which showed reduced GRIA3 transcripts in both the carrier mother and her affected son. But the carrier mother was not affected because the skew was found only in the lymphocytes and not in the brain.

In addition to some of the usual features of this illness as mentioned above, Trivisano et al [1] reported hypothyroidism. The mutation observed in this case was a hemizygous missense variant c.2359 G > A (p.Glu787Lys), and Bipolar disorder was noted by Gecz et al. [7]. Among seizure types, myoclonic seizures were most common [8], [9]. Other types included absence seizures, GTCS, non-convulsive status epilepticus [1] and atonic seizures of which most are refractory to treatment.

ID with increased awake time of sleep wake cycle [10] was reported by Davies et al. They hypothesized that there is a progressively increasing wake cycle as the child grows, due to AMPAR sensitizing the retina to light (retino-hypothalamic pathway) and abundance of AMPAR in the supra chiasmatic nucleus.

Exaggerated startle reflex and chorea [8] were reported by Piard et al who on sequencing found out a missense variant c.2477G > A; p.(Gly826Asp) which affected the transmembrane AMPAR.

Bonnet et al [11] reported inguinal hernia and Philippe et al [12] reported ectopic testes, scoliosis, pain insensitivity, pes planus and micro-penis.

In our case, a missense variation in the exon 13 of the GRIA3 gene that results in the amino acid substitution of lysine for glutamic acid at codon 700 in the patient, with a similar gene detected in the mother in heterozygous condition indicating that the mother is an asymptomatic heterozygous carrier of uncertain significance. Other mutations reported in other studies include duplications deletions translocations [13]. Both duplications and deletions seem to cause reduced synthesis of GLUA 3 [14].

Conclusion

Early detection of genetic diseases helps in better management of the patient. In this case, refractory seizures and facial dysmorphism should clue into a rare genetic of illness. Genetic testing and counselling paves a way to the early detection and management of syndromic children. Physicians in this case, should treat the child in a multidisciplinary approach which symptomatically helps in well-being of the child.

Conflicts of interest

The authors declares that they do not have conflict of interest.

Funding

No funding was received for conducting this study.

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CASE REPORT

Unusual Presentation of Trigeminal Neuralgia and its Surgical Management

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Abstract

Trigeminal neuralgia (TN) is a debilitating neuropathic condition characterized by excruciating, lancinating pain attacks. The standard first-line treatment of TN is carbamazepine medication, but some patients do not experience relief from this drug. For cases that do not respond to medication, surgical procedures that cut or remove portions of the peripheral nerves, such as the inferior alveolar and mental nerves, can be attempted. However, these neurectomy surgeries often have high rates of severe facial pain recurring over time. A 40-year-old man suffered from chronic, debilitating trigeminal neuralgia. He underwent multiple tooth extractions and took carbamazepine, but neither provided improvement in his agonizing facial pain. He then had surgical neurectomies of the mental and inferior alveolar nerves, which provided only partial pain relief. The patient was not relieved, so he underwent a surgical neurectomy of the lingual nerve. This third procedure successfully provided a significant reduction in his trigeminal neuralgia pain. Lingual neurectomy emerges as a potentially definitive treatment modality for trigeminal neuralgia refractory to medication or alternative neurectomy procedures. This minimally invasive surgical approach offers a valuable option for patients seeking sustained pain relief, particularly those who are not suitable candidates for or desire to avoid, more extensive or resource-intensive interventions.

Keywords: peripheral neurectomy, trigger points, lingual neurectomy, facial pain, trigeminal neuralgia

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Introduction

Trigeminal neuralgia (TN) is a debilitating neuropathic condition characterized by excruciating, lancinating pain attacks. This pain typically affects one or more branches of the trigeminal nerve, the major nerve responsible for facial sensation. As defined by the International Headache Society, TN manifests as "brief jolts of severe pain lasting seconds to a few minutes, recurring along specific areas of the face" [1].

The sudden onset, sharp, and recurrent nature of these attacks significantly disrupts a patient's quality of life. Simple daily activities like washing the face, brushing teeth, or even touching certain areas of the face can trigger an agonizing episode [4]. The mandibular division of the trigeminal nerve is most commonly affected, although the maxillary and ophthalmic branches can also be involved [2,3].

Diagnosing TN often relies solely on the patient's reported symptoms. The excruciating pain can significantly interfere with daily routines, making it challenging to perform routine clinical examinations [4].

While carbamazepine is considered the first-line medication for TN, it doesn't provide adequate pain relief for up to a quarter of patients [5]. For those who don't respond to carbamazepine, other treatment options may be explored. These options include surgical procedures like microvascular decompression, stereotactic radiosurgery, or minimally invasive percutaneous techniques like glycerol rhizotomy or radiofrequency rhizotomy [6].

Peripheral neurectomy is another surgical approach for TN. This minimally invasive procedure has been used for many years to manage intractable cases of trigeminal neuralgia [7]. Notably, neurectomies targeting the inferior alveolar or mental nerve branches have been documented with success in prior studies [8].

However, failure to address potential pain input from the lingual nerve could contribute to high rates of recurrence seen with these procedures [9].

Case Presentation

We present the case of a 40-year-old male with classic trigeminal neuralgia symptoms who underwent multiple tooth extractions and treatment with up to 400mg carbamazepine daily for 6 months without improvement. He subsequently had a mental neurectomy in 2013 and an inferior alveolar neurectomy in 2019, each providing temporary partial relief before his agonizing pain returned. Examination revealed a potential trigger point on the right lateral border of his tongue, suggesting involvement of the lingual nerve distribution. The patient was then planned for surgical lingual neurectomy in an attempt to attain pain control.

The lingual neurectomy was performed under local anesthesia. The incision was made in the mucosa along the anterior tonsillar pillar, just behind the posterior third of the tongue on the affected side. The surgical dissection proceeds by dissecting supraperiosteally and reflecting the mucosa to expose the underlying musculature of the tongue base (Figure 1).

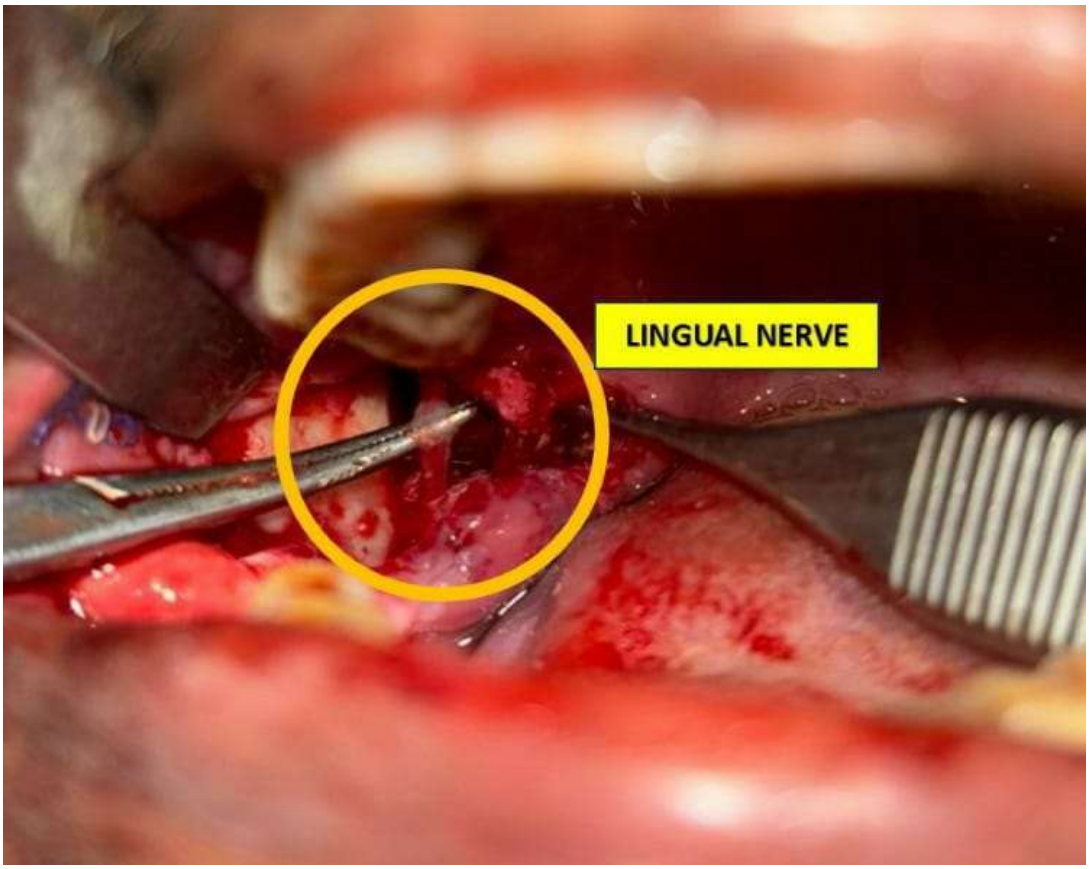

Figure 1. Lingual nerve identified after subperiosteal dissection

The lingual nerve was identified as it courses along the undersurface of the tongue, traveling between the inferior longitudinal muscle and the hyoglossus muscle. Care is taken to isolate the nerve without injuring the surrounding hypoglossal nerve that innervates the tongue muscles. Once the lingual nerve is visualized, a segment of 2-3 cm of the nerve is freed from surrounding tissues using blunt and sharp dissection. (Figure 2) This freed segment was then avulsed (torn away) from its distal and proximal attachments. Hemostasis was achieved by applying electrocautery to the proximal lingual nerve stump to prevent nerve regrowth and diminish the possibility of painful neuroma formation. The surgical site was then closed in layers using resorbable sutures in the muscle planes and mucosa. Patients were monitored for any bleeding, hematoma, or impaired swallowing function in the immediate post-operative period before being discharged home the same day or after an overnight observation. This neurectomy procedure alleviates trigeminal neuralgia pain by disrupting the sensory innervation from the lingual branch of the trigeminal nerve to the anterior two-thirds of the tongue on the affected side.

Figure 2. Lingual nerve after neurectomy

Discussion

Trigeminal neuralgia (TN) is a neuropathic facial syndrome characterized by sudden, severe, brief, stabbing, and typically unilateral pain in the distribution of one or more branches of the trigeminal nerve. Paroxysmal attacks can last from seconds to minutes and are often triggered by innocuous stimuli like talking, eating, or facial movements [10]. TN demonstrates a slight female predilection and commonly manifests in the fourth decade of life, more frequently affecting the right side and mandibular division.

Diagnosing TN can prove challenging due to symptom overlap with other orofacial pain conditions. A meticulous clinical history and examination remain paramount for accurate diagnosis. While carbamazepine is established as the first-line medical therapy, its long-term use carries risks of adverse effects. Alternative medications like gabapentin and pregabalin are increasingly employed, either as monotherapy or adjunctive agents [11,12].

Peripheral neurectomy represents a minor, safe, minimally invasive surgical option that can be performed as an outpatient procedure under local anesthesia [13]. It involves surgically dividing or avulsing a peripheral branch of the trigeminal nerve to disrupt the afferent pain pathways. This approach may be favored for patients who cannot undergo more invasive neurosurgical procedures due to financial or medical constraints. Fareedi Mukram Ali, Prasant, et al. performed peripheral neurectomy on 14 patients with terminal branches of trigeminal nerve who were elderly and unfit for surgery. Postoperative pain was relieved after 15 to 24 months of follow-ups. There were no

intra-operative or post-operative complications. None of the patients had post-operative infection. [17] Cerovic et al. [18] in a recent study on peripheral neurectomy of the infraorbital nerve, reports show good post-operative results in the follow-up period between 12 to 15 months. Khanna and Galinde,[19] reported a case of pain relief from peripheral neurectomies, for the infraorbital nerve after 24 months of follow-ups and that for the mental nerve is 26 months follow-up. Quinn [20] reported a case series of 63 patients with 112 neurectomies, in which a follow-up period of 0–9 years was noted, and a pain relief period of 24–32 months was reported.

Surgical intervention is considered for medically refractory cases or when drugs produce intolerable side effects. Peripheral neurectomies offer a treatment option, particularly for select patient populations. However, this approach has limitations compared to other definitive central neurosurgical procedures such as microvascular decompression (MVD) and gamma knife radiosurgery (GKS).

Despite its historical limitations, peripheral neurectomy remains a valuable tool in trigeminal neuralgia treatment. Its advantages include the possibility of outpatient procedures under local anesthesia, making it suitable for elderly, debilitated, or geographically isolated patients who may not be ideal candidates for complex neurosurgery. Furthermore, some patients prefer this approach due to its potentially lower risk profile compared to more extensive surgeries.

Key limitations of peripheral neurectomy include generally lower rates of complete and durable pain relief, paucity of high-quality evidence from large prospective studies, potential for procedural complications like persistent numbness or dysesthesias, and progressively diminishing efficacy with repeated neurectomies [14,15]. In contrast, central procedures like MVD and GKS that directly address the root causative mechanism of vascular compression demonstrate superior long-term outcomes and safety profiles [16].

For patients who fail to achieve adequate symptom control with medical management, early referral to neurosurgical evaluation may circumvent delays in definitive treatment and avoid risks associated with prolonged medication use or unsuccessful attempts at peripheral neurectomy. Careful patient selection, thorough counseling regarding reasonable expectations, and judicious treatment sequencing are essential when considering peripheral neurectomy within the context of the full therapeutic armamentarium for trigeminal neuralgia.

Conclusions

The success of peripheral neurectomy relies heavily on several factors. Careful selection of patients who are likely to benefit from this surgery is essential. Additionally, thorough discussions with patients regarding realistic outcomes and potential limitations of the procedure are necessary. Finally, strategically sequencing peripheral neurectomy within the broader treatment plan for TN, considering all available options, is paramount.

Conflicts of interest

The authors declares that they do not have conflict of interest.

Funding

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CASE REPORT

A rare complication of rupture of a mediastinal Teratoma into the bronchus: A case report

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Abstract

Background: Germ cell tumours (GCT) are tumours arising from primordial germ cells. Gonadal and extragonadal GCT are infrequent in childhood occurring at a rate of 2.4 cases per million children accounting for 2-3 % of paediatric malignancies with most common subtype being a matured Teratoma. **Case presentation:** We present a case of a 10-year-old female child who presented to the emergency department of a tertiary care centre with complaints of cough with massive expectoration of blood of approximately 200 ml in quantity which on imaging revealed a left anterior mediastinal mass which was managed by left lateral thoracotomy with a non-anatomical left sided pulmonary lobectomy which on histopathology was diagnosed to be a case of mature teratoma. **Conclusion:** This case report describes a unique presentation of extra-gonadal mediastinal teratoma which presented as a rare complication with rupture into the left bronchus. It emphasizes caution and a high clinical suspicion is required in managing cases of varied presentations of teratomas.

Keywords: Mediastinal Teratoma, Germ cell tumours (GCT), Primordial germ cells

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Introduction

Germ cell tumours (GCT) are tumours arising from primordial germ cells. Gonadal and extragonadal GCT are infrequent in childhood occurring at a rate of 2.4 cases per million children accounting for 2-3 % of paediatric malignancies with most common subtype being a matured Teratoma. The teratomas may be gonadal or extra-gonadal in origin. We present a case of 10-year-old female child with extra-gonadal mediastinal teratoma which presented as a rare complication with rupture into the bronchus which was managed with a left lateral thoracotomy with a non-anatomical left sided pulmonary lobectomy with a successful outcome.

Case presentation

A 10-year-old female child presented to the emergency department of a tertiary care centre with complaints of cough with massive expectoration of blood of approximately 200 ml in quantity. She had experienced a similar episode 15-20 days back for which she was admitted in hospital. There was no h/o any bleeding diathesis and no history of fever. CECT (Contrast enhanced computerised Tomography) thorax was done which revealed well defined lobulated smoothly marginated lesion in anterior mediastinum with fat densities within air foci and within the lesion, centrilobular ground glass opacities with bronchiectatic changes with a consolidatory patch was noted in left lingual lobe and so, a diagnosis of thymolipoma was made. Along the lingual lobe of lung aberrant vasculature were also noted (Figures 1 and 2).

Figure 1. CECT Thorax showing well defined lobulated smoothly marginated lesion in anterior mediastinum.

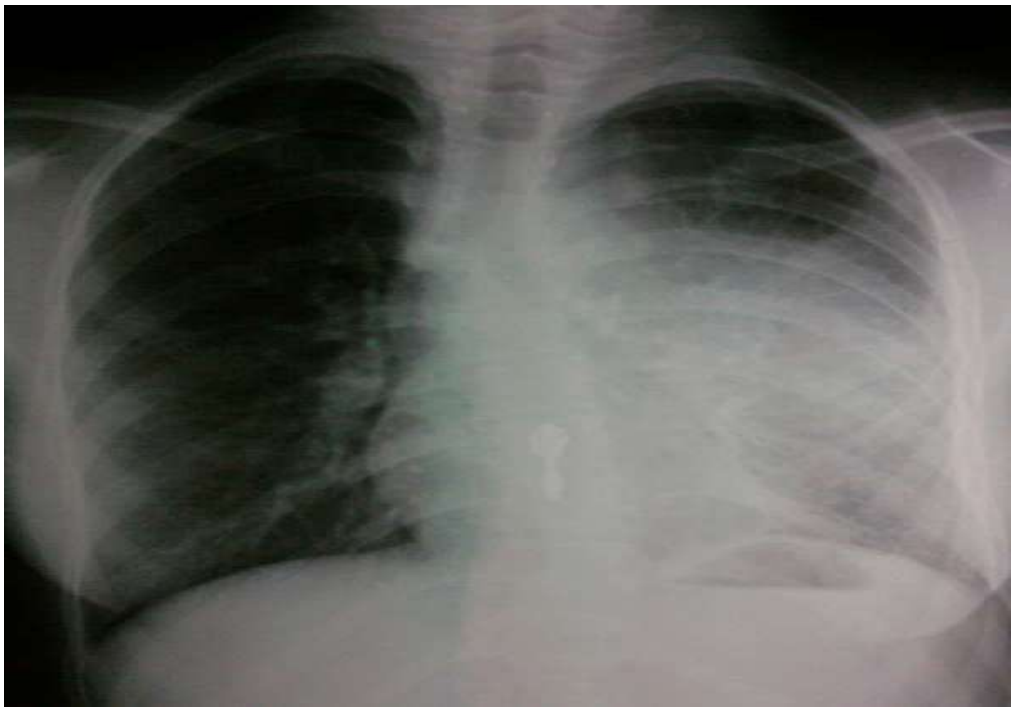

Figure 2. Chest radiograph showing the left anterior mediastinal tumour.

CT guided embolization of aberrant vessels was tried but was unsuccessful. Child lost about 100 ml blood daily through haemoptysis and was having a morbid course. CT guided Fine needle aspiration was done but cytology revealed fat cells and haemorrhagic tap. So surgical intervention with excision of mass and non-anatomical lobectomy was planned. On left lateral thoracotomy a 5*5 cm mass firm in consistency was found in anterior mediastinum adherent to pleura pericardium and arch of aorta with a communication with lingual lobe bronchus. The mass was excised and it revealed evidence of cheesy pultaceous material upon cutting open the mass postoperatively (Figure 3).

Figure 3. Clinical picture of the resected specimen showing cheesy pultaceous material after cutting open the specimen.

Histology of the specimen revealed a mature Teratoma with bronchiectasis, pneumonitis and haemorrhage in lung tissue. The postoperative course involved mechanical ventilation for 4 days followed by successful extubation and a successful recovery in 12 days and was discharged on 14th postoperative day. Patient has been on regular follow up of 3 months for the last 2 years and there is no recurrence.

Discussion

Embryo histogenesis: Extragonadal germ cell tumours arise from aberrant or incomplete migration of primordial germ cells. Another hypothesis is that these tumours arise from totipotent embryonal cells that have escaped the influence of embryonic organisers controlling normal differentiation [1,2].

The two most common sites for extragonadal GCT in older children are mediastinum and brain.

Molecular biology: Individuals with 46, XY and 45, X/46, XY gonadal dysgenesis have a 10 % to 50 % risk of developing a gonadal germ cell tumour. Patients with Klinefelter syndrome (47, XXY) have an increased risk of developing extra gonadal germ cell tumours, in particular mediastinal germ cell tumours [3,4]. In these patients, Increased levels of Beta HCG and AFP confirms malignant etiology. If there is increased beta-HCG and increased AFP levels; then it is suggestive of nonseminomatous germ cell tumours. If

there is decreased beta-HCG and nondetectable AFP levels, then it is of pure seminoma. Isochrome 12 p is diagnostic of undifferentiated germ cell malignancy even in absence of elevated serum markers.

Treatment: Treatment of mature mediastinal Teratoma is complete surgical resection. Radiotherapy and chemotherapy play no role in management. In case of Immature Teratoma cisplatin-based adjuvant chemotherapy can be given (4 cycles with cisplatin, etoposide, bleomycin or vinblastine, ifosfamide). In case of nonresectable Teratomas, neoadjuvant chemotherapy can be considered.

Prognosis

Multivariate cox proportional hazards regression analysis identified age >12 yrs. as a prognostic factor. Using this analysis patients with thoracic primary >12 yrs. had a sixfold higher risk of death. All primary mediastinal nonseminomatous germ cell tumours fall into poor risk category of international germ cell consensus classification.

Conclusion

This case report describes a unique presentation of extra-gonadal mediastinal teratoma which presented as a rare complication with rupture into the left bronchus. It emphasizes caution and a high clinical suspicion is required in managing cases of varied presentations of teratomas.

Conflicts of interest

The authors declares that they do not have conflict of interest.

Funding

No funding was received for conducting this study.

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CASE REPORT

Retinal Toxicity from Ectoparasiticide Exposure or Coincidental?

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Abstract

Case Report: A 42 Year old male presented with complaints of sudden painless diminution of vision in RE for 3days, after fall of ectoparasticide (DELTAMETHRIN1.25%) in Right Eye. Uncorrected visual acuity in Right eye: counting fingers at 1/2metre, Left Eye: 6/6. Anterior segment evaluation showed Right and Left eye within normal limits. Pupils were 3mm round, regular, reactive to light in OU. Dilated Fundus Examination using indirect ophthalmoscopy showed Right Eye C:D:0.5, A:V 2:3 with subretinal fluid accumulation in macula and Left Eye normal fundus picture. A diagnosis of RE Central serous Chorioretinopathy (CSCR) was made using Optical Coherence Tomography. **Discussion:** With an incidence rate of 9.9 per 100,000, or roughly six times higher than that of women, CSCR mostly affects men. Acute or subacute central vision loss or distortion is the most prevalent symptom, and it typically affects men between the ages of 20 and 50.With regard to illnesses like CSCR, this case study aims to provide clinicians with more insight into the diagnosis, treatment, and management of pesticide-induced ocular damage. **Conclusion**: This is rare case of retinal toxicity following exposure to Deltamethrin.For an accurate diagnosis and management of CSCR, it is imperative to comprehend its risk factors, particularly the exposure to pesticides. Emphasizing eye protection and preventative health measures will help us safeguard our vision from environmental risks such as pesticide exposure.

Keywords: Pesticide, Deltamethrin, Central serous, Chorioretinopathy

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Introduction

The health risks associated with pesticide exposure are well-documented environmental health concerns. Occupational exposures to pesticides primarily occur within the agricultural sector, affecting pesticide applicators, farmers, and other agricultural workers. The toxic effects on the eyes from pesticide exposure can occur through inhalation, ingestion, dermal contact, and direct ocular exposure.

When unprotected eyes are exposed to pesticides, the chemicals can be absorbed into ocular tissues, leading to potential ocular toxicity. Deltamethrin, a synthetic pyrethroid, is a pesticide developed as a safer alternative to the more harmful and persistent organophosphate and organochlorine pesticides. Deltamethrin is widely used as an insecticide on crops, a pesticide for pets and livestock, in home pest control, and for malaria vector control [1].

Occupational exposure to Deltamethrin and other pesticides is frequently caused by poor protective measures, such as a lack of personal protective equipment, the use of excessive quantities, spraying against the wind, and unintentional intake. Pesticide exposure has been shown to cause pathogenic consequences on the conjunctiva, cornea, lens, retina, and optic nerve, among other ocular components. Signs of macular and retinal degeneration among pesticide workers have been documented in a number of case series.

With an emphasis on deltamethrin and its harmful effects on the eye, this case study seeks to clarify the ocular toxicity linked to pesticide exposure.

Case Presentation

A 42 Year old male presented with complaints of sudden painless diminution of vision in Right Eye for 3 days, after fall of ectoparasticide (DELTAMETHRIN 1.25%) in Right Eye. Uncorrected visual acuity in Right Eye: counting fingers at 1/2metre, Left Eye: 6/6. Anterior segment evaluation showed Right Eye and Left Eye within normal limits. Pupils were 3mm Round, regular reactive to light in OU. Both eyes fundus were evaluated using indirect ophthalmoscopy. Both eyes Optical coherence tomography was done (Figures 1 to 4).

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OD

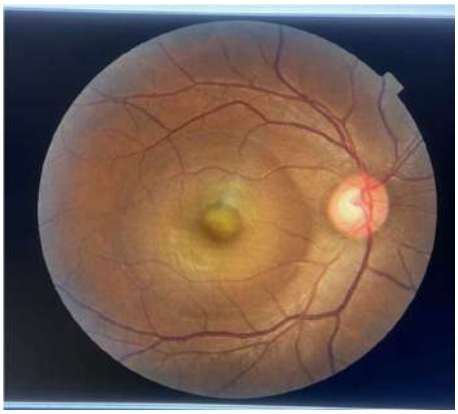

Figure 1. Fundus photo of RE showing, C:D 0.5 with subretinal Fluid accumulation in macula

OS

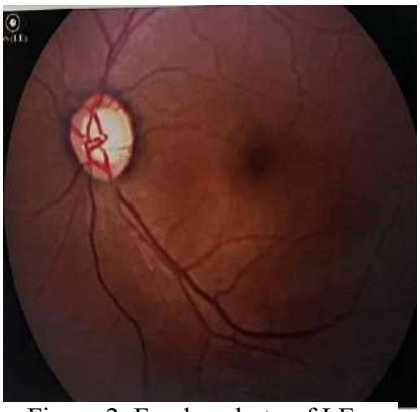

Figure 2. Fundus photo of LE showing, C:D O.7 Dull FR.

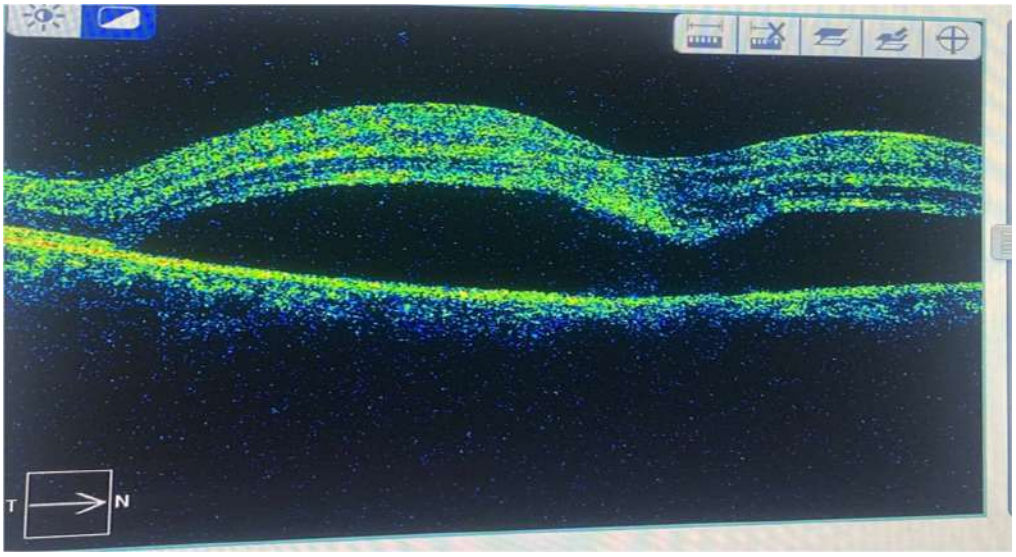

Figure 3. OCT picture of RE: Showing Serous sub retinal fluid accumulation in the Macular area

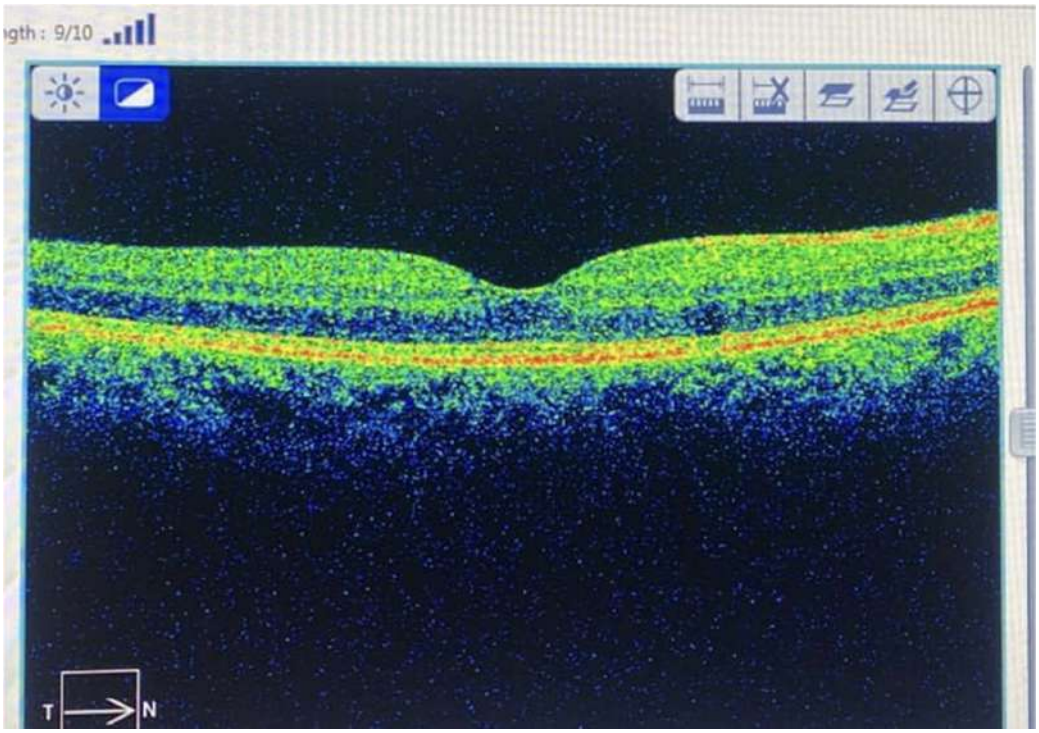

Figure 4. OCT Picture of LE showing: Normal Macula

A diagnosis of RE Central serous Chorioretinopathy was made using OCT.

- Following this, Topical Nepafenac 0.1% BD was administered and advised for follow up after 1 month
- During follow up Right eye visual acuity improved to 6/60 with resolution of sub retinal fluid seen with Optical coherence tomography.
- Patient has been advised for regular monthly followup.

Discussion

Central serous chorioretinopathy (CSCR) is the fourth most frequent kind of retinopathy, after age-related macular degeneration, diabetic retinopathy, and branch retinal vein occlusion.

CSCR primarily affects men, with an incidence rate of 9.9 per 100,000, which is about six times higher than that of women. Males between the ages of 20 and 50 are most commonly affected, with symptoms usually presenting as acute or subacute central vision loss or distortion. Patients often describe symptoms including diminished contrast sensitivity and color saturation, central scotoma, hyperopic (most common) or myopic shift, micropsia, and metamorphopsia.

Although the precise pathophysiologic mechanisms responsible for CSCR are yet unknown, it is believed that hyper-permeable choroidal capillaries are the cause of the condition. This increased permeability, along with retinal pigment epithelium malfunction, causes a severe detachment of the neurosensory retina. Several risk factors have been related with CSCR, including type A personality, use of steroids, pregnancy, antibiotics, alcohol, Uncontrolled high blood pressure, Obstructive sleep apnea. Recurrence of CSCR occurs in roughly 31% of patients, however some texts indicate recurrence rates of up to 50% [2].

Research points to a possible link between pesticide exposure and an increased risk of retinal degeneration. The Agricultural Health Study, a major prospective study including over 50,000 farmer pesticide applicators, discovered a link between retinal degeneration and fungicide and other pesticide exposure [3].

Furthermore, retinopathy associated with pesticide exposure has been observed in agricultural labourers and the spouses of pesticide-using farmers [3].

Pesticides from chemical classes including organophosphate and pyrethroid insecticides and the bipyridyl herbicide paraquat increase the oxidative stress in the retina [4]. However, the contemporary literature on the hazards of ocular damage from pesticide exposure is minimal.

This case report seeks to help clinicians diagnose and manage ocular toxicity caused by pesticide exposure, as well as get a better knowledge of its implications in disorders such as CSCR.

Conclusion

CSCR is a major cause of vision impairment, especially in middle-aged men. Understanding its risk factors, especially pesticide exposure, is critical for accurate diagnosis and management. Pesticide-related ocular toxicity management includes identifying high-risk populations with ocular exposure to pesticides, monitoring visual symptoms, and developing improved and rapid techniques of detecting eye diseases. In order to reduce the possibility of ocular toxicity caused by pesticides, it is critical to progress research, improve diagnostic methods, and enforce effective public

health initiatives. We can protect our vision from environmental threats like pesticide exposure by emphasizing eye protection and preventative health practices.

Conflicts of interest

The authors declares that they do not have conflict of interest.

Funding

No funding was received for conducting this study.

Informed Consent

Informed consent was obtained from the participant.

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COMMENTARY ARTICLE

Is Family Adoption Programme as What It Seeks: A Resident's Perspective?

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Abstract
The National Medical Commission recently launched the Family Adoption Programme for the medical undergraduates across the country in the process of making Indian Medical Graduates a full-fledged primary care physician. The program has been running across in few institutes across the country and such large level replication of the same with objectives of giving public health exposure to medical undergraduates is a welcome step. But the program brings with it their own set of challenges for the implementation of the same. Hence, the article attempts to identify the lacunae in the policy and suggests a way forward for better conduct of the program and achieve what it actually desires.

Keywords: Indian Medical Graduate, Family adopt programme, Village adoption programme, National Medical Commission

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Background

In India, a huge majority of the population (around 65.5%) resides in rural areas, where access to healthcare is a major concern [1]. The fact that only 27.5% of rural districts have medical colleges adds to this concern. So as to make healthcare accessible for the neediest population, a community-based approach among healthcare professionals, especially upcoming ones, becomes necessary [1].

MGIMS Sewagram has set a model for a village adoption program where the first professional students of the medical college are allotted families in a village and given an opportunity to get acquainted with the community's needs [1]. While the village adoption program focuses on an integrated development of a village that requires cooperation from every sector, family adoption came into the picture, aiming for enhanced healthcare services in rural areas with the help of medical colleges.

Taking inspiration from the already-running model of Sewagram, the National Medical Commission (NMC) devised the Family Adoption Programme (FAP) for the undergraduate medical curriculum in 2022 under which fresh undergraduate students were to adopt five families and take care of them for the next three years. With the objective of sensitizing the students towards the community needs and their practices along with the development of better communication skills from the start of their MBBS curriculum and the creation of leaders at the level of primary health care, the layout of the program was set.

The steps to be implemented were precise as follows [2]:

1. Allotment of families in villages or urban slums (bastis, jhuggis, etc.) other than those already covered under the rural health training centers of the college.
2. Regular visits divided over a span of three years followed by telemedicine practice for the next two years after the first year and three-monthly data collection subsequently along with annual data collection.
3. Conduction of annual vaccination drives will also serve the dual purpose of expanding immunization coverage.

Apart from this, several advantages of the overall development of the postgraduate students and the senior residents will also be a simultaneous goal achieved through this program.

Challenges

The great story doesn't end here while implementation of the same remains a mammoth task at the ground level. To begin with, the identification of villages not covered under the field practice areas already has devised in the NMC policy is one of the primary challenges which involves the allocation of various resources in terms of transportation, manpower, etc. Especially for metropolitan cities like Delhi and Mumbai which are so widespread, traveling within the city has so many barriers due to the rising traffic, taking the students to long distances within a stipulated time, conducting the session, and coming back to the college is typically impossible. To solve this, some colleges have approached nearby slum areas in place of outreach villages to conduct the program as the slum areas will also serve in the development of the competencies asked [3]. Apart from distance, the number of vehicles required to carry out the program must also be looked up as some colleges with batches

of 150-250 students would require 5-10 such buses which practically no college in India has currently.

Coming to the next challenge is the scarcity of the manpower required to carry out such visits in terms of students' security and timely allotment of families. Since the urban slums mostly comprise of the illiterate population living in inadequate conditions and mostly not well-lit, it becomes a concern for the authorities to send the fresher batch to these families. Since the house demarcation is also not concrete, it is difficult for the supervisor to look after all students visiting five- seven families with a full focus on their security. Again, in colleges with batches of 150-250, approximately 20-25 residents are required. This means that whole of the Department needs to be deployed in a single activity at such times. While the policy plans to be conducted under the supervision of young faculty, the designation of single or even two faculty will make them overloaded with various concerns and make the targets unachievable. Another issue at ground-level implementation is that the junior residents have to be actively involved and while most of the colleges have five or even below five postgraduate seats in every college, they are overburdened as even in a batch of 100 MBBS students, each resident will be responsible for fifty families considering their exemption from all other work of the department and their training. This whole exercise of traveling to their practice area, allotting the families, and then returning sounds vague for almost all of the colleges.

Moreover, the process of monitoring the exercise at the end of three years through a log book is also vague. If any student does not attend any of the visits, this might not affect his overall minimal attendance criteria since there is no guideline on attending a minimum number of visits and if they come with their complete logbooks, it is hard to keep a check on their attendance and the authenticity of the data they present. Hence, there is an evident loophole in the monitoring and evaluation of the program at the end of three years.

The next phase of family allotment is to make sure that the students are allotted families focusing on the cases they need to emphasize like under-five children, adolescent age group, older age people, etc which is again difficult to identify in places where the migratory population is so large consisting mainly of young males mostly living together in the areas focused here. Such houses have to be excluded from the program due to the lack of availability at the desired time and the lack of potential cases for the students to learn and polish their academic and clinical skills. Coming to the post-allotment phase, students have been directed to take the history of the family members, build rapport with them and advise accordingly. All the clinical exposure and competencies required to carry this out are initiated in the second-year curriculum after the beginning of their clinical postings. But while executing this program, the onus again lies on the Department of community medicine to academically build up the students to interact appropriately during the family visits. So, in toto, not only the execution of FAP is an added responsibility, but even academically the burden has increased on the faculty and there is repetition since they will be taught this again in depth once they enter the third phase of MBBS.

Another issue arises when the guidelines suggest that these MBBS students also need to facilitate hospital

visits for their families whenever needed. But in certain colleges, most of the students are day scholars, and hence the challenge arises of who will facilitate this once they are away from the campus. Also, the MBBS curriculum is so tightly packed that it rarely gives the time to these MBBS students during college hours to arrange for the same while it gives a bad impression to these families if we are not able to support them in their moments of need; loss and exploitation on both sides. Most importantly, there is no provision of attending to these patients in hospitals on a priority basis. Hence, these patients also have to go through the same procedure as general patients for their specialist consultation and other services.

Moreover, as per the experiences so far, though most of the families have been receptive, some families are not that conducive and create a challenge for the students further. They are not comfortable with a doctor visiting their house, entering their personal space, and various other issues. And if they cooperate, they have their other demands which they want to be fulfilled since preventive health is a concept yet to reach the poor. They demand the facilitation of clinical visits to the nearby hospitals, prescription, and delivery of medicines at their homes which is not feasible as there is no such hospital policy to date.

Suggested Solutions

The program has been inculcated into the MBBS curriculum with realistic objectives which are also the need of the hour. But apart from designing the objectives, a stipulated division of the curriculum and the field visits is also required to make the implementation better. Since a lot of manpower is required for the same, it can be better if we start with short-term and realistic commitments. A flexible attitude in allotment of families in small colleges where there is not as much manpower and in large colleges where there are not many families to be allocated for a large number of students, we can start with one family per student. Alongside this, a better design of hour-wise allotment must also be done to create a better understanding of what has to be done on the ground. A minimum duration of visits in terms of the number of hours has been well described in the curriculum policy, for instance, 27 hours and 9 visits in to during the first professional year but it does not take into account the travel time which inadvertently gets included as the other parts of the daily curriculum cannot be hampered [2].

Another issue is how to measure the achievements which can be done by designing a uniform logbook for the students which can be used all over the country. Since monitoring is tough in the current design, measures must be taken to ensure the authenticity of the data collected and recorded by the students. Stringent evaluation measures also need to be deployed for the same. Specific guidelines on how to benefit the families post visits and facilitating the hospital visits in the absence of any such hospital policy for them, facilitating subsidized treatment charges for them as mentioned in the guidelines can also be perceived to be a tough task for the MBBS students since they are not well acquainted with the hospital settings and their curriculum doesn't allow that much free time. This point is also to be noted since if we fail to help the families with in-hospital treatment, it is going to give a bad impression and lead to fallout. A vivid workup on the benefits

perceived by the families and the students involved can also be taken up to understand their outlook on the policy. Involvement of other departments especially the clinical ones must also be made for better outcomes of the initiative and not be done at the intra-department level only. After this, modifications can be done to make up a better plan.

So, we conclude that the program is the beginning of a change and every change brings its own challenges. Any policy whenever introduced must always contain three main components post launch: 1) Proper implementation 2) Reporting from the stakeholders on the policy implementation and 3) feedback from the same which can help in providing a glimpse of the ground reality to the policymakers and hence expand the scope of improvisation. The challenges, though many, are not impossible to combat and hence, we support the initiative with the suggestion for modification of the program and time-to-time evaluation of implementation at various colleges for improving the feasibility, sustainability, and effectiveness of the program.

Conflicts of interest

The authors declares that they do not have conflict of interest.

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LETTER TO THE EDITOR

Corrosive Burns From Cashew Nut Shell Liquid (CNSL): Emphasizing the Need for Caution in Transport and Handling

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Cashew nut shell liquid (CNSL) with CAS registry number 8007-24-7, is a versatile by-product of the cashew industry. The nut has a shell of about 1/8-inch thickness inside which is a soft honey comb structure containing a dark reddish brown viscous liquid. This liquid is a significant byproduct of cashew nut and cashew apple production, derived from the cashew tree (Anacardium occidentale). CNSL, the pericarp fluid of the cashew nut, consists of a mixture of phenolic compounds with aliphatic side chains. Natural CNSL comprises roughly 70% anacardic acid, 5% cardanol, and 18% cardol [1]. Many countries import raw cashew nuts for processing, producing CNSL as a byproduct. India, Brazil, Bangladesh, Tanzania, Kenya, Mozambique, tropical Africa, Southeast Asia, and the Far East produce significant quantities of cashew nuts and CNSL.

CNSL provides cost-effective and sustainable alternatives by replacing phenol in manufacturing processes, thus mitigating the environmental impact associated with chemical usage. Its applications range from friction linings to bio-fuel, promoting the sustainable utilization of cashew nut byproducts. CNSL has diverse industrial applications, including resin production for coatings, adhesives, and friction materials. It is also used in insecticides, automotive brake linings, laminating varnishes, rubber compounding, and surface coatings such as paints and varnishes.

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CNSL constituents can be absorbed via ingestion, inhalation, and skin contact. CNSL constituents are metabolized by the liver into hydrophilic substances and excreted through urine or bile. Additionally, they can accumulate in adipose tissue [2]. CNSL toxicity is commonly observed in farmers engaged in cashew processing. Workers slicing outer cashew nut shells often come into contact with the oil, leading to brownish to thick black sheets of dead skin on their hands. Other skin issues seen in these communities include maceration, loss of dermatoglyphics, pitted keratolysis, and fingertip pits. This occupational hazard can be prevented by oiling the hands/ wearing proper gloves and other personal protective equipment [3].

Transporting CNSL is risky due to its corrosive phenolic derivatives, which can pose serious health and safety hazards if released in an accident. Strict safety measures and protocols are essential to mitigate these risks. We report a case concerning a 43-year-old male who suffered extensive corrosive burns due to the spillage of high concentration CNSL and subsequently succumbed to injuries sustained in a road traffic accident. Upon autopsy, partially healed dermo-epidermal chemical burns affecting 67-70% (Figures 1 and 2) of the total body surface area, were observed across the body. Additionally, closed fractures of both bones in the left leg (stabilised with intramedullary nails and external fixator) were noted at the proximal part, with all underlying tissues exhibiting signs of gangrene. Internally, both pleural cavities contained about half a litre of yellow fluid. Both lungs emanated foul-smelling greenish purulent material on cut section.

The histopathological examination, of kidney showed acute tubular necrosis, the lung displayed dilated alveoli with acute and chronic inflammatory cells, congested and dilated blood vessels, the skin exhibited denuded and ulcerated epidermis with acute to chronic inflammatory cell collections and areas of coagulative necrosis, along with congested blood vessels in the dermis. (Figure 3). The total timeline between exposure to CNSL and death in this case was approximately two weeks. The review of clinical records revealed that, despite aggressive orthopaedic and chemical burns management, the patient developed compartment syndrome in the fractured leg. A fasciotomy was performed, and burns care was initiated. However, the patient subsequently developed acute renal failure, possibly due to crush syndrome exacerbated by extensive chemical burns. The large surface area of burns made the patient prone to sepsis, leading to multi-organ dysfunction syndrome. Clinical chemistry parameters were consistent with acute renal failure and sepsis. The cause of death was determined to be *"Septicaemia consequent to chemical burns associated with fracture of both bones of the left leg."*

Figure 1. Dermo-epidermal chemical burns due to CNSL

Figure 2. Dermo-epidermal chemical burns due to CNSL

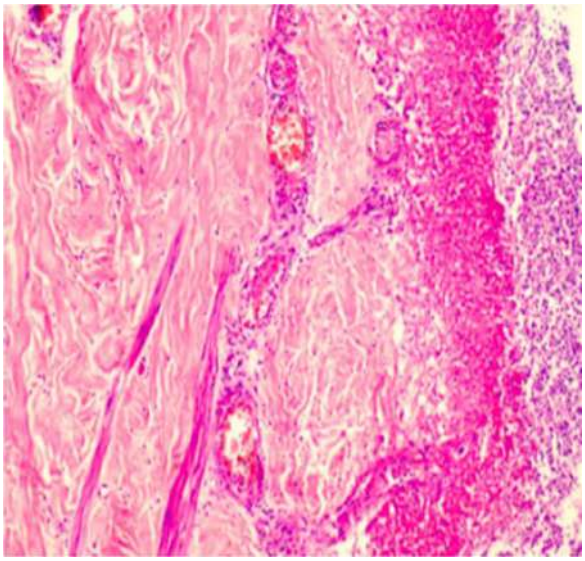

Figure 3. Skin HPE: Inflammatory infiltrates and coagulative necrosis due to corrosive effects of CNSL (H & E 40X)

Acute CNSL poisoning, depending on the concentration of the substance, can present with various symptoms due to its corrosive effects on the gastrointestinal tract, including burning sensation, difficulty in swallowing, intense thirst, and tenesmus etc. If aspirated, it can cause chemical pneumonitis. CNSL contains several alkylated phenols, with anacardic acid being the primary component. This compound, similar to urushiol in poison ivy, can cause contact dermatitis and may eventually result in hyperpigmentation of the affected areas. Additionally, CNSL exposure can lead to toxic hepatitis, affecting coagulation, indicated by elevated prothrombin and partial thromboplastin times, suggesting a potential inhibitory effect on clotting factors. The principles of management include prompt decontamination with activated charcoal, followed by symptomatic treatment. In cases of toxic hepatitis and metabolic acidosis, fresh frozen plasma, bicarbonate, proton pump inhibitors, steroids, and N-acetylcysteine should be used [4].

Research conducted on mice regarding the toxicity of CNSL, particularly its main constituent anacardic acids (AAs), demonstrates varying levels of toxicity depending on the dosage and duration of exposure. The hepatorenal and hematopoietic systems appear to be primarily affected, while genotoxicity is not observed [5].

Interestingly, in vivo research has shown that CNSL derivatives offer a sustainable option for selective peroxisome proliferator-activated receptor (PPAR) modulators, with moderate affinities (EC50 around 100 nM to 10 μM), promoting beneficial gene activation patterns for treating diabetes and obesity [6]. Moreover, CNSL derivatives have also been considered as potential drug candidates to treat Alzheimer's disease [7].

This case underscores the significant risks associated with CNSL, an acidic corrosive substance. Similar to regulations in other countries governing the transport of hazardous substances, we need to establish regulations for CNSL transport in India. While fatalities related to CNSL exposure are rare, cases of self-limiting toxic hepatitis have been reported. The hepatotoxicity can impact the coagulation system, potentially leading to death. In the present case, the severity of chemical burns exacerbated the situation, making the fracture management more challenging. Therefore, raising awareness about safety measures when handling and transporting CNSL is crucial.

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Ethical Considerations

All ethical concerns should be addressed by the authors

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