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Emphasize the new and important aspects of the study and the conclusion that follow from them. The detail data or other material given in the Introduction or the results section should not be repeated. The implications of the find-

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EDITORIAL

Time to Ban Paraquat: a Deadly Poison Masquerading as a Herbicide in Bangladesh

Professor Dr. Quazi Arif Ahmed

In the heart of rural Bangladesh, where farming is not just a livelihood but a way of life, a silent killer lurks in sheds, fields, and storage rooms -paraquat, a highly toxic herbicide. Over the past years, this chemical has been increasingly misused as a means for suicide, particularly among vulnerable agricultural workers and rural youth and also some cases of accidental poisoning are observed. The tragic pattern is unmistakable, and the time has come for Bangladesh to impose an outright ban on paraquat.

Paraquat is one of the deadliest herbicides known to science, with no known antidote. Chemically it is a toxic bipiridyl compound that was discovered in 1950s and found its way into agricultural use by 1962. This liquid herbicide was primarily used for weed and grass control but due to its highly poisonous nature was soon categorized as a "restricted-use" herbicide [1]. Ingesting even a small amount - as little as 10-20 milliliters of the concentrated form can lead to multi-organ failure and death within days. The principal target organ for paraquat poisoning is the lung and kidney. Paraquat has a structural similarity to naturally occurring polyamines that are taken up by the alveolar cells and hence paraquat concentrates in alveolar type I and II cells. Paraquat is also actively secreted by the kidney leading to its accumulation in the proximal tubular epithelial cells at higher concentrations. On accumulation in the pulmonary alveoli and the nephrons, paraquat causes redox cycling and production of toxic reactive oxygen species. This oxidative stress overwhelms the cellular defense mechanisms and leads to pulmonary damage (alveolitis and fibrosis) [2]. In Bangladesh, where mental health support is scarce and agricultural chemicals are loosely regulated, paraquat has become an alarmingly easy method for impulsive suicide attempts.

Hospitals across the country, especially in tertiary centers, frequently report cases of fatal paraquat poisoning, often involving young people from low-income farming families. Once consumed, it causes irreversible damage to the lungs, kidneys, and liver. The death is slow, painful, and in most cases, inevitable. The suffering of these patients and their families is heartbreaking - and entirely preventable.

Bangladesh is not alone in facing the dangers of paraquat. Recognizing its public health risks, over 50 countries, including the European Union nations, South Korea, and China, have already banned the herbicide. Even in the United States, its use is severely restricted due to its high toxicity.

So why is paraquat still legal in Bangladesh?

The answer lies in a mix of outdated policies, lack of awareness, and resistance from sections of the agricultural sector. Yet, no economic argument can justify the ongoing loss of life. Alternatives to paraquat exist and are already in use in many parts of the world. Banning paraquat is not a blow to agriculture - it is a step toward safe and healthy farming.

The repeated and predictable nature of paraquat-related deaths qualifies it as a public health emergency. Mental health crises are complex, and no single policy can prevent all suicides. But restricting access to lethal means is a proven, evidence-based strategy in suicide

prevention. Removing paraquat from the market would save lives, give individuals in distress a second chance, and send a powerful message that public health matters more than profit margins.

Bangladesh has made remarkable strides in health, agriculture, and development. But allowing a known poison to circulate freely is a tragic contradiction to those achievements. It is time we put an end to this avoidable source of suffering. Let the voices of grieving families and lost futures move us to act - before more lives are needlessly cut short.

Paraquat must go. Lives are at stake.

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Original Article

Utility of Assessing Mucin Characteristics in Colorectal Adenocarcinoma by Applying Cost Effective Combined Periodic Acid Schiff and Alcian Blue

*Mashrufa Rezmin[1], Gazi Abdus Sadique[2]

Abstract

Background: Colorectal carcinoma is the most common malignancy of the gastrointestinal tract. Adenocarcinomas account for 90% of the colorectal carcinomas. Mucinous adenocarcinoma is a subtype of colorectal adenocarcinoma. **Objective:** This is a study to see mucin characteristics in colorectal adenocarcinoma to help in diagnosis and predict prognosis. **Materials and methods:** The study comprises of 50 paraffin blocks of all patients who were histopathologically diagnosed as having colorectal adenocarcinoma in the Department of Pathology, Rajshahi Medical College. **Results:** Out of total 50 cases, most 13 (26%) cases belonged to the age group of 51-60 years and the patients were predominantly males. Mucin content was seen in 43 cases and acidic mucin was the prevalent type. Out of these 43 cases, the cases which showed presence of mucin content above 50% are categorized as mucinous. Rectum being the most common site of involvement (36%) followed by ascending colon, sigmoid colon and descending colon. In this study, most 20 (40%) were grade 3 tumors, followed by 18 (36%) grade 2 tumors and 12 (24%) grade 1 tumors. Marked mucin positivity was found mostly in grade 3 tumor. **Conclusion:** This study has showed that predominance of acid mucin increases along with the increase in tumor grade. So, mucin may be a helpful marker for early recognition of cancerous transformation and prediction of future prognosis.

Keywords: Adenocarcinoma, Tumor grade, mucin, PAS, Alcian Blue.

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Introduction

Colorectal cancer is the most common malignancy of the gastrointestinal tract and ranks third in terms of incidence and second in mortality, overall. More than 1.9 million new colorectal cancer cases and 9,35,000 deaths are estimated to occur in 2020, representing about 1 in 10 cancer cases and deaths [1].

Adenocarcinomas account for 90% of the colorectal carcinomas [2]. Mucinous adenocarcinoma is a subtype of colorectal adenocarcinoma with more than 50% of the lesion composed of mucin [3]. The colorectal carcinoma cases with less than 20% mucin are categorized as mild, those cases with 20-50% mucin as moderate and those with more than 50% mucin as marked [2].

Colorectal carcinoma with marked mucin carries a poor prognosis due to imbibition of water by the mucin, which swells and cleaves the tissue planes, dispersing malignant cells [4].

Though immunohistochemistry is an advanced diagnostic modality alongside the routine histopathology, but mucin study is a cost effec-

tive tool for diagnostic histopathology of colorectal carcinoma [5].

This study was undertaken to assess the mucin characteristics in colorectal adenocarcinoma and to compare our experience with findings in this literature.

Materials and methods

The present study was carried out in the Department of Pathology, Rajshahi Medical College, Rajshahi, Bangladesh from March 2021 to February 2023. It comprises 50 paraffin blocks of all patients, who were histopathologically diagnosed as having colorectal adenocarcinomas in this department. All histopathologically confirmed colorectal adenocarcinoma cases were included in this study. Poorly fixed sample were excluded.

Both H&E stain and combined PAS/AB stain were done according to the protocol followed in the Department of Pathology, Rajshahi Medical college. Slides of all cases were examined and then they were graded as well (grade 1), moderate (grade 2) and poorly (grade 3) differentiated carcinomas. On the basis of mucin content, colorectal adenocarcinomas were categorized as mild (<20% mucin), moderate (20- 50% mucin) and marked (>50% mucin). For the comparison of mucin content, a control section of combined PAS/AB stained normal colonic wall was used.

Results

The present study includes 50 cases of colorectal adenocarcinomas reported in the Department of Pathology, Rajshahi Medical College. The age group ranged from 20-75 years with a mean age 51.2±13.74. Most 13 (26%) cases belonged to the age group of 51-60 years. 3 (6%) cases were less than 30 years, 10 (20%) cases were within 31-40 years, 12 (24%) cases were within 41-50 years and 12 (24%) were in the age group of more than 60 years. Table-1 shows the age wise distribution of colorectal adenocarcinomas in our study.

Table I. Distribution of the study subjects by their age (n = 50).

Age (year)	Frequency n (%)
<30	3 (6)
31-40	10 (20)
41-50	12 (24)
51-60	13 (26)
>60	12 (24)
Mean ± SD	51.2 ± 13.74
Range (Min-Max)	(20-75)

There were 40 (80%) males and 10 (20%) females with a male to female ratio 4:1. Figure 1 shows gender distribution.

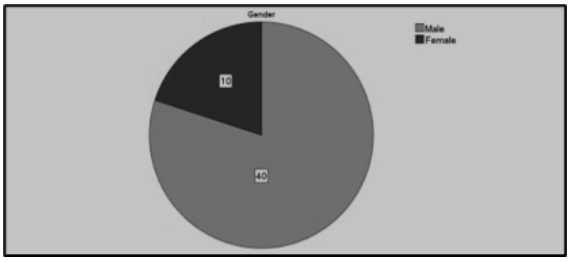

Fig. 1: Pie chart showing gender distribution (n = 50).

Out of 50 cases, most were located in the rectum 18 (36%), followed by ascending Colon 16 (32%), sigmoid colon 13 (26%) and descending colon 3(6%). Figure 2 shows distribution of cases according to the site of the tumor.

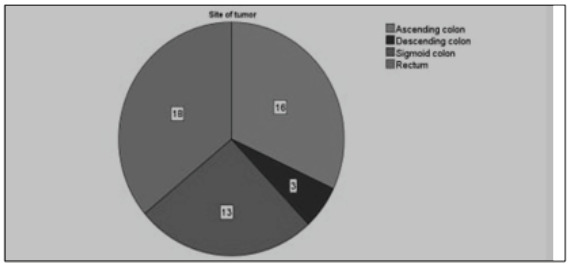

Fig. 2: Pie chart showing distribution of cases according to the site of the tumor (n = 50).

Most 20 (40%) were grade-3 tumors, followed by 18 (36%) grade 2 tumors and 12 (24%) grade 1 tumors. Figure 3 shows distribution of study subjects according to tumor grade.

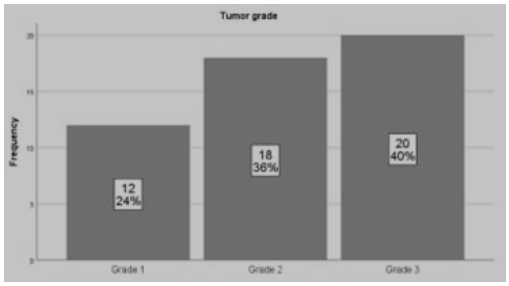

Fig. 3: Bar diagram showing distribution of study subjects according to tumor grade (n=50).

Out of 50 colorectal adenocarcinoma cases mucin positivity was found in 43 (86%) cases and 07 (14%) were mucin negative. Among the mucin positive cases mild mucin expression was found in 12 (24%) cases, moderate expression was found in 12 (24%) cases and strong expression was found in 19 (38%) cases. Figure 4 shows distribution of cases according to mucin content.

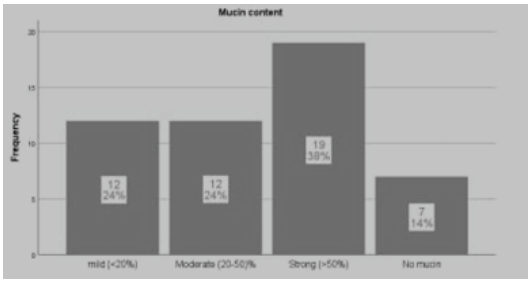

Fig. 4: Bar diagram showing mucin content (n = 50).

Out of 43 colorectal adenocarcinoma cases, marked mucin positivity was found mostly in grade 3 tumor that is 15 (83.3%) cases. 03 (16.7%) cases of grade 3 tumors showed mild mucin positivity. Moderate mucin positivity was found mostly in grade 2 in 07 (50.0%) cases and mild mucin positivity was found in grade 1 in 05 (45.5%) cases. Association of mucin content with tumor grade was statistically significant (p-value = 0.001) that is mucin content increases with the increase of tumor grade. Table-II shows association of mucin content with tumor grade.

Table II. Association of mucin with tumor type (n = 43).

Mucin content	Tumor Grade			*p value*
	Grade I	Grade II	Grade III	
Mild (<20%)	5 45.5%	4 28.5%	3 16.7%	0.001[s]
Moderate (20-50) %	5 45.5%	7 50.0%	0 0%	
Marked (>50%)	1 9.0%	3 21.5%	15 83.3%	

Both Mucinous and non-mucinous adenocarcinoma showed predominantly acidic mucin in 18 (94.7%) cases and 18 (75%) cases respectively. This association was not statistically significant. Table-III shows association of mucin type with tumor type.

Table III. Association of mucin content with tumor grade (n = 43).

Mucin Type	Tumor Type		*p value*
	Non mucinous	Mucinous	
Mixed with predominance of neutral mucin	6 25.0%	1 5.3%	0.082[ns]
Mixed with predominance of acidic mucin	18 75.0%	18 94.7%	

Discussion

Colorectal cancer is the most common malignancy of the gastrointestinal tract and ranks third in terms of incidence and second in terms of mortality [1]. Adenocarcinomas account for most colorectal carcinomas, about 90%.2 Colorectal adenocarcinoma with marked mucin content requires wide excision, tend to recur locally, and carry a poor prognosis. Mucinous adenocarcinomas are associated with poorer response to chemotherapy and chemoradiotherapy [4]. Though immunohistochemis-

try is a recent advanced diagnostic modality alongside the gold standard routine histopathology, but mucin study by combined PAS and AB stain may provide a valuable and cost effective tool for diagnostic histopathology of colorectal adenocarcinoma [5]. This study was planned to evaluate the mucin characteristics in colorectal adenocarcinoma by applying combined PAS/AB stain in the Pathology Department of Rajshahi Medical College, to help in diagnosis, predict prognosis and plan management.

This present study included 50 colorectal adenocarcinoma cases. After PAS/AB stain they were classified into mild, moderate and marked. Afterwards mucinous and non-mucinous subtyping was done.

The age group ranged from 20-75 years with a mean age 51.2 ± 13.74. Out of 50 total study cases, most 40 (80%) were males and 10 (20%) were females. In India, Borgohain et al. [2] conducted a similar study on colorectal adenocarcinoma in 2017. A total of 50 cases of histologically confirmed colorectal carcinoma irrespective of age and sex were studied. The peak incidence was seen between 40-49 years with maximum cases in between 30-70 years of age and predominantly the cases were males. Another study conducted by Parul et al. (2014) [3] showed that the age interval of patients was from 23 to 78 year, the median age being 53 years. Most (82-22%) of the cases occurred in patients above 40 years of age. The male: female ratio was 1.4:1. There were 52 (57.77%) male patients and 38 (42.22%) female patients. In current study most tumors were in the rectum 18 (36%), followed by ascending colon 16 (32%), sigmoid colon 13 (26%) and descending colon 3 (6%). Another study, was conducted by Lucky et al. (2016) [6] on colorectal adenocarcinoma and it was seen that the commonest site of growth was rectum (59%) followed by ascending colon (16%), transverse colon (12%), sigmoid colon (8%) and descending colon (6%). Parul et al. (2014) [3] found that most (40%) of the carcinomas had a right colonic location followed by rectum with 24.44% of cases. Left colon accounted for 20% of the cases, whereas rectosigmoid region accounted for 15.55% cases.

Out of 50 colorectal adenocarcinoma cases mucin positivity was found in 43 (86%) cases and 7 (14%) were mucin negative. Among the mucin positive cases mild mucin expression was found in 12 (24%) cases, moderate expression was found in 12 (24%) cases and strong expression was found in 19 (38%) cases. 31 (62%) cases were non-mucinous tumor and 19 (38%) were mucinous. 36 (83.72%) mucin positive cases showed predominantly acidic mucin and 7% (16.28%) showed predominantly neutral type mucin. Ali et al. (2013) [7] studied 16 cases of colorectal adenocarcinoma by combined PAS/AB and found 67.6% cases with mild acidic mucin, 20.6% cases with moderate acidic mucin, 5.9% cases with marked acidic mucin, 2.9% cases with mild neutral mucin and 2.9% cases with moderate neutral mucin.

In another study conducted by Borghain et al. (2017) [2] out of the 50 cases mucin was seen in 35 cases and was absent in 15 cases. To detect the nature of mucin Alcian blue/PAS staining was done. Out of the 35 cases 34 showed presence of acidic mucin, while only 1 case showed presence of neutral mucin. Of these 34 cases, 26 showed mild acidic mucin, 3 showed moderate content and only 5 cases demonstrated marked acidic mucin. In a study conducted by Parul et al. (2014) [3] on 90 colorectal carcinoma patients, combined PAS/AB staining was positive for both stains in 68.88% cases, positive for only one stain in 28.88% cases, and negative for both stains in 2.22% cases indicating that both neutral and acidic mucins are increased in CRC.

In this current study out of 50 colorectal adenocarcinomas, most 20 (40%) were grade 3 tumors, followed by 18 (36%) grade 2 tumors and 12 (24%) grade 1 tumors. Marked mucin positivity was found in most of the grade 3 tumor, in 15 (83.3%) cases; moderate mucin positivity was found in grade 2 in 07 (50.0%) cases and mild mucin positivity was found in grade 1 in 05 (45.5%) cases. In a study conducted by lucky et al. (2016) [6] it was found that out of the 50 cases there were 41 (82%) low grade tumors and 9 (18%) high grade tumors. Mucinous carcinoma showed a higher proportion of high-grade tumors 5 cases (55%) as compared to non-mucinous which was 4 cases. In a study conducted by Duara et al. (2016) [5] it was seen that 5 (55%) grade 3 tumors are mucinous and 4 (44.4%) grade 3 tumor are non-mucinous. Seventeen (94.4%) grade 3 tumors are predominantly acidic mucin followed by grade 2 (78.5%) and grade 1 (72.8%).

Conclusion

This study concludes that predominance of acid mucin increases along with the increase in tumor grades. So, mucin may be a helpful marker for the early recognition of cancerous transformation, and prediction of future prognosis. It can be used as an adjunct to H&E stain in detection of mucin producing colorectal adenocarcinomas, which sometimes may be difficult to diagnose on H&E stain alone.

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Original Article

Functional & Neurological Outcome of Lumbar Discectomy at L4/5 and L5/S1

***Md. Mahamudul Hasan[1], Professor Md. Shah Alam[2], Sarwar Jahan[3], Chitta Ranjan Roy[4], Probir Kumar Das[5], Md. Fakhrul Alam[6], Md. Ismail Hossain[7], Raju Ahmed[8]**

Abstract

Background: Lumbar disc herniation (LDH) is the most common specific cause of low back pain (LBP). It is a degenerative process as well as acute trauma causing annular tear with extrusion of the nucleus pulposus through the posterior midline or posterolateral aspect of the disc, leading to compression of the thecal sac and nerve roots with radicular symptoms. Disc prolapse often affects the lumbar region, typically at L4/L5 or L5/S1. Individuals with occupation of prolonged standing (e. g. traffic police), prolonged sitting (desk job) weightlifters, and those with multiple jerking trauma (e. g. bikers, dancers) are at higher risk. Surgery is reserved for those who are not responding to nonsurgical management for at least 6 weeks. Surgical management of lumbar intervertebral disc prolapse (PLID) is crucial for alleviating pain and restoring function. In Bangladesh, evaluating surgical outcomes is essential. Aim of the study: To evaluate the functional & neurological outcome of lumbar discectomy at L4/5 and L5/S1. **Methods:** This prospective observational study was conducted in the different private hospitals in Satkhira, Bangladesh, from January 2020 to December 2023. A total of 112 patients with low back pain who diagnosed with PLID do not respond to conservative treatment or progressive neurological deficits were enrolled and analyzed in this study. Detailed demographic and clinical data were recorded, and patients voluntarily joined a clinical follow-up program, with assessments preoperatively, on day one post-surgery, after one week, at 12 weeks, and after 1 year. Functional improvement was assessed by the ODI score & categorized into excellent, good, fair & poor, neurological improvement was assessed by the Nurick score improvement of pain control by VAS score. **Results:** Pre-operative ODI score was 54.6±12.8 & post-operative score was improved to 10.2±3.3. The pre-operative & post-operative Nurick score was 2.9 & 0.8 respectively. There was significant improvement in pre-operative & post- operative VAS score for leg pain was 6.90 ± 1.9 & 2.0 ± 0.8 respectively & for low back pain was 5.8±1.2 & 2.2±0.8 respectively. **Conclusion:** The study found that PLID surgery at a district-level private hospital in Bangladesh resulted in significant pain reduction and excellent outcomes for most patients.

Keywords: Disc prolapse, surgical management, lumbosacral spine, and back pain.

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Introduction

The surgical management of prolapse of lumbar intervertebral discs (PLID) stands as a critical intervention in the realm of spinal healthcare, aiming to alleviate pain and restore functionality for individuals grappling with this debilitating condition. In Bangladesh, a country with a burgeoning healthcare landscape, evaluating surgical outcomes is paramount. The vertebral disc comprises an outer tough annulus fibrosis and an inner gel-like nucleus pulposus. Degenerative changes in the annulus fibrosis result in the protrusion of the inner nucleus pulposus. Disc degeneration can be attributed to both degenerative disc disease and ageing. This condition is commonly known as disc prolapse or a slipped disc [1]. In our community, disc prolapse holds significance, particularly for individuals engaged in stressful occupations, as they are more prone to spinal injuries that eventually lead to disc prolapse. Postero-lateral disc prolapse is predominant due to the presence of the posterior longitudinal ligament, although central disc herniation does occur [2]. Most disc prolapses (95%) manifest in the lumbar region at the L4/L5 or L5/S1 levels [3]. Professionals with prolonged sitting, smokers, weightlifters, individuals experiencing trauma, and drivers are all at an increased risk of disc prolapse. Age is a contributing factor to disc wear and tear, with degenerative diseases being considered a more significant cause than trauma, according to most authors [4]. Professional athletes are also susceptible to disc injuries [5, 6]. The initial presentation of disc prolapse often includes backache due to ligament pressure and sciatica due to nerve compression. Compression of other nerve roots can lead to muscle weakness, limb numbness, paraesthesia, and urinary retention, attributed to the compression of cauda equina nerves. The lifetime incidence of sciatica in the general population ranges from 13 to 40% [7]. During the examination, lower back tenderness and spasms of paravertebral muscles may be observed. A straight leg raising test might reveal limited movement on the affected side. Crossed sciatic tension, performed by raising the unaffected leg, may induce increased pain on the affected side, though this is not a common finding. The femoral stretch test, indicating L3/L4 nerve involvement, is another particular test. At the level of prolapse, paraesthesia, muscle weakness, and reduced reflexes may be noted. L5 nerve root impairment results in loss of sensation on the dorsal side of the foot and lateral side of the leg, along with weakness in significant toe extension. S1 nerve root impairment causes weakness in ankle jerk reflex, plantar flexion, foot eversion, and loss of sensation on the lateral and plantar aspects of the foot. Compression of cauda equina nerves can lead to loss of lower back sensation and urinary retention. The differential diagnosis for disc prolapses includes tuberculosis, spinal stenosis, vertebral abscess, ankylosing spondylitis, vertebral hematomas, vertebral tumors, nerve tumors, paravertebral muscle sprain, and mechanical pain. Given the substantial disease burden in our community, we conducted a study to determine outcomes for patients treated at our center for prolapsed intervertebral discs. The study aimed to explore the various demographic aspects of patients undergone PLID surgery, focusing on clinical presentation, complications, and surgical outcomes.

Methodology

This prospective observational study was conducted in a different private Hospital, Satkhira, Bangladesh, from January 2020 to December 2023. A total of 112 patients undergoing PLID surgery were enrolled and analyzed in this study. MRI was utilized to confirm the diagnosis, focusing on identifying disc prolapse at the specific level and side corresponding to the clinical symptoms and physical examina-

tion findings. Dynamic View X-ray of L/S Spine was done to see instability. In this study, a purposive sampling technique was employed to select participants. Detailed demographic and clinical information for each participant was meticulously recorded. The study population comprised individuals who voluntarily agreed to participate in a standardized clinical follow-up program, which included consultations and the collection of patient-based outcome measures. These assessments were conducted at various times, including preoperatively, day one post-surgery, after one week, after 12 weeks and after 1 year of follow-up. To ensure the integrity of the study, specific exclusion criteria were applied.

Inclusion criteria:

- Patients aged 18-60 with symptomatic low-back pain from lumbar intervertebral disc prolapse
- Patients who failed from conservative treatment
- Cauda equina Syndrome.
- Disc prolapsed at L4, 5; L5, S1 level

Exclusion criteria:

- Patients with prolapsed lumbar intervertebral disc (PLID) associated with other spinal pathologies such as spinal tumors, infections, and inflammation, those who had undergone repeat lumbar disc surgery due to symptom recurrence, and individuals with PLID caused by direct trauma resulting in vertebral fracture-dislocation, severe co-morbidity unfit for surgery, PLID other than L4, 5; L5, S1 level were excluded from the study.

Pain was assessed using VAS scores [8], and functional outcome by ODI and neurological assessment by Nurick score. The data analysis used MS Office tools to facilitate accurate and comprehensive research outcomes. All statistical analyses were performed using the statistical package for the social science (SPSS) program and Windows. Continuous parameters were expressed as mean±SD and categorical parameters as frequency and percentage.

Results

The study was conducted at different private hospitals of Satkhira district of Bangladesh and focused on evaluating surgical outcomes for the prolapse of lumbar intervertebral discs (PLID) among 112 participants. Among the participants, the majority were in the age group of 31-40 years, constituting 70 (46.05%) of the total sample. The second most represented age group was 21-30 years, comprising 54 (35.53%) participants. A smaller proportion of 23 (15.18%) participants were in the age groups of 41-50 years, and only 2.68% were aged 51-60 years (Table 1). Figure 1 illustrates the gender distribution, with males comprising the majority (61.61%) and females (38.39%). Eighty-eight patients experienced PLID on the left (58.04%) and 35.71% on the right. Bilateral involvement, where both sides were affected, was noted in a smaller proportion of cases (6.25%) (Figure 2). Before surgery, participants reported a mean VAS score of 7.4±1.2. Immediately postoperative on Day 1, the mean VAS score decreased to 6.8±1.1. At the 12-week follow-up, the mean VAS score significantly dropped to 2.8±0.4 (Table 3). Eighty-five (75.89%) patients were achieved an excellent outcome, 20(17.86%) reported a good outcome, 5(4.46%) experienced a fair outcome, and 2(1.76%) reported a poor outcome following surgery (table 6).

Table I. Age distribution of participants (n=112).

Age (year)	**Frequency** n (%)
21-30	40 (35.71)
31-40	52 (46.43)
41-50	17 (15.18)
51-60	3 (2.68)
Total	112 (100)

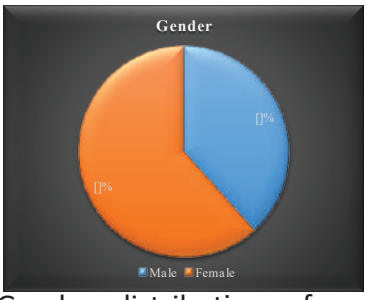

Fig. 1: Gender distribution of participants (n=112).

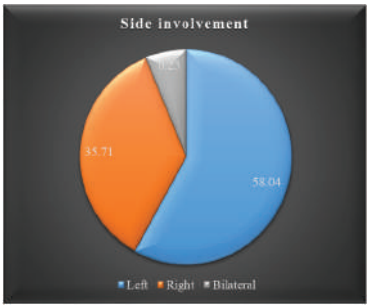

Fig. 2: Side involvement (N=112).

Table II. Levels of disc prolapse (n=112).

Levels of disc prolapse	Frequency n (%)
L4-L5	69 (61.61)
L5-S1	43 (38.39)

Table III. VAS score distribution to assess pain (n=112).

Period	VAS scores mean±SD
Preoperative	7.4±1.2
Day 1	6.8±1.1
After 1 week	3.9±0.7
After 12 weeks	2.8±0.4

Table IV. Pre-operative and post-operative comparison of pain after 12 months (n=30) (according to VAS score).

Pain	Preoperative VAS scores mean±SD	Final (f/up) VAS scores mean±SD	*p* value
Back Pain	6.90±1.8	1.8±0.7	<0.001[s]
Leg Pain	5.8±1.1	2.1±0.7	<0.001[s]

Table V. Pre-operative and post-operative Nurick & ODI score of the patients (n=112).

Score	Preoperative	Postoperative
Nurick	2.8	0.7
ODI (mean±SD)	54.5±12.7	10.1±3.2

Table VI. Distribution of outcomes among the study population (n=112).

Outcomes	Frequency n (%)
Excellent	85 (75.89)
Good	20 (17.86)
Fair	5 (4.46)
Poor	2 (1.79)

Discussion

The demographic characteristics observed in our study show a majority of male participants, accounting for 61%, with the remaining 39% being female. Moreover, the age distribution in our research spanned a wide range, from 17 to 63 years, with the highest proportion of cases, precisely 46%, falling within the 41-50 age group. This age group is particularly significant as it represents a stage in life when lumbar disc-related conditions are more prevalent, thereby emphasizing the relevance of our study's findings. Interestingly, these findings closely correspond with those reported in a study conducted by Audat, Ziad, as referenced in [9]. In their study, they treated a total of seventy-one patients, with a similar gender distribution of 60% male and 40% female, who had herniated intervertebral disc conditions in one or two levels of the lower lumbar spine. The age range of patients in their study also mirrors ours, ranging from 17 to 63 years, with a mean age of 36.48 and a standard deviation of 10.057 years. These parallels in demographic characteristics underline the consistency of these parameters across studies focusing on lumbar disc-related conditions. In our study, when examining the side involvement of prolapsed lumbar discs among the cases, it

was evident that most, specifically 58% of cases, were affected on the left side. In contrast, 35% of cases exhibited right-sided involvement, while 7% had bilateral involvement. These findings align closely with another study [10], which reported that most cases (57%) had involvement on the left side. Furthermore, when considering the level of disc prolapse among the participants in our study, most cases, accounting for 61.6%, had disc prolapse at the L4-L5 level. Additionally, 38.3% of cases had disc prolapse at the L5-S1 level. These results closely resemble those reported in another study [11], where 55.2% of patients had a disc prolapse at the L4-L5 level, 35.5% at the L5-S1 level. This study's mean VAS score was 6.9±1.8 before surgery, indicating a high pain level. However, the positive news is that on the first-day post-surgery, the mean VAS score decreased to 6.1±1.1; after one week, there was a further reduction in pain, with a mean VAS score of 3.4±0.7. At the 12-week mark, the mean VAS score dropped even further to 1.8±0.7, indicating a significant improvement in pain management and overall patient comfort. These findings were comparable with a previous study [12]. Several points are considered when assessing the results of lumbar disc surgery [13]. In our Study Nurick score reduced from preoperative 2.8 post operative 0.7 which is Similar to Anowarul Islam et al. where they show Nurick score reduced preoperative 2.9 to post operative 0.8 [13]. In our study, as per the ODI outcome criteria, 72% of our participants got excellent results, followed by 18% who got good results. In the previous study [14], most patients (75.9%) had excellent functional outcomes, 13.8% good, 6.9% fair, and 3.4% had poor functional outcomes per ODI.

Conclusion

The study found that PLID surgery at a district-level private hospital in Bangladesh resulted in significant pain reduction and excellent outcomes for most patients. Lumbar discectomy is a safe & effective method to treat the patients with lumbar disc prolapse with shorter hospital stay & better prognosis with minimum & considerable complications.

Limitations of the study: This study was limited by its single-center design and relatively small sample size, which may affect the generalizability of the findings to other populations and healthcare settings. Additionally, the follow-up period of 1 year may not capture long-term outcomes and complications post-surgery. The exclusion criteria, including patients with recurrent lumbar disc surgery and those with concurrent spinal pathologies, may result in a selection bias, potentially skewing the outcomes.

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Original Article

Normal Angiogram of ETT Positive Female Patients in Bangladesh

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Abstract

Background: Coronary artery disease (CAD) is a major global health concern, causing over 17 million deaths annually, significantly impacting low- and middle-income countries, like Bangladesh, where it contributes to the rising prevalence of non-communicable diseases. The electrocardiographic exercise test (ETT) is widely used to assess cardiovascular health, but its specificity and positive predictive value (PPV) are influenced by metabolic conditions, structural heart diseases, and demographic factors, particularly showing lower PPV in women. The study aimed to access the correlation between coronary angiographic results and positive ETT results in female patients. **Methods:** This study was conducted at Cardiology Department in Khulna Specialized Hospital, Khulna, Bangladesh, involving 102 female patients aged between 30 and 45 years, who tested positive for ETT. Angiogram was performed in the patients. Demographic data, including age, occupation, accommodation, and BMI, were collected, and informed consent was obtained. The study was approved by the institution's Ethical Review Committee. Data were analyzed using SPSS version 26.0, with significance set at $p<0.05$. **Results:** The study reveals normal angiograms (69.61%), single vessel coronary artery disease (SVCAD) (13.73%), double vessel coronary artery disease (DVCAD) (5.88%), and triple vessel coronary artery disease (TVCAD) (10.78%) in ETT positive study subjects underscoring false-positivity probably due to hormonal differences and microvascular dysfunction. **Conclusion:** In spite of positive ETT findings, angiogram was normal in most cases in this study. The findings emphasize developing diagnostic strategies and additional tools to better manage cardiovascular risk in women.

Keywords: Coronary Artery Disease, Electrocardiographic Exercise Test, and Angiography.

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Introduction

Coronary artery disease (CAD), also called coronary heart disease (CHD), or ischemic heart disease (IHD), is a type of heart disease involving the reduction of blood flow to the cardiac muscle due to a build-up of atheromatous plaque in the arteries of the heart [1, 2]. CAD is the most common of the cardiovascular diseases [3] that can cause stable angina, unstable angina, myocardial ischemia [4], and myocardial infarction [5]. Cardiovascular diseases (CVDs) account for >17 million deaths globally each year (30% of all deaths), 80% of which occur in low-income and middle-income countries, and this figure is expected to grow to 23.6 million by 2030 [6, 7]. Globally, there has been a significant rise in the proportion of women suffering from CAD over the last few decades. South Asia bears the largest overall burden of CAD partly because of its large pop-

ulation and the early onset of CAD in this region [8]. The causes of this evolutionary change may be genetic or environmental factors [9].

Bangladesh has been experiencing epidemiological transition from communicable disease to non- communicable disease (NCD) for more than thirty years. The overall mortality rate has decreased significantly over the last couple of decades. But deaths due to chronic diseases, specially the 'fatal four' i.e., cardiovascular disease (CVD), cancer, chronic respiratory disease and diabetes, are increasing at an alarming rate. CAD is an important contributor to one of the four i.e., CVDs [10]. In Bangladesh, noncommunicable diseases (NCDs) contribute to 67% of all deaths, with CVDs accounting for 30% of total fatalities [11]. CAD is recognized as a leading cause of morbidity and mortality particularly among middle-aged adults [12]. Age is a significant predictor of CAD in both women and men, with prevalence increasing sharply in women in their 70s [13].

Exercise acts as a physiological stressor that can reveal the underlying cardiovascular disease that may not be evident at rest. The electrocardiographic exercise test (EET), also known as the exercise tolerance test (ETT), is one of the most commonly used non-invasive methods to assess cardiovascular health [14]. ETT is employed to evaluate physical fitness, diagnose heart or lung pathologies, induce angina, and assess the stability of the cardiopulmonary system [15]. While sensitivity and specificity are often used to measure the validity and reliability of diagnostic test, physicians are more focused on detecting the disease in patients they suspect of having it. This is reflected in the positive predictive value (PPV) of the test [16].

The PPV of a diagnostic test is critical, as it indicates the likelihood that a positive result corresponds to true disease presence. A high PPV reduces unnecessary hospitalizations, alleviates financial costs, and minimizes patients' anxiety [17]. Although ETT is sensitive and helpful in detecting CAD, its specificity is influenced by several parameters, that can lead to false-positive results [18]. Reduced specificity has been observed in individuals with metabolic conditions such as anemia, glucose load, hyperventilation, and hypokalemia. Structural heart diseases, including severe aortic stenosis, mitral valve prolapse, significant regurgitation, cardiomyopathies, and left ventricular hypertrophy, can also affect test accuracy. Other factors that can affect its accuracy include marked resting ST segment depression, intraventricular conduction disturbances, pre- excitation syndromes, severe hypertension, severe hypoxia, sudden intense exercise, supraventricular arrhythmias, or digitalis therapy [19].

Previous studies have demonstrated a low PPV of ETT in women, particularly in young premenopausal subjects [20]. Currently, ETT serves as a gatekeeper for coronary angiography, with only patients who test positive undergoing further investigation. This approach reduces the number of true-negative results, increasing the test sensitivity while lowering its specificity, a phenomenon known as post-referral bias [21]. However, few studies in developing countries have assessed the PPV of ETT. This study aims to evaluate the variability in coronary angiographic findings among patients with positive ETT results.

Methods

This prospective observational study was conducted at the Department of Cardiology in Khulna Specialized Hospital, Khulna, Bangladesh from the month of May to November of 2024, Bangladesh. A total of 102 female patients aged between 30 and 45 years were considered in this study. All the patients had positive ETT results during the study period

and underwent angiography. Data were recorded using a predefined proforma, and informed consent was obtained from all participants. Patients with coronary artery bypass grafting (CABG), percutaneous coronary intervention (PCI), ischemic heart disease, aberrant angiography results, contraindications to angiography, and valve replacement surgery were not included. Wolf- Parkinson-White (WPW) syndrome, congenital cardiac disease, aortic stenosis, and anomalies of the ECG (left bundle branch block) were also excluded. Demographic data, including age, occupation, accommodation, and body mass index (BMI), were obtained prior to ETT. Informed consent was obtained from all participants, and confidentiality was ensured. The institution's Ethical Review Committee granted the institution's approval for the study.

Baseline demographic characteristics were compared between true-positive and false-positive ETT results. Significant CAD identified via angiography indicated a “true positive” result, while the absence of significant CAD indicated a “false positive” result. Data were compiled using Microsoft Excel, reviewed for accuracy, and analyzed by using the Statistical Package for Social Sciences (SPSS) version 26.0 for Windows. Descriptive data were presented in tables and graphs and associations between categorical variables were evaluated using the chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

The sociodemographic profile of 102 ETT-positive female patients with normal angiograms revealed that 70.59% were aged between 30 and 37 years, and 50.98% were housewives. A majority of patients (57.84%) resided in rural areas, and 86.27% had a BMI below 30 kg/m², while 13.73% were classified as obese (Table 1). More than 35% of the female patients had diabetes, 31.37% were hypertensive, and

Table I. Sociodemographic profile of the patients performed ETT (n = 102).

Variables		Frequency n (%)
Age (year)	30-37	72 (70.59)
	38-45	30 (29.41)
Occupation	Service	42 (41.18)
	Housewives	52 (50.98)
	Others	8 (7.84)
Locality	Rural	59 (57.84)
	Urban	43 (42.16)
BMI (kg/m²)	<30	88 (86.27)
	>30	14 (13.73)

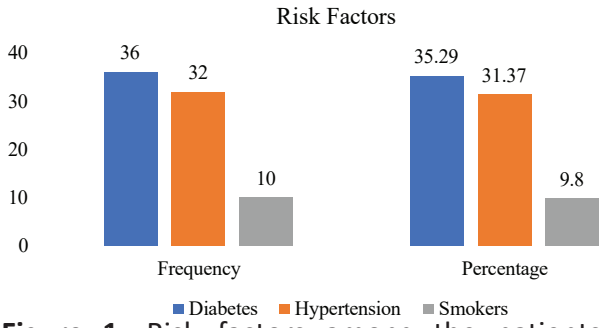

Figure 1: Risk factors among the patients (n=102).

Most women (69.61%) had normal angiograms. Among those with coronary artery disease, 13.73% were diagnosed with single-vessel coronary artery disease (SVCAD), 5.88% with double- vessel coronary artery disease (DVCAD), and 10.78% with triple-vessel coronary artery disease (TVCAD) (Figure 2).

Table 2 indicates no significant difference in diabetes prevalence between true-positive (35.48%) and false-positive (35.21%) ETT results. However, significant differences were observed in smoking and hypertension, with a higher proportion of smokers in the true-posi-

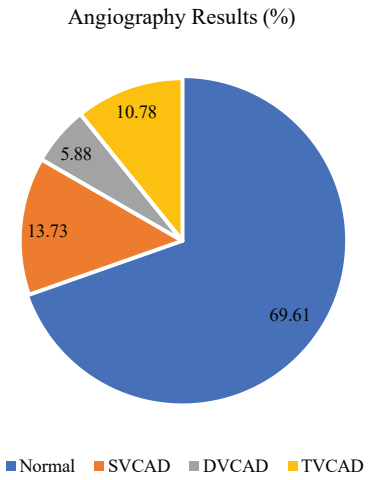

Figure 2: Angiography results among the patients (N=102). SVCAD, DVCAD, and TVCAD denote single vessel coronary artery disease, double vessel coronary artery disease, and triple vessel coronary artery disease, respectively.

tive group (12.90%) and more hypertensive patients in the false-positive group (35.21%). True-positives results were more frequently observed in earlier stages of ETT, whereas false-positive results were more common in stage 3 (47.89%), though this difference was not statistically significant (Table 2).

Table II. Comparison between true-positives and false-positives of ETT patients.

Parameters		True Positive n (%)	False Positive n (%)	*p* value
Diabetics		11 (35.48)	25 (35.21)	NS
Non-diabetics		20 (64.52)	46 (64.79)	
Smoker		4 (12.9)	6 (8.45)	S
Non-smoker		27 (87.1)	65 (91.55)	
Hypertensive		7 (22.58)	25 (35.21)	S
Non-hypertensive		24 (77.42)	46 (64.79)	
Stage of ETT	Stage 1	10 (32.26)	12 (16.9)	NS
	Stage 2	12 (38.71)	25 (35.21)	
	Stage 3	9 (29.03)	34 (47.89)	

Discussion

The exercise tolerance test (ETT) is a widely used, non-invasive diagnostic tool for evaluating patients with suspected CAD. A positive ETT result typically indicates myocardial ischemia, suggesting the presence of obstructive coronary lesions. However, some patients, particularly females, may have a positive ETT result but exhibit normal coronary angiogram, a condition known as false-positive ETT. This phenomenon is more prevalent in women due to several factors, including hormonal differences, microvascular dysfunction, and the inherent limitations of standard diagnostic protocols [17,20].

In Bangladesh, where cardiovascular disease represents a growing public health concern, the frequent observation of normal angiograms in ETT-positive females raises critical questions regarding the diagnostic approach to CAD in female patients. Understanding the implications of false-positive ETT results in women is essential for improving diagnostic accuracy and ensuring appropriate management of cardiovascular risks in this population. Our study included 102 patients, of whom 57% were employed in the service sector. The majority, 72 (71%), were under 37 years of age, and 59 patients (57%) resided in the rural areas. Additionally, 12 patients (13%) were classified as obese. This sociodemographic profile aligns with the findings of a Bangladeshi study conducted by Islam and Majumder [10] and is consistent with the work of Ikbal et al. [21].

In terms of risk factors, 36 patients (35.29%) had diabetes (DM), 32 (31.37%) suffered from hypertension, and 10 (9.8%) were smokers. These results align with previous research, which identified diabetes and hypertension as the common risk factors for ischemic heart disease (IHD). Smoking and lifestyle were also noted as significant contributors to IHD [15].

In our study, 69.61% of ETT-positive patients had normal angiography. The finding contrasts with other studies reporting a positive predictive value (PPV) of ETT between 75% and 85% [14,21]. Additionally, no statistically significant difference was observed in the prevalence of diabetes between the true-positive group (35.48%) and the false-positive group (35.21%) ($p>0.05$). While diabetes is a known risk factor for CAD, it may contribute to false-positive results due to microvascular dysfunction or autonomic neuropathy, which can affect the sensitivity of ETT

without revealing significant stenosis on angiography [22]. Previous studies have reported PPV among people with diabetes to be hovering at 77% [23].

Smoking showed a significant association ($p<0.05$) between the two groups, with a higher percentage of smokers in the true-positive group (12.90%) compared to the false-positive group (8.45%). This finding suggests that smokers are more likely to have true-positive ETT results. However, the low prevalence of smoking among women in Bangladesh may have limited the overall impact of this factor in the study. Nonetheless, research indicates that chronic smokers, both male and female, tend to have higher PPV than non-smokers [23]. Identification of diabetes and chronic tobacco smoking as established risk factors for the development of complex CAD may explain the higher PPV in these subsets of patients [23].

Hypertension was significantly more prevalent in the false-positive group (35.21%) than in the true-positive group (22.58%) ($p<0.05$). This finding is consistent with the notion that hypertensive females are more prone to false-positive ETT results, potentially due to increased vascular resistance and impaired endothelial function [21]. In hypertensive patients, microvascular ischemia or exaggerated blood pressure responses during exercise may lead to abnormal ETT results without corresponding coronary artery stenosis on angiography. Other studies also report a higher number of false positives among hypertensive individuals, with PPVs for hypertensives found to be lower (50%) compared to normotensives (88.2%) [22]. Impaired subendocardial perfusion in hypertensives may contribute to these discrepancies, leading to increased false- positive results [23].

In this study, true-positive patients showed positive ETT results earlier, with 32.26% in stage 1 and 38.71% in stage 2, compared to 16.90% and 35.21% for false-positive patients, respectively. A larger proportion of false positives (47.89%) reached stage 3 before testing positive, compared to 29.03% of true positives. Though the differences were not statistically significant, the trend suggests that true positives are more likely to exhibit ischemic changes earlier, while false positives tend to occur after prolonged exertion. These findings are consistent with the findings of Khan et al. [17]. Due to the limited specificity of ETT in detecting inducible angina, there has been an increased reliance on advanced technologies, such as myocardial perfusion scans (MPS) and cardiac magnetic resonance imaging (CMR), for more accurate diagnosis. Nevertheless, ETT remains a valuable tool for assessing the functional capacity of the heart during exercise and stress, especially in cases with a normal resting ECG [20].

Limitations of the study

This study contains several limitations. First of all, the sample size is relatively small and restricted to a specific demographic (female patients aged 30 to 45 years) in a single medical institution, which may limit the generalizability of the findings. Furthermore, the exclusion of male patients and those with a history of ischemic heart disease or significant medical interventions may influence the results. Addi-

tionally, the reliance on self-reported data for risk factors such as smoking and hypertension could introduce potential bias.

Conclusion & Recommendations

The study highlights the high prevalence of normal angiograms in female patients with positive ETT results in Khulna, with 69.61% of the cases showing no significant CAD. This finding underscores the challenge of false-positive ETT results in women likely to be influenced by factors such as hormonal differences and microvascular dysfunction. The higher prevalence of hypertension and smoking among true-positive cases suggests the need for more refined diagnostic strategies. These insights emphasize the importance of considering additional diagnostic tools alongside ETT to enhance accuracy and ensure effective management of cardiovascular risk in women, ultimately improving clinical outcomes in this community.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

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Original Article

Exploring the Nephroprotective Efficacy of *Carica papaya* Leaf Extract on Serum Creatinine and Kidney Histopathology in Cyclophosphamide-Induced Thrombocytopenic Long-Evans Rats

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Abstract

Background: Cyclophosphamide, a widely used chemotherapeutic agent, is known to cause nephrotoxicity and thrombocytopenia, leading to renal dysfunction marked by increased serum creatinine and oxidative stress-induced kidney damage. Despite limited treatment options, *Carica papaya* leaf extract has shown promising antioxidant properties due to its rich content of flavonoids, tannins, and vitamin E. **Objective:** To investigate the nephroprotective potential of *C. papaya* leaf extract by examining its modulatory effects on serum creatinine levels and renal histopathological alterations in Long-Evans rats subjected to cyclophosphamide-induced thrombocytopenia. **Methods:** A total of 30 healthy rats (8–10 weeks, 150–250 g) were acclimatized for 14 days and divided into Control (Group A) and Experimental (Group B) groups. Group A was further subdivided into A1 (Baseline control) and A2 (Cyclophosphamide-induced thrombocytopenic control), with 10 rats in each subgroup. All rats received a basal diet for 23 days, while Group A2 and Group B were administered cyclophosphamide (70 mg/kg/day, subcutaneously) on days 1, 3, and 5 to induce stable thrombocytopenia. Group B additionally received *C. papaya* leaf extract (400 mg/kg/day) from day 10 to day 23. Blood samples were collected on day 1 and day 10 via tail vein, and on day 24 through cardiac puncture for serum creatinine evaluation, along with histopathological examinations of kidney tissues. Statistical analysis was performed using SPSS version 22, with significance set at $p \leq 0.05$. **Result:** Group A2 had significantly elevated serum creatinine levels ($p<0.05$) compared to Group A1. In contrast, Group B exhibited markedly reduced creatinine levels ($p<0.05$) relative to Group A2, with values comparable to Group A1, demonstrating robust nephroprotective effects. Histopathological analysis revealed kidney abnormalities in 40% of Group A2 and 10% of Group B, with no abnormalities in Group A1. **Conclusion:** *C. papaya* leaf extract significantly reduces serum creatinine levels and histopathological damage in cyclophosphamide-induced thrombocytopenic Long-Evans rats, indicating its potential as an effective adjunctive therapy for renal complications, likely due to its antioxidant properties.

Keywords: Thrombocytopenia, Cyclophosphamide, *C. papaya* leaf, Long Evans male rats.

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Introduction

Thrombocytopenia, defined as a platelet count of less than 150,000 per microliter, poses significant clinical challenges, particularly in patients undergoing chemotherapy. It is a common hematological complication associated with various malignancies and treatments, including cyclophosphamide, a widely utilized alkylating agent in cancer therapy [1]. Cyclophosphamide, while effective in treating a range of cancers, is notorious for inducing myelosuppression and nephrotoxicity, resulting in elevated serum creatinine levels and structural damage to renal tissues [2]. The kidneys are especially susceptible to oxidative stress generated by cyclophosphamide metabolism, leading to the production of reactive oxygen species (ROS), which can initiate lipid peroxidation, protein damage, and eventual cellular apoptosis [3].

Current therapeutic interventions to manage cyclophosphamide-induced nephrotoxicity are limited and often associated with significant adverse effects, necessitating the exploration of safer and more effective adjunctive therapies. Natural products, particularly plant extracts, have emerged as promising candidates for protecting against oxidative stress and enhancing renal function [4]. Among these, C. papaya leaf extract has gained attention due to its rich profile of bioactive compounds, including flavonoids, tannins, saponins, and vitamin E, which are known for their potent antioxidant and anti-inflammatory activities [5].

Numerous studies have highlighted the protective effects of C. papaya leaf extract on various organ systems. For instance, Nandini et al. [6] demonstrated its ability to improve platelet counts in cyclophosphamide-treated rats, suggesting its role in mitigating chemotherapy-induced hematological side effects. Furthermore, Alzahrani et al. [7] and El-Sayed et al. [8] reported that the extract effectively reduced oxidative stress markers and inflammatory cytokines in experimental models of nephrotoxicity. Despite these promising findings, the specific nephroprotective effects of C. papaya leaf extract in the context of cyclophosphamide-induced thrombocytopenia have yet to be thoroughly investigated.

The objective of this study is to evaluate the nephroprotective efficacy of C. papaya leaf extract by assessing its impact on serum creatinine levels and renal histopathological changes in Long-Evans male rats subjected to cyclophosphamide-induced thrombocytopenia. By elucidating the mechanisms underlying the protective effects of this natural extract, the study aims to provide valuable insights into potential therapeutic strategies for preventing renal complications associated with cyclophosphamide treatment. The findings may contribute to the development of adjunctive therapies that enhance patient outcomes while minimizing the risks associated with conventional chemotherapy.

Methodology

Study Settings and Population: This experimental study was conducted at the Department of Physiology, Sir Salimullah Medical College (SSMC), Dhaka, Bangladesh. The study involved 30 healthy male Long-Evans rats, aged 8 to 10 weeks, with body weights ranging from 150 to 250 grams. These animals were sourced from the Animal Resource Facility at the International Center for Diarrheal Disease Research, Bangladesh (ICDDR,B) in Dhaka. Only rats exhibiting normal health were included; those showing signs of illness or disease were excluded to ensure the integrity of the experimental outcomes.

Grouping of the Rats: Following a 14-day acclimatization period, the 30 Long-Evans rats were randomly allocated into two primary groups. Group A (control) was further subdivided into

Group A1, which comprised 10 rats receiving only a basal diet for 23 days, and Group A2, consisting of 10 rats that received a basal diet along with subcutaneous injections of cyclophosphamide (70 mg/kg) on days 1, 3, and 5. Group B (experimental group) also included 10 rats that were administered the same diet and cyclophosphamide injections as Group A2, but additionally received an oral dose of C. papaya leaf aqueous extract (400 mg/kg/day) from days 10 to 23.

Intervention: Group A1 served as the baseline control, receiving a basal diet throughout the 23-day study period. Group A2 acted as the cyclophosphamide-induced thrombocytopenic control group, being fed a basal diet and receiving subcutaneous cyclophosphamide injections (70 mg/kg body weight) on days 1, 3, and 5. Group B, the experimental group, underwent similar treatment as Group A2 but was also treated with C. papaya leaf aqueous extract (400 mg/kg body weight) delivered orally via gastric gavage from day 10 to day 23. All interventions, including dietary provisions and cyclophosphamide administration, were carried out daily between 9:00 AM and 10:00 AM throughout the study.

Study Procedure: The research protocol received ethical approval from the Institutional Ethics Committee (IEC) at Sir Salimullah Medical College (SSMC) in Dhaka, Bangladesh. The experiment was performed at the animal facility of the Institute of Nutrition and Food Science, Dhaka University, under controlled conditions (temperature: 27–28°C; 12-hour light/dark cycle). The 30 male Long-Evans rats underwent a 14-day acclimatization phase with unrestricted access to food and water. The experimental phase lasted 23 days, during which body weights were measured on day 1 and day 23.

On day 1, baseline assessments of platelet count, bleeding time (BT), and clotting time (CT) were conducted for all rats. Thrombocytopenia was induced in Groups A2 (cyclophosphamide-induced thrombocytopenic control) and B (experimental) through subcutaneous injections of cyclophosphamide (70 mg/kg) on days 1, 3, and 5. Group A1 received only a basal diet. By day 10, platelet counts, BT, and CT were reassessed to confirm thrombocytopenia development in Groups A2 and B, evidenced by prolonged BT and CT, while Group A1 maintained normal values.

From day 10 to day 23, Group B was administered C. papaya leaf aqueous extract (400 mg/kg/day) via gavage, while Group A2 continued with a basal diet. Blood samples were collected again on day 10 to reassess platelet counts, BT, and CT. On day 24, all rats were subjected to anesthesia using 30% chloroform and then euthanized. Serum creatinine levels were quantified using established laboratory methods, specifically the Kinetic Alkaline Picrate Method (Jaffe reaction) utilizing the Atelica CI Analyzer (Siemens Healthineers).

To investigate the histopathological impacts of the interventions, kidney tissues were harvested from all sacrificed rats. These tissue samples were processed to prepare histological slides, which were then examined under a light microscope. Photomicrographs of the kidney sections were captured to document any pathological changes. The histopathological analysis was performed at the Department of Pathology, Sir Salimullah Medical College, Dhaka. Tissue samples were evaluated for structural alterations such as necrosis, inflammation, and cellular degeneration, thereby elucidating the potential protective or damaging effects of C. papaya leaf extract on renal health following cyclophosphamide-induced toxicity.

Statistical Analysis: Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22. Results were presented as

mean values ± standard deviation (SD). One-way ANOVA was employed to compare differences across groups, followed by post hoc Bonferroni tests for pairwise comparisons. Where appropriate, paired t-tests and Fisher's Exact tests were conducted. A p-value of ≤ 0.05 was considered statistically significant.

Ethical Approval: The study protocol received approval from the Institutional Ethics Committee (IEC) of Sir Salimullah Medical College (SSMC), Dhaka, Bangladesh.

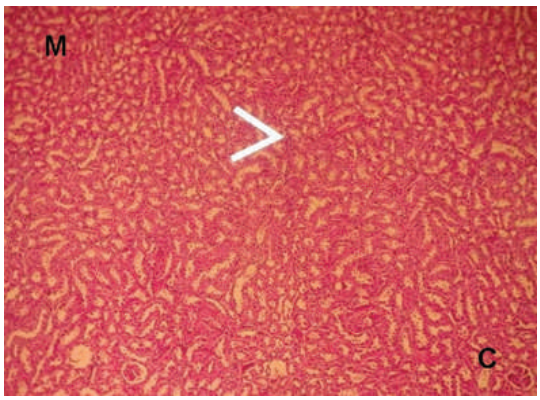
Result

The mean (± SD) serum creatinine was 0.63 ± 0.20, 0.78 ± 0.19 and 0.55 ± 0.17 mg/dl in group A1, group A2 and group B, respectively (Figure 1).

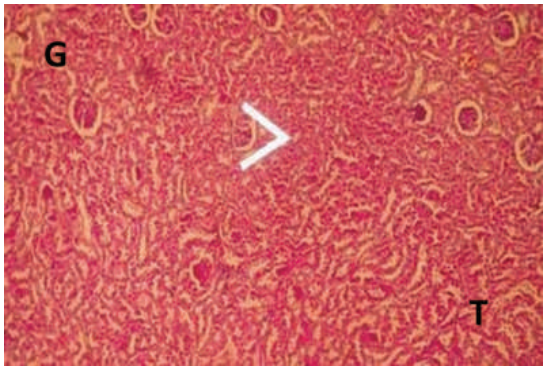
Table I. Mean serum creatinine level at day 24 in different groups of rats (N=30).

Group	*p* value
A1 vs A2 vs B	0.033*
A1 vs A2	0.212 ^{ns}
A1 vs B	1.000 ^{ns}
A2 vs B	0.034*

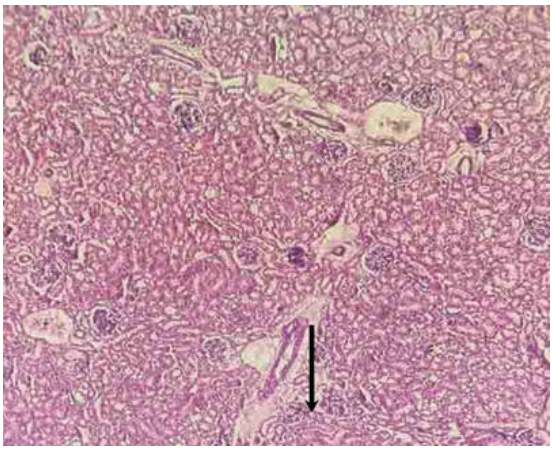
Data are presented as mean ± SD. Statistical analysis was performed using one-way ANOVA for group comparisons, followed by post hoc Bonferroni tests for pairwise group comparisons. Values in parentheses indicate the range. Group A1 served as the baseline control group, Group A2 as the cyclophosphamide-induced thrombocytopenic control group, and Group B as the experimental group, where thrombocytopenic rats were treated with C. papaya leaf extract. The total number of rats is represented by N, with n indicating the number of rats in each group. Statistical significance is denoted as follows: ns for non-significant, * for p<0.05, and *** for p<0.001.



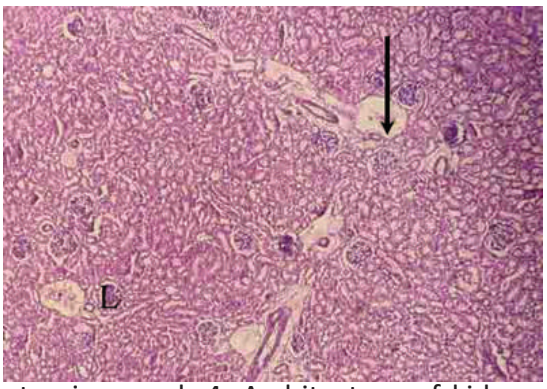
Photomicrograph 1: Architecture of kidney in baseline control group of rats (here C represents cortex and M represents medulla in ×100).



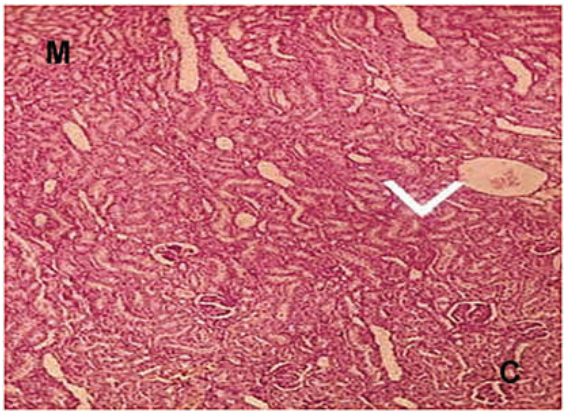
Photomicrograph 2: Architecture of kidney in baseline control group of rats (here T represents tubules and G represents glomerulus in ×400).



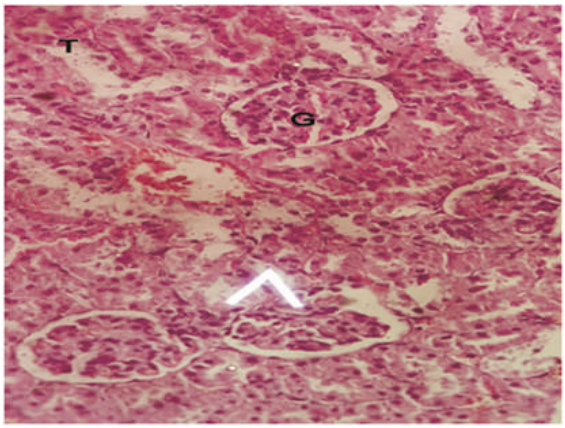
Photomicrograph 3: Architecture of kidney in cyclophosphamide induced thrombocytopenic control group of rats (here arrow represents mild tubular necrosis in x 100).



Photomicrograph 4: Architecture of kidney in cyclophosphamide induced thrombocytopenic control group of rats (here arrow represents slight tubular dilatation and L represents lymphocyte infilation X 400).



Photomicrograph 5: Restoration of normal architecture of kidney in thrombocytopenic rats with C. papaya leaf treated group of rats (here M represents medulla C represents cortex X 100).



Photomicrograph 6: Restoration of normal architecture of kidney in thrombocytopenic rats with C. papaya leaf treated group of rats (here G represent glomerulus X 400).

Table II. Multiple comparisons of mean distribution of Rats Kidney by the histopathological findings in kidney (N=30).

Group	*p* value
A1 vs A2 vs B	0.044*
A1 vs A2	0.093^{ns}
A1 vs B	1.000^{ns}
A2 vs B	0.300^{ns}

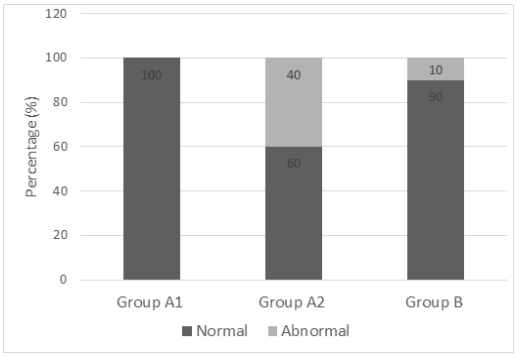


Figure 2: Mean distribution of rats by histopathological findings in kidney (N=30); Group A1: Baseline control group; Group A2: Cyclophosphamide induced thrombocytopenic control group; Group B: Thrombocytopenic rats with C. papaya leaf treated group; N= Total number of rats.

Discussion

The current study aimed to assess the anti-thrombocytopenic effects of C. papaya leaf extract in cyclophosphamide-induced thrombocytopenic rats. To evaluate the potential nephrotoxic effects, serum creatinine levels were measured, and histological examinations of renal tissues were conducted to observe microscopic changes in the kidneys.

Serum creatinine level: In this study, serum creatinine levels were significantly elevated ($p < 0.05$) in the cyclophosphamide-induced thrombocytopenic control group compared to the thrombocytopenic rats treated with C. papaya leaf extract. These results align with earlier findings reported by Bordoloi et al. [9] and Deli et al [10]. Furthermore, serum creati-

nine levels in the C. papaya leaf-treated group were comparable to those in the baseline control group, with no statistically significant difference observed. Similar observations have been documented by Anjum et al [11], Dharmarathna et al [12], and Hampilos et al [13].

Histological changes in kidney: In the present study, mild histological alterations, including tubular necrosis, lymphocyte infiltration, and slight tubular dilatation, were observed in some rats from the cyclophosphamide-induced thrombocytopenic control group. These findings are consistent with previous research by Nandini et al [6] and Nwangwa et al [14]. Conversely, the majority of rats treated with C. papaya leaf extract exhibited normal kidney histological architecture, corroborating results from Francis et al [15].

The cyclophosphamide-induced thrombocytopenic control group and the C. papaya leaf-treated group both displayed evidence of thrombocytopenia, as indicated by slightly elevated serum creatinine levels and mild architectural changes in the kidneys observed during histopathological examination [16, 17]. These histopathological changes may be attributed to increased free radical production, which initiates lipid peroxidation and subsequent cellular damage; however, the current study did not measure free radical concentrations to elucidate this mechanism.

C. papaya leaf extract effectively reduced elevated serum creatinine levels in thrombocytopenic rats, suggesting its non-toxic nature and protective role against renal complications associated with thrombocytopenia [6, 11, 18]. The nephroprotective effects of the extract are attributed to its content of tannins, flavonoids, saponins, triterpenoids, and vitamin E, which exhibit antioxidant properties by significantly inhibiting malondialdehyde (MDA) levels, a marker of oxidative stress [19-21]. The extract reduces lipid peroxidation, mitigates the production of reactive oxygen species (ROS) and reactive nitrogen species (RNS), and scavenges free radicals, thereby preventing oxidative stress-induced kidney damage [22-23].

Furthermore, lower serum levels of creatinine in this group suggest that C. papaya leaf extract does not exert toxic effects on the liver or kidneys. Mild histopathological changes in the liver and kidneys of thrombocytopenic rats treated with C. papaya leaf may be due to its free radical scavenging activity, although the precise mechanisms underlying these effects cannot be determined from this study.

Conclusion

This study demonstrates that C. papaya leaf extract significantly improves cyclophosphamide-induced thrombocytopenia and reduces renal toxicity in Long Evans rats by lowering serum creatinine levels and preventing kidney damage. Future research should explore varying doses of the extract, identify the key bioactive compounds, and assess antioxidant enzymes like superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx) to better understand its protective mechanisms. These findings highlight C. papaya leaf extract's potential as a natural adjunct for managing thrombocytopenia and renal complications.

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Original Article

A Hospital-Based Study on the Causes of Menstrual Regulation and Illegal Abortion Among Rural Women in Barishal, Bangladesh

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Abstract

Background: Menstrual regulation (MR) and illegal abortion remain critical public health issues in Bangladesh, particularly among rural women who face systemic barriers to reproductive healthcare. **Objective:** This study aimed to investigate the causes, contextual factors, and clinical characteristics surrounding MR and illegal abortion among rural women in Barishal, Bangladesh. **Methods:** A descriptive cross-sectional study was conducted among 88 rural women who sought MR or illegal abortion services at the Marie Stopes Clinic in Barisal between July and December 2024. Data were collected through structured face-to-face interviews and clinical record reviews. Variables included sociodemographic characteristics, reproductive history, contraceptive use, reasons for seeking MR/abortion, legal awareness, procedural details, complications, and decision-making dynamics. Chi-square tests were used to determine associations between key variables. **Results:** Most participants were young (37.5% aged 20–24), married (90.9%), and had low educational attainment (56.8% had no formal or only primary education). Only 29.5% had used contraception prior to pregnancy, with lack of awareness cited as the main reason for non-use. The leading cause for seeking MR or illegal abortion was unintended pregnancy (42%), followed by economic hardship (25%) and partner/family pressure (17%). Most procedures were performed within 8 weeks of gestation (64.7%), with medical methods being more common (54.5%). Post-procedural complications were reported by 18.2% of respondents, particularly among those who underwent the procedure after 8 weeks ($p = 0.013$). Legal awareness of MR was low (31.8%), and significantly associated with higher educational levels ($p = 0.002$). In most cases, reproductive decisions were made by partners or family members (63.6%), and only 39.8% of women received counseling prior to the procedure. **Conclusion:** The findings highlight major gaps in contraceptive awareness, legal literacy, and reproductive autonomy among rural women in Barishal. Despite the formal provision of MR services in Bangladesh, many women remain uninformed or are influenced by external pressures. Targeted interventions—including educational outreach, enhanced counseling services, and community engagement—are urgently needed to empower women and ensure safer reproductive health outcomes.

Keywords: Menstrual regulation, illegal abortion, rural women, Bangladesh, reproductive health, legal awareness, contraception.

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Introduction

In many developing nations, abortion remains a major contributor to maternal morbidity and mortality, particularly when conducted in unsafe conditions [1]. Between 2010 and 2014, approximately 55.9 million abortions were performed globally each year, with a significant 88% occurring in developing countries [2]. During the same period, the proportion of abortions in developing regions rose from 76% (1990–1994) to 88% (2010–2014), and nearly half of these procedures were considered unsafe [2-3]. Countries with restrictive abortion laws—where termination is permitted only to save the life of the woman—tend to experience higher rates of unsafe abortions, complications, and related deaths [2, 4, 5]. Beyond health risks, abortion also imposes considerable socio-economic and psychological burdens on affected individuals and families [5].

In Bangladesh, abortion is legally restricted and is only allowed when necessary to save a woman's life [6]. Despite notable progress in reducing overall maternal mortality over the past two decades, abortion-related deaths and complications continue to pose a significant public health challenge [5]. Between 2010 and 2016, both the number of abortions and the proportion of abortion-related maternal deaths in Bangladesh increased [2, 7, 9]. Specifically, the abortion ratio (abortions per 100 live births) rose from 18 in 2010 to 35.5 in 2014, while the share of maternal deaths attributed to abortion grew from 1% in 2010 to 7% in 2016 [7–9]. In 2014 alone, around 1.19 million induced abortions occurred in Bangladesh, most of which were performed in unsafe environments without the supervision of skilled healthcare personnel. These procedures often led to serious complications such as incomplete abortion, hemorrhage, cervical trauma, sepsis, uterine perforation, bladder injury, and even shock [10, 11]. Although abortion is legally restricted, Bangladesh has been offering menstrual regulation (MR) services since gaining independence. In 1979, MR was incorporated into the national family planning program, allowing trained doctors, paramedics, and family welfare visitors (FWVs) to provide services through government facilities and approved private institutions. Officially, MR is defined as "the regulation of menstruation when menstruation is absent for a short duration," with this period being interpreted as up to 12 weeks from the last menstrual period if administered by a physician, and up to 10 weeks if performed by a FWV, who operates at the community level [12, 13]. To enhance access to MR services, the Government of Bangladesh has implemented several initiatives. These include training mid-level providers such as nurses and midwives, expanding the MR workforce, offering services free of charge, extending the allowable period for MR, establishing national guidelines to standardize service delivery and quality, and introducing medication-based MR options [11, 14, 15]. Nevertheless, recent facility-based studies and surveys of healthcare providers suggest that while the rate of MR services has declined, the rate of abortions has increased [7, 14]. However, these surveys may underestimate the actual prevalence of MR due to underreporting by providers who avoid documenting procedures that do not align with government guidelines [7, 16, 17]. Additionally, MR often occurs outside formal health systems, including through self-management or by untrained individuals, as a result of social stigma or denial of services from official facilities [16, 18].

Methodology

This research was conducted as a descriptive cross-sectional study aimed at identifying and analyzing the underlying causes prompting rural women to seek menstrual regulation

(MR) or undergo illegal abortion. Additionally, the study explored various sociodemographic and contextual factors contributing to these reproductive decisions. The study was carried out among rural women from different regions of Barisal District, Bangladesh. Data were collected exclusively from the Marie Stopes Clinic in Barisal, a specialized reproductive health facility that provides services to a large number of rural women. The data collection period spanned six months, from July to December 2024. The study population included rural women who presented at the Marie Stopes Clinic for either menstrual regulation or illegal abortion procedures during the specified timeframe. A total of 88 women were selected for inclusion based on specific eligibility criteria. Participants were eligible if they were residents of rural areas in the Barisal District, had undergone MR or an illegal abortion at the clinic, and provided informed consent to participate. Women who were unwilling or unable to provide consent, those with spontaneous miscarriages without any induced intervention, or those with incomplete or missing records were excluded from the study. Data were gathered using a structured and pre-tested questionnaire administered through face-to-face interviews and supplemented by reviews of clinical records. Interviews were conducted by trained healthcare personnel under the close supervision of the research team. The questionnaire collected detailed information on participants' sociodemographic profiles such as age, marital status, educational attainment, occupation, and number of children. It also documented reproductive history including contraceptive use, previous MR or abortion history, and birth spacing. The participants were asked about the specific reasons for seeking MR or abortion, such as unplanned pregnancy, financial difficulties, family or partner pressure, social stigma, or health-related concerns. Additional sections covered the type and timing of the procedure, awareness of legal status and safety, and any post-procedural complications or follow-up visits. All interviews were conducted in a confidential setting to ensure privacy and uphold ethical standards. Written informed consent was obtained from each participant after a thorough explanation of the study's objectives, procedures, and confidentiality assurances. Anonymity was maintained by assigning unique codes to each respondent, and all data were securely stored and used solely for this research.

Results

Table I. Sociodemographic characteristics of participants (n=88).

Variables	Catagories	Frequency n (%)
Age (year)	<20	12 (13.6)
	20–24	33 (37.5)
	25–29	23 (26.1)
	≥30	20 (22.8)
Marital status	Married	80 (90.9)
	Unmarried	8 (9.1)
Educational level	No formal education	26 (29.5)
	Primary	24 (27.3)
	Secondary	23 (26.1)
	Higher secondary+	15 (17.1)
Occupation	Housewife	61 (69.3)
	Garment/Day labor	12 (13.6)
	Service/Business	8 (9.1)
	Student	7 (8)

Table 1 illustrates that most participants were young women aged 20–24 years (37.5%), predominantly married (90.9%), and a majority had low educational attainment, with nearly 57% having no formal or only primary education.

Table II. Reproductive History and Contraceptive use (n=88).

Variables	Catagories	Frequency n (%)
Number of Children	0	15 (17)
	1	26 (29.6)
	2–3	47 (53.4)
Contraceptive use	Yes	26 (29.5)
	No	62 (70.5)
Reason for not using	Lack of awareness	36 (41)
	Partner refusal	12 (13.6)
	Fear of side effects	10 (11.4)
	Religious/cultural	4 (4.5)

Table 2 shows that over half of respondents had 2–3 children (53.4%), but only 29.5% reported using contraception before pregnancy, with lack of awareness being the main reason for non-use.

Table III. Reported reasons for MR or illegal abortion (n=88).

Reason	Frequency n (%)
Unintended pregnancy	37 (42)
Financial/economic constraints	22 (25)
Family or partner pressure	15 (17)
Health-related reasons	8 (9.1)
Fear of social stigma	6 (6.8)

As detailed in Table 3, unintended pregnancy was the leading cause for seeking menstrual regulation or illegal abortion (42%), followed by economic hardship (25%) and family/partner pressure (17%).

Table 4 summarizes key clinical and contextual factors surrounding menstrual regulation or abortion among respondents. A majority of procedures were done within 8 weeks (64.7%), mostly through medical methods (54.5%). Legal awareness was low (31.8%), and around 18.2% reported complications such as bleeding or pain. Only 27.3% had a prior MR/abortion history, and just 39.8% received counseling. In nearly half of the cases (44.3%), the husband or partner made the abortion decision, highlighting a significant influence of partner or family input.

Table VI. Procedural details, awareness, and associated factors of MR/abortion (n = 88).

Variables	Catagories	Frequency n (%)
Gestational age	≤8 weeks	57 (64.7)
	>8 weeks	31 (35.3)
Type of procedure	Medical	48 (54.5)
	Surgical	40 (45.5)
Aware of legal status	Yes	28 (31.8)
	No	60 (68.2)
Post-abortion complications	Yes	16 (18.2)
	No	72 (81.8)
Previous MR/abortion	Yes	24 (27.3)
	No	64 (72.7)
Counseling received	Yes	35 (39.8)
	No	53 (60.2)
Decision maker	Self	32 (36.4)
	Husband/Partner	39 (44.3)
	Parents/In-laws	17 (19.3)

Table 5 demontrates a significant association (p = 0.002) was observed, where women with higher education were more likely to be aware of the legal status of MR/abortion. Those undergoing procedures after 8 weeks had significantly more complications (p = 0.013), emphasizing the importance of early access to services.

Discussion

This study offers critical insights into the sociodemographic profile, reproductive patterns, procedural characteristics, and legal awareness among women who underwent menstrual regulation (MR) or illegal abortion in Bangladesh. The findings reveal multiple layers of socio-cultural and health system barriers that continue to influence women's reproductive choices and health outcomes. A majority of participants were young (20–24 years) and married, consistent with national fertility trends indicating early marriage and childbear-

Table V. Association Between Key Variables and Outcomes (Chi-Square Test Results, n = 88).

Association	Category	Aware/ Complication	Not aware/ no complication	Total (n)	X^2 (df)	*p* value
Education Level vs. Legal Awareness	No formal education	3	23	26	14.62 (3)	0.002
	Primary	5	19	24		
	Secondary	10	13	23		
	Higher secondary or more	10	5	15		
	Total	28	60	88		
Gestational age vs Post-abortion complications	≤8 weeks	6	51	57	6.13 (1)	0.013
	>8 weeks	10	21	31		
	Total	16	72	88		

ing among Bangladeshi women [5]. Educational attainment was generally low, with over half having no formal or only primary education—an important determinant of health literacy, decision-making autonomy, and access to reproductive health services. Notably, nearly 70% of the women were housewives, reflecting limited economic independence, which may further restrict their capacity to make informed reproductive choices. Contraceptive non-use was remarkably high (70.5%), primarily due to lack of awareness. This finding mirrors reports from the Bangladesh Demographic and Health Survey (BDHS 2017–18), which identified knowledge gaps and fear of side effects as major deterrents to contraceptive uptake [17]. Such unmet contraceptive needs directly contributed to unintended pregnancies—the most cited reason (42%) for seeking MR or abortion in this study. Economic hardship (25%) and partner or family pressure (17%) also significantly influenced decisions to terminate pregnancies, highlighting the complex interplay of personal, financial, and relational factors. Clinical findings underscore the preference for early abortion, with 64.7% of procedures performed within eight weeks of gestation. This is a positive indicator, as early intervention is associated with fewer complications. Medical abortion was slightly more common (54.5%) than surgical methods, in line with WHO recommendations favoring medical approaches up to 9 weeks of gestation [18]. Nonetheless, 18.2% of women reported post-procedural complications, primarily among those who presented after 8 weeks—a statistically significant association ($p = 0.013$). This affirms the risks of delayed abortion and underscores the need for timely access to safe services.

Alarmingly, only 31.8% of participants were aware of the legal status of MR in Bangladesh, despite its long-standing provision under the national reproductive health program. The association between educational level and legal awareness was significant ($p = 0.002$), emphasizing education as a key enabler of reproductive rights. This aligns with findings from a study by Ramirez et al, 2024 which reported that women with secondary or higher education were more likely to understand the legality and availability of MR services [19]. Pre-procedural counseling was received by fewer than half the participants (39.8%), despite its proven benefits in reducing anxiety, improving informed consent, and enhancing safety [7, 8]. Additionally, the fact that partners or family members decided the majority of cases (63.6%) points to a lack of agency among women regarding their repro-

ductive health—a pattern noted in other South Asian contexts as well [5]. Together, these findings highlight persistent gaps in contraceptive education, legal awareness, and women's autonomy. Despite the availability of MR services in Bangladesh, socio-cultural norms, misinformation, and limited access continue to drive unsafe or uninformed abortions. Programs aiming to improve reproductive health must prioritize community-based awareness campaigns, strengthen counseling services, and promote female education to ensure women can make safe, informed reproductive choices.

Conclusion

This study highlights critical gaps in reproductive health awareness, autonomy, and service accessibility among rural women in Barisal, Bangladesh. Unintended pregnancy, financial hardship, and partner or family pressure were primary drivers of MR or illegal abortion. Low contraceptive use, limited legal awareness, and inadequate counseling reflect systemic shortcomings. Significant associations between education and legal knowledge, and between gestational age and complications, emphasize the need for timely, informed interventions. Expanding reproductive education, improving access to safe, early MR services, and empowering women in decision-making are essential steps to reducing preventable complications and promoting reproductive rights in rural communities.

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Original Article

Acute Effect of Oral Rehydration Salt on Blood Pressure among the Medical Students of a Private Medical College in Dhaka, Bangladesh: Clinical Trial

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Abstract

Introduction: Hypertension is the main cause of global death from cardiovascular events. High intake of salt cause rise of blood pressure is widely accepted. However, intervention studies focused on blood pressure response to acute oral rehydration solution (ORS) loading is deficient. **Objective:** The study aimed to assess the effect of ORS on blood pressure among fourth year medical students of a private medical college in Dhaka city, Bangladesh. **Methods:** An uncontrolled clinical trial was done in Ibn Sina Medical College, Dhaka from July, 2021 to December, 2021. Systolic blood pressure (SBP) of ≥140 mmHg and diastolic blood pressure (DBP) of ≥90 mmHg was considered as hypertension. Blood pressure was measured 30 minutes and 1 hour after of 500 ml ORS administration. Forty-five normotensive medical students included in the study. **Results:** Study findings depicted students after 500 ml ORS administration showed a significant rise in both SBP (Male: from 116 ± 7.07 to 128 ± 9.89; P = 0.000 and female: from 108 ± 6.05 to 118 ± 5.88; P = 0.000) and DBP (Male: from 78 ± 3.54 to 85 ± 5.32; P = 0.000 and female: from 74 ± 2.07 to 78 ± 4.02; P = 0.007) at 1 hour and significantly (P = 0.000) higher rise in male students (Average SBP and DBP rise: 12 and 7 mmHg respectively) than that of female (Average SBP and DBP rise: 10 and 7 mmHg respectively). **Conclusion:** Study result indicated that ORS can be considered as a treatment strategy to increase blood pressure and it is important to avoid acute ORS load in people with hypertension.

Keywords: Hypertension, blood pressure, prevalence, medical students, male, female, oral rehydration salt, intervention, clinical trial.

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Introduction

Hypertension, often known as high blood pressure (BP), which is a silent killer that cause diseases affecting the heart, kidneys, brain, and other organs [1, 2]. About 1.3 billion people are affected according to World Health Organization (WHO) estimates and they greatly increase morbidity and mortality worldwide [3]. The prevalence of hypertension is rising worldwide [4]. Two-thirds of those affected individuals reside in low- and middle-income countries, including Bangladesh. Over the past few years, the prevalence of hypertension in Bangladesh has alarmingly increased [5]. Globally, one in five women and one in four men are affected [6].

Hypertension is a multifactorial disease. One risk factor is salt sensitivity of blood pressure

(SSBP), which occurs when BP varies with changes in salt intake [7]. In normotensive people, this may eventually lead to hypertension [8]. However, normotensive and hypertensive persons' blood pressure responses to changes in sodium and extracellular fluid balance differ [9].

Additionally, only a portion of the mechanisms that may be responsible for the elevated blood pressure associated with a high salt intake are known. Acute salt administration may inhibit plasma renin activity (PRA) [10]. Response of different individuals to the acute salt loading differs. Through a dietary salt intervention trial, a previous study had shown that women, hypertensive individuals, and elderly people had elevated salt sensitivity of BP [11]. Many research results showed that salt immediately affects BP. A 1 mmol/L change in serum sodium translates into approximately 2 mmHg of blood pressure increase [12, 13], and there is evidence that eating foods high in salt (around 1495 mg of sodium) reduces brachial artery flow-mediated dilatation within 30 minutes [14].

However, there was no human subjects-based intervention studies focused on BP response to acute oral rehydration solution (ORS) loading. Previous study depicted that highest proportion of hypertensive medical students (24.8%) were in their final year, followed by those in their fourth year (22.0%) [15]. We hypothesized that there may be variations of BP after acute ORS load in fourth year medical students. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) is used to measure blood pressure. If a patient's SBP is 140 mmHg or higher and DBP is 90 mmHg or higher, considered hypertension according to National Guidelines for Management of Hypertension in Bangladesh16. High BP is considered by measuring BP on at least two separate occasions [16, 17].

This study aimed to (1) assess the acute effect of ORS loading on BP (2) how much changes of blood pressure with the amount of ORS (3) assess the changes in blood pressure in relation to gender differences. The results highlighted that, the significance of ORS supplementation can be considered as a treatment strategy to improve blood pressure and restriction of ORS may be needed in hypertensive patients or tight monitoring of hypertensive patients when they are taking ORS.

Methods

Trial design and trial participants: This was an uncontrolled clinical trial, conducted in the Ibn Sina Medical College, Dhaka, Bangladesh from July, 2021 to December, 2021. For this study, fourth year medical students were selected, and 46 were approached conveniently (based on their presence on the day of data collection). Out of 46 participated students, 1 student found hypertensive; excluded from the intervention and analysis. Finally, 45 students were included in analysis; 17 students were male and 28 students were female.

Data collection: The tutorial room was selected to measure blood pressure. Female lecturer took the measurement of female students. An Aneroid Sphygmomanometer machine (ALPK2, No.500-V) was used for measurement. Blood pressure was measured after 10 minutes rest while students were in sitting posture. Students with SBP ≥140 mmHg or DBP ≥90 mmHg were classified as hypertensive16.

Intervention schedule: Pre-intervention phase: Blood pressure was measured before administration of ORS after 10 minutes rest while students were seated.

Intervention phase: Five hundred ml ORS was administered. During the 1-hour study period, no other foods or drinking were permitted.

Post-intervention phase: Blood pressure was

measured after 30 minutes of 500 ml ORS administration and again after 1 hour of 500 ml ORS while the students were seated. The evaluation battery took 2 to 4 minutes for every student. The students were discharged from the study after measurement of blood pressure at 1 hour of 500 ml ORS administration.

Ethical Issues: Thorough briefing regarding the objectives and procedure of the study was done. Students were also informed about the confidential handling of their information and they've right to refuse to participate or withdraw from the study.

Statistical Analysis: Microsoft Excel was used to compile, present, and analyze the data following per-protocol principle. The data was described using means and standard deviations. Paired t-test, unpaired t test were done to compare the blood pressure between before and after ORS administration, and between male and female students respectively. The level of significance was considered to be a p-value < 0.01.

Results

The data from 46 fourth year medical students was collected. Out of these, 17 (38%) were males and 28 (62%) were females. One student (2.2%) found hypertensive (140/100 mm Hg) and excluded from the analysis. Finally, 45 students were included in analysis. Notably, none of the students were on antihypertensive drugs. The mean (± SD) SBP and DBP of male students were 116 (± 7.07) and 78 (± 3.54) mmHg before ORS administration respectively. A noticeable difference was found 30 minutes after ORS which was statistically significant (SBP: 125 ± 6.80; P = 0.000 and DBP: 82 ± 2.09; P = 0.005). Also, significant difference was noted 1 hour after ORS (SBP: 128 ± 9.89; P = 0.000 and DBP: 85 ± 5.32; P = 0.013). This rise had become more significant in both SBP and DBP in comparison to before and 1 hour after ORS (SBP from 116 ± 7.07 to 128 ± 9.89; P = 0.000 and DBP from 78 ± 3.54 to 85 ± 5.32; P = 0.000). In female students, the mean (± standard deviation) SBP and DBP were 108 (6.05) and 74 (2.07) mmHg before ORS administration respectively. A noticeable change was found 30 minutes after ORS which was statistically significant (SBP: 118 ± 5.88; P = 0.000 and DBP: 78 ± 4.02; P = 0.000). A noticeable but not statistically significant difference was noted 1 hour after ORS (SBP: 118 ± 5.88; P = 0.5 and DBP: 78 ± 4.02; P = 0.5). But a significant rise of BP had become evident in both SBP and DBP in comparison to before and 1 hour after ORS (SBP from 108 ± 6.05 to 118 ± 5.88; P = 0.000 and DBP from 74 ± 2.07 to 78 ± 4.02; P = 0.007) [Table I].

Discussion

Hypertension is the main cause of global death from cardiovascular disease, primarily coronary heart disease, and stroke [18]. But unfortunately, there is no research found applying ORS as a treatment strategy involving human subjects to improve blood pressure. Given the link between saline loading and blood pressure [10], and the relationship between oral saline intake and pulse pressure increase [19], the primary purpose of the study is to assess the effect of ORS on blood pressure. Indeed, the importance of this uncontrolled clinical trial was to determine how much increase in blood pressure after ORS administration with the gender differences among the medical students.

It is well known that there is inverse relationship between renin and salt intake [20]. By increasing the concentration of NaCl at the macula densa, an acute sodium treatment could inhibit both renin release and plasma renin activity (PRA) [21] and then produce hypertension. In dietary salt intervention trial a difference was found in response of individuals to the acute salt loading i.e. women had

Table I. Blood Pressure in students before ORS intake, 30 minutes after ORS intake, and 1 hour after ORS intake.

Variables	Before ORS intake (mean ± SD)	30 Minutes after ORS intake (mean ± SD)	1 hour after ORS intake (mean ± SD)	*p* value[x]
SBP of male students (mmHg) (n=17)	116 ± 7.07	125 ± 6.80	1128 ± 9.89	a = 0.000 b = 0.0001 c = 0.000
DBP of male students (mmHg) (n=17)	78 ± 3.54	82 ± 2.09	85 ± 5.32	a = 0.005 b = 0.013 c = 0.000
SBP of female students (mmHg) (n=28)	108 ± 6.05	118 ± 5.88	118 ± 5.88	a = 0.000 b = 0.5 c = 0.000
DBP of female students (mmHg) (n=28)	74 ± 2.07	78 ± 4.02	78 ± 4.02	a = 0.000 b = 0.5 c = 0.007

SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, n = number of patients, SD = standard deviation, xpaired t-tests, a = compare between before ORS and the 30 minutes after ORS, b = compare between the 30 minutes after ORS and the 1 hour after ORS, c = compare between before ORS and the 1 hour after ORS.

Table II. Blood Pressure in male and female students before ORS intake, 30 minutes after ORS intake, and 1 hour after ORS intake.

Variables		Male (17) (mean±SD)	Female (28) (mean±SD)	*p* value[z]
SBP (mmHg)	Before ORS	116 ± 7.07	108 ± 6.05	0.000
	30 Minutes After ORS	125 ± 6.80	113 ± 5.45	0.000
	1 Hour After ORS	128 ± 9.89	118 ± 5.88	0.000
DBP (mmHg)	Before ORS	78 ± 3.54	74 ± 2.07	0.013
	30 Minutes After ORS	82 ± 2.09	77 ± 3.01	0.003
	1 Hour After ORS	85 ± 5.32	78 ± 4.02	0.000

n = number of patients, SD = standard deviation, z = Unpaired t-tests

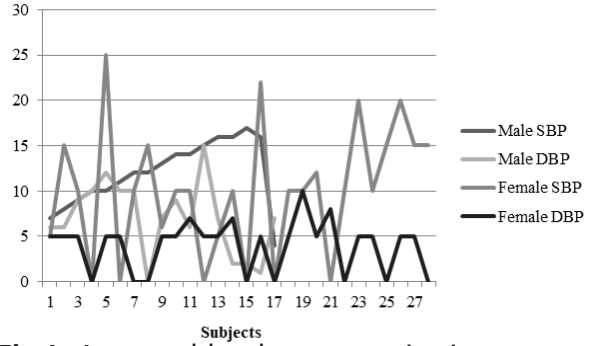

Fig 1: Average blood pressure rise in response to ORS among male and female students.
SBP = systolic blood pressure, DBP = diastolic blood pressure.

increased response to salt on blood pressure [11].

We noted a significant increase in BP after 1 hour of ORS. From this finding it is understood, the increase that was found as a result of administrating ORS was significant after 30 minutes and this increase had become more significant after 1 hour in both male (SBP: P = 0.000 and DBP: P = 0.000) and female (SBP: P = 0.000 and DBP: P = 0.007) students. Similar finding was demonstrated after acute oral loading of 1000 ml of 0.9% saline solution

results with an increase in SBP [10]. A comparative study showed oral rehydration solution supplementation increase in pulse pressure [19]. The trial findings were also consistent with another study within 127 individuals taking 1 g sodium chloride and found about 32% of participants had increases in SBP [22].

Our study's sex difference i.e. male students were more likely to have high BP compared to female students (SBP: P = 0.000 and DBP: P = 0.013) is in line with a Bangladeshi study on trainee doctors, which indicated that male had higher rate of hypertension than female [22, 23]. Also, a significant difference was observed between the male and female students after 30 minutes (SBP: P = 0.000 and DBP: P = 0.003), and this difference become more significant after 1 hour (SBP: P = 0.000 and DBP: P = 0.000).

An average increase in 12 mmHg SBP and 7 mmHg DBP was found which is in line with results of two other studies where notable variation in SBP values when compared to baseline levels were at 3 and 4 hours 6.6 mmHg (4.6-8.6 mmHg) and 6.9 mmHg (4.9-8.9 mmHg) respectively [13] and all subjects experienced a significant increase of 14 mmHg (7–21 mmHg) SBP after taking oral salt (1 g sodium chloride) that was higher than the level of 20 mmHg that is usually considered as clinically significant level [22]. Additionally, following saline loading, another study revealed a significant increase of 8.12 mmHg SBP10. The effect of salt to influence BP may be less explained by its relation to the effects on extracellular volume and cardiac output, but instead its ability to increase serum osmolarity [24].

Finally, the rate of increase in blood pressure after ORS among medical students highlights the urgently focused attention for preventing development of hypertension as they are vulnerable by stress, unhealthy dietary habits, and sedentary behaviors during intense academic periods. The strength is that this is the first intervention study conducted on medical students to focus on the acute effect of ORS intake on the variations of BP. Some scholars claimed that acute salt loading has been linked to negative cardiovascular consequences30. The limitations of the current study are the sample size was much small, absence of placebo-controlled group, randomization was not done, intervention was given by oral saline but the other method including intravenous saline were not included, long term effects of ORS therapy on BP were not assessed.

Conclusion

From the study result it can be concluded that that ORS can be considered as a treatment strategy to increase blood pressure and it is important to avoid acute ORS load in people with hypertension.

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Author Contributions

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Conflict of Interest

The authors declare that there were no commercial or financial relationships that could be raised suspicions of a potential conflict of interest.

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Original Article

Utility of Color Doppler Sonography in the Prediction of Outcome in Severe Pre-eclamptic Patients

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Abstract

Background: Pre-eclampsia causes placental insufficiency which is the most common cause of growth retardation, which is an important obstetric problem on account of the high association with perinatal morbidity and mortality. **Objective:** To assess fetal well-being by color Doppler ultrasonography in severe pre-eclamptic patients. **Methodology:** This prospective study was conducted in the department of Obstetrics & Gynecology of Dhaka Medical College Hospital between the periods of December 2023 to June 2024. Fifty diagnosed patients of pre-eclampsia were selected randomly for the study. Color Doppler sonography was done to them to see abnormal blood flow indices (pulsatility index, resistance index and systolic/diastolic velocity ratio) of uterine artery, umbilical artery and middle cerebral artery between 29-40 weeks of gestation. **Result:** In our study we found that, 70% of patients delivered at 34±3.7 weeks of gestational age had abnormal color Doppler indices (S/D PI, Rl) of uterine artery, umbilical artery, and middle cerebral artery, where most of them found abnormal blood flow. Out of 50 patients, 35 (70%) babies had an adverse perinatal outcome, and 15 (30%) had a normal outcome. **Conclusion:** The results of our study indicate that abnormal Doppler indices of the blood vessels in patients with pre-eclampsia will result in adverse clinical outcomes. Therefore, color Doppler ultrasonography can be done routinely in these patients to predict outcome.

Key words: Fetal wellbeing, color doppler, pre-eclampsia.

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Introduction

The main goal of prenatal testing is to identify fetus at risk for perinatal morbidity and mortality. The traditional methods for fetal surveillance like nonstress test, fetal heart monitoring, fetal biophysical profile are no more sufficient test because of their inability to detect early stage of fetal distress. It has long been recognized that impaired fetoplacental perfusion is associated with pre-eclampsia and subsequently intrauterine growth retardation (IUGR). Both the pregnancy-related complications make a significant contribution to perinatal mortality and morbidity [1]. Pre-eclamptic pregnancies demonstrate high impedance in the fetoplacental circulation and a reduction in the volume of flow, thought to result from failed trophoblastic invasion of spiral arteries in the early second trimester. Fetoplacental vascular resistance can be assessed by doppler ultrasound and therefore, impedance indices measured by doppler have been evaluated as an early screening test for high-risk pregnancies. Pre-eclampsia causes placental insufficiency which is the most common cause of growth retardation, which is an important

obstetric problem on account of the high association with perinatal morbidity and mortality.

Intrauterine growth retardation is defined as growth at the 10th or less percentile for weight of all fetuses at that gestational age [2]. IUGR is characterized by failure of the fetus to reach its normal growth potential. Intrauterine growth retardation is the 2nd leading cause of perinatal death [3]. IUGR is associated with significant morbidity, including increased rates of meconium aspiration, hypoglycemia, respiratory distress syndrome, intrapartum developmental delay and still birth. Intra uterine growth retardation is associated with an increased risk of perinatal mortality and morbidity and impaired neuro-development [4]. The correct detection of the compromised IUGR fetus to allow for timely intervention is a main objective of antenatal care.

Color Doppler is the most rigorous evaluation test among the non-invasive tests of fetal well-being. Doppler ultrasound allows a non-invasive assessment of fetal hemodynamics. Newborns affected by IUGR are at increased risk of HTN, CVD, and diabetes later in life. Uteroplacental circulation can be assessed using Doppler ultrasonography of the uterine artery. Placental insufficiency, whether primary or secondary to maternal factors such as hypertension, poor nutrition etc. is the most important cause of intrauterine growth retardation which is an important obstetric problem on account of the high association with perinatal mortality and morbidity. It is essential to recognize placental insufficiency early so that its hazards can be reduced [5]. Doppler measurements are taken from the maternal uterine artery, fetal middle cerebral artery and umbilical artery. Calculation of Systolic/Diastolic ratio (S/D), resistive index (RI), and pulsatility index (PI) is done. The indices are correlated with fetal outcome. Doppler indices are considered abnormal when S/D, PI, RI of each artery >2SD for the gestational age according to the standard reference value [6]. In normal pregnancy, all three indices show a gradual decline with increasing gestational age. But in pre-eclampsia, there is increased resistance in spiral arteries. This leads to increased impedance of blood flow in the uterine artery. This is reflected in higher values of S/D, PI, RI of the uterine artery.

The abnormal waveforms are characterized by a higher systole lower diastole and the persistence diastolic notch which helps in predicting PIH [7]. In normal pregnancy the mean of all indices shows a progressive decline with advancing age due to decrease in umbilical artery resistance. But in IUGR first there is decreased diastolic flow in the umbilical artery due to increase in the resistance that occurs in small arteries and arterioles of the tertiary villi. This raises the S/D ratio, Pl, RI of the umbilical artery. As the placental insufficiency worsens, the diastolic flow decreases, then may become absent and later reverse. Absent umbilical artery wave form is a strong and important predictor of adverse perinatal outcome [8]. Fetal middle cerebral artery (MCA) is a low resistance circulation throughout pregnancy. Normally the mean value of all indices showed decline with advancing gestational age due to decrease in impedance in MCA so as to meet the oxygen demands of the growing fetus. In IUGR in response to chronic hypoxia, there is redistribution of blood flow from nonessential organ to the brain and myocardium. This adaptation is known as brain sparing effect. Several observational studies have explored cerebral redistribution {abnormal MCA doppler indices and /or abnormal UA/MCA Doppler ratio} for the prediction of perinatal outcome in high-risk pregnancies [9, 10]. Doppler velocimetry has been proved to reliably predict any adverse fetal outcome in hypertensive pregnancies and aids in the appropriate timing of

delivery. It helps us to take timely action, plan the treatment and also counsel the patients in future pregnancies.

Materials & methods

This prospective study was carried out in the department of Obstetrics & Gynecology of Dhaka Medical College Hospital, Dhaka, Bangladesh between the periods of December 2023 to June 2024. We selected 50 patients randomly who were admitted due to severe pre-eclampsia. Doppler sonography was done to them between 29-40 weeks of gestation to evaluate uterine artery, middle cerebral artery and umbilical artery. Detail history and clinical examination was done. Prior to commencement of this study the respective authority approved the research protocol and informed consent was taken from the study subjects.

Doppler velocimetry indices include-

>Pulsatility index (PI)

>Resistance index (RI)

>Systolic/diastolic velocity ratio (S/D ratio)

Doppler indices were considered abnormal when S/D ratio, Pl and Rl of each artery > 2SD for the gestational age according to the standard reference values. Appropriate data were collected using a preformed data sheet. All the findings were analyzed by appropriate standard statistical method.

Result

Among 50 patients 70% patients delivered at 34±3.7 weeks of gestational age having abnormal color doppler indices and 30% patients delivered at 38±1.6 weeks of gestational age whose color doppler indices were normal (Table-I). Among the patients, most of them found abnormal blood flow accordingly 70%, 68%, 62% in our study (Table-II). Among 50 Patients 33 (66%) had small for gestational age (SGA) baby and 17 (34%) had average gestational age (AGA) of baby (figure 1) and 70% had adverse perinatal outcome (figure 2).

Table I. Distribution of patients according to gestational age at delivery in weeks (n = 50).

Color Doppler indices findings	Frerquency n (%)	Gestational age at delivery (weeks) (Mean ± SD)
Abnormal	35 (70%)	34 ± 3.7
Normal	15 (30%)	38 ± 1.6

Table II. Distribution of respondents according to normal and abnormal blood flow indices (S/D, PI, RI) of uterine artery, umbilical artery, middle cerebral artery in doppler sonography (n=50).

Blood flow indices (S/D ratio, PI, RI)	Normal flow n (%)	Abnormal flow n (%)
Uterine artery	15 (30%)	35 (70%)
Umbilical artery	16 (32%)	34 (68%)
Middle cerebral artery	19 (38%)	31 (62%)

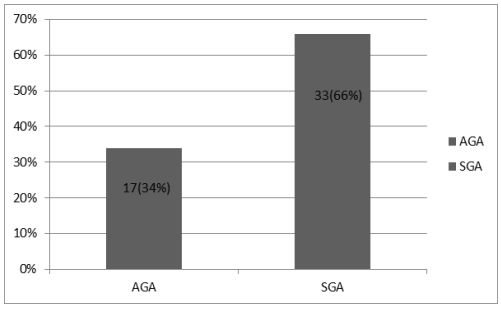

Figure 1: Bar chart shows prenatal outcome among the respondents (n=50).
AGA= Average Gestational Age of baby.
SGA= Small for Gestational Age baby.

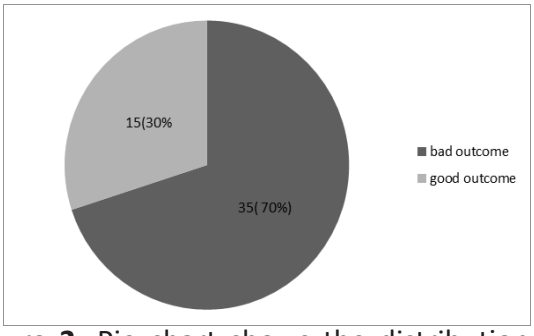

Figure 2: Pie chart shows the distribution of Adverse Perinatal Outcome (n=50).

Discussion

Two significant contributors to maternal and neonatal morbidity and mortality are pre-eclampsia and IUGR. Since traditional methods are not good enough to assess uteroplacental and fetoplacental circulation, blood flow studies by using color Doppler technology are used to assess fetal wellbeing in pre-eclampsia patients. Pre-eclampsia and intrauterine growth retardation (IUGR) are common complications of pregnancy which arc associated with a failure of normal placental invasion and development of the consequences of this placental dysfunction may include an altered resistance to blood flow in uterine circulation and carry a significantly increased risk of morbidity and mortality for both the mother and the fetus. This current study was carried out with an aim of establish the usefulness of color Doppler sonography of maternal uterine artery and fetal umbilical and middle cerebral artery, in evaluation of fetal out come in women with severe preeclampsia. Calculation of systolic diastolic ratio (S/D), resistive index (RI), and pulsatility index (PI) were done. The indices were correlated with fetal outcome.

Pre-eclampsia is a multisystem condition with an unknown etiology that manifests as hypertension that reaches 140/90 mmHg or higher and proteinuria after the 20th week of pregnancy in patients who were previously normotensive with no proteinuria. A non-invasive technique for assessing pathological hemodynamic alterations in uteroplacental circulation as well as subsequently changed fetal and fetoplacental circulation is the Doppler study [11].

In the low-risk group, the systolic/diastolic ratio (SD), resistive index (RI), and pulsatility index (PI) all reduced with gestation length, while in the high-risk group, these values rose in the uterine and umbilical arteries. MCA-PSV (peak systolic velocity) in the middle cerebral artery (MCA) rose as gestational stage grew, but PI dropped. These findings suggest that aberrant blood vessel Doppler indices in high-risk pregnant women would lead to unfavorable clinical outcomes [12]. In our study 70% patients delivered at 34±3.7 weeks of gestational age having abnormal color doppler indices and 30% patients delivered at 38±1.6 weeks of gestational age whose color doppler indices were normal. Fifty patients admitted in DMCH with severe pre-eclampsia were evaluated by color doppler to see the blood flow indices (S/D PI, Rl) of uterine artery, umbilical artery, and middle cerebral artery where most of them found abnormal blood flow accordingly 70%, 68%, 62% in our study. Another study also got similar findings that the most prevalent high-risk variables were preeclampsia and pregnancy-induced hypertension (PIH). In that study it was observed 58.33% abnormal umbilical artery (UA) flow patterns of the cases. Unfavorable results were substantially associated with abnormal UA and middle cerebral artery (MCA) Doppler indices [13]. In our study it was found that 33 (66%) patients had small for gestational age (SGA) baby and 17 (34%) had average gestational age (AGA) of baby. Out of 50 patients 35 (70%) baby had adverse perinatal outcome and 15 (30%) had normal outcome. UA (umbilical artery) Doppler is a placental function test that provides important diagnostic and prognostic information in preterm IUGR. Color Doppler effectively identifies those preterm IUGR fetuses that are at high risk for adverse outcome (particularly stillbirth) at least 1 week before delivery, independent of the UA waveform [14].

Conclusion & Recommendation

From the study it could be concluded that, color Doppler evaluation of maternal uterine artery, fetal middle cerebral and umbilical artery is a useful modality in diagnosis of IUGR and prediction of adverse perinatal outcome.

Further study with large number of sample size can be done in our country to establish the screening test standard for detection of IUGR which is strongly associated with perinatal mortality and morbidity.

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Case Report

Primary Ewing's Sarcoma of the Sole in a 40-Year-Old Female: a Rare Case Report

***Gazi Abdus Sadique[1], Ahammad Al Mamun Sweet[2]**

Abstract

Ewing's sarcoma is a malignant tumor characterized by small round blue cells, primarily affecting children and adolescents. Its occurrence in adults, especially at skin or extremity sites such as the sole, is extremely uncommon. We present a case of a 40-year-old woman who had a pigmented lesion on her right sole, which was initially thought to be a melanocytic lesion. After histopathological and immunohistochemical analysis, the final diagnosis was determined to be Ewing's sarcoma. This case highlights the necessity of considering Ewing's sarcoma in the differential diagnosis of atypical acral tumors, even in adult patients.

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Introduction

Ewing's sarcoma is classified as a primitive neuroectodermal tumor (PNET) that is most commonly found in children and usually develops in bones or deep soft tissue. Primary cutaneous or acral forms are uncommon, especially in adults over 30 years old. The histopathological characteristics are similar to those of other small round blue cell tumors, making the use of immunohistochemistry essential for accurate diagnosis [1]. We present a rare case of Ewing's sarcoma occurring on the sole of a 45-year-old female in Bangladesh, highlighting the diagnostic challenge and significance of appropriate immunohistochemical markers.

Case Presentation

A 45-year-old female presented to the Labaid dermatology clinic with a pigmented lesion on the right sole, noticed over several months with gradual enlargement and intermittent tenderness. There was no history of trauma, systemic symptoms, or similar lesions elsewhere.

Clinical Examination

- Location: Right sole, lateral to mid-plantar area
- Appearance: 4.5 cm pigmented, slightly raised lesion
- No regional lymphadenopathy
- Provisional clinical diagnoses included melanoma, pigmented adnexal tumor, or vascular lesion

Investigations

Biopsy: Punch biopsy revealed a dermal tumor composed of sheets of small round blue cells with scant cytoplasm, round nuclei, and inconspicuous nucleoli.

IHC Panel

- CD99: Strong membranous positivity
- NKX2.2: Nuclear positivity
- Desmin: Focal cytoplasmic positivity.
- LCA: Negative
- Synaptophysin: Negative
- BCOR: Focally positive
- FLI 1: Positive

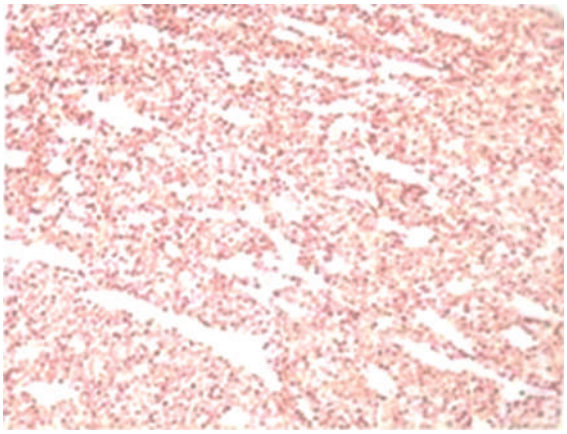

Figure 1: Tumor cells are positive for NKX 2.2.

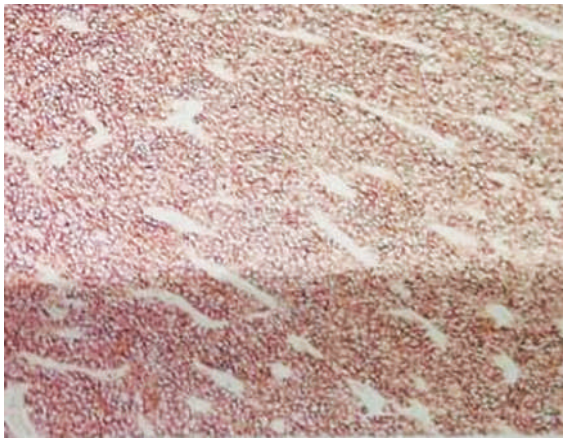

Figure 2: Tumor cells are positive for CD99.

Final Diagnosis

Ewing's sarcoma, confirmed based on histopathology and immunoprofile.

Further Workup

- MRI of the foot showed a well-circumscribed soft tissue mass with no bony involvement.
- PET-CT scan: No evidence of metastasis.

Management

The patient underwent wide local excision with negative margins. She was referred to oncology for systemic evaluation and adjuvant chemotherapy following Ewing's sarcoma protocol (VAC/IE regimen: Vincristine, Adriamycin, Cyclophosphamide alternating with Ifosfamide and Etoposide).

Follow-Up

At 6 months post-treatment, the patient remains disease-free with no local recurrence or metastasis.

Discussion

Ewing's sarcoma in adults, particularly in atypical cutaneous or acral sites, is infrequently seen, which can cause delays in diagnosis. The sole is a rare location, and the initial pigmented look can resemble benign lesions or melanoma [2]. The IHC profile plays an important role in differentiating Ewing's sarcoma from similar conditions like lymphomas (LCA+), neuroendocrine tumors (synaptophysin+), or other small round cell sarcomas (BCOR+ in clear cell sarcoma or CIC-rearranged sarcomas). The key diagnostic markers include the distinctive CD99 positivity on the membrane and the nuclear expression of NKX2.2 [3]. Although desmin positivity may raise suspicion for rhabdomyosarcoma, its focal nature here supported an Ewing's diagnosis.

Conclusion

This case exemplifies a rare adult-onset Ewing's sarcoma at an atypical acral site, emphasizing the need for histological and immunohistochemical vigilance in diagnosing small round blue cell tumors in unexpected clinical scenarios.

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