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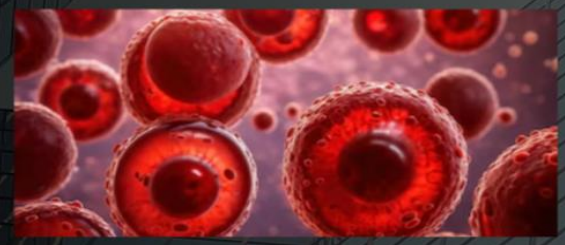

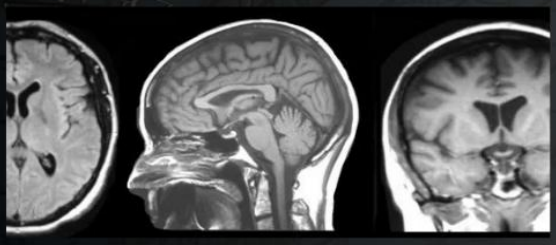

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Aims & Scope

The Journal aims to publish research in all fields of clinical, diagnostic, experimental & preventive areas related to medical sciences to disseminate scholastic work among clinicians and scientists around the globe.

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Editorial

The Silent Epidemic: Surgical Site Infections and Antimicrobial Resistance

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ABSTRACT:
Surgical Site Infections (SSIs) remain one of the most common and costly complications of surgery. Despite decades of advances in surgical safety, infection prevention, and antimicrobial therapy, they continue to undermine outcomes, particularly in low- and middle-income countries. The growing shadow of antimicrobial resistance (AMR) has only made this challenge more difficult, turning once-manageable infections into life-threatening conditions. This editorial reflects on the burden of SSIs, the ways AMR is reshaping their management, and the urgent steps needed, including but not limited to stronger prevention, smarter antibiotic use, and global collaboration, to protect the future of safe surgery.

Keywords: surgical site infection, antimicrobial resistance, Surgery, Patient Safety, Infection Control

INTRODUCTION

Every surgeon, regardless of experience, carries the quiet fear of infection after an otherwise successful surgical procedure. A clean incision, carefully closed, can still become a source of prolonged morbidity and longer hospital stay. This paradox that surgery can both heal and harm, is nowhere more evident than in the persistence of surgical site infections (SSIs). Globally, SSIs account for a large proportion of hospital-acquired infections. In some hospitals specially in low-resource settings, as many as one in three surgical patients will develop infection at surgical site. Even in well-equipped centers, SSIs continue to trouble patients and surgeons alike. The rise in antimicrobial resistance (AMR) has reshaped this old problem, making it harder to treat and, in some cases, nearly impossible to control. An SSI does not just extend a hospital stay; but it changes a patient's life trajectory. Families face unexpected costs, patients often lose weeks or months of productivity, and in resource-limited countries, even a minor postoperative infection can drain savings and force difficult financial decisions. For hospitals, the impact is equally harsh. A single infection can mean multiple reoperations, extended antibiotic courses, and longer intensive care stays. Globally, billions of dollars are lost each year to infections that, with the right systems in place, could have been prevented. The burden is not evenly shared—patients in low- and middle-income countries pay from their own source in most places.

When antibiotics first became available, they transformed surgical practice. Suddenly, the great fear of sepsis after an operation was no longer inevitable. Now that dramatic change in surgical outcome is changing due to high rate of AMR. Resistant organisms such as MRSA, ESBL-producing Enterobacteriaceae, carbapenem-resistant Gram-negatives are not a rare finding. They are found in operating theaters across the world. This brings a huge challenge to the surgeons that the very antibiotics they rely on to prevent and treat SSIs are also increasingly becoming resistant. Surgeons often feel compelled to extend prophylaxis, fearing infection, but on that works as a two way sword on one end they are trying to prevent infection but on other end, they may unintentionally fuel resistance. The cycle needs a watchfull consideration, otherwise it risks taking us back to an era where even routine operations carried major risks of infection related morbidity and mortality during post-operative period.

Despite global guidelines, SSIs remain stubbornly common. In many hospitals, basic infection control measures are still unreliable, instruments may be reused with inadequate sterilization, operating rooms are overcrowded, and hand hygiene compliance is inconsistent. Antibiotics, sometimes used as substitutes for inadequate infection prevention, are overprescribed and continued long after surgery.

Another challenge is the surveillance. In many regions, SSIs are underreported or not tracked at all. Without reliable data, policymakers and clinicians cannot see the true scale of the problem. The result is an invisible epidemic, underappreciated until it claims lives.

Charting a Way Forward

Solving the problem of SSIs in the age of AMR requires more than surgical skill—it demands system-wide change:

1. Fundamental corrections: Safe water, reliable sterilization, strict hand hygiene, and adherence to surgical safety checklists need to be made mandatory for even minor surgical procedures.
2. Careful use of antibiotics: Short, targeted prophylaxis must replace prolonged, indiscriminate use. Local resistance data should guide practice, and stewardship programs should involve surgeons, microbiologists, and pharmacists working together.
3. Better surveillance: Hospitals and national systems must track infections honestly and consistently. Only then can progress be measured.
4. Investment in infrastructure and system delivery: Low- and middle-income countries need support to strengthen infrastructure, supply chains, and training in infection prevention.
5. Innovation: From antimicrobial sutures to AI-driven wound monitoring, new tools are emerging that can complement traditional infection control strategies.

The persistence of SSIs in 2025 is not simply a failure of surgery but it is a failure of systems. Patients place extraordinary trust in their surgeons, believing an operation will bring relief, not more suffering. That trust is eroded when preventable infections occur.
The way forward requires global solidarity. SSIs should not be accepted as inevitable, nor should AMR be allowed to dictate the future of surgery. If we can commit to stronger prevention, wiser use of antibiotics, and honest measurement of outcomes, we can turn this tide.

CONCLUSION

Surgical site infections are as old as surgery itself, but in an age of modern medicine, they should not remain among the most common complications. The added burden of antimicrobial resistance makes them one of the most urgent challenges of global health. The scalpel, once empowered by antibiotics, now risks becoming blunt in the face of resistant microbes. It is up to us—as clinicians, researchers, and policymakers—to ensure that safe surgery remains a reality for all

Conflict of Interest

Author declare no conflict of interest.

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Original Article

PREVALENCE AND ASSOCIATED FACTORS OF INTRADIALYTIC HYPERTENSION IN PATIENTS UNDERGOING HEMODIALYSIS IN A TERTIARY CARE CENTER IN KARACHI, PAKISTAN

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ABSTRACT:

A significant number of patients with end-stage renal disease (ESRD) experience a paradoxical rise in systolic blood pressure (SBP) during or immediately following hemodialysis (HD), a condition known as intradialytic hypertension (IDHTN). While the physiological removal of excess fluid typically lowers blood pressure, IDHTN has been linked to increased morbidity, hospitalization, and mortality. A cross-sectional study was conducted on 134 adults undergoing thrice-weekly maintenance HD at a tertiary care center in Karachi, Pakistan, to investigate the prevalence and associated factors of this condition in a resource-constrained setting where data are scarce. Intradialytic hypertension was defined as a change in SBP of at least 10 mmHg from pre- to post-dialysis, averaged over three consecutive sessions. The study found a prevalence of 35.8% (48 out of 134 patients). The condition was significantly associated with several factors, including pre-existing hypertension ($p=0.005$) and diabetes mellitus ($p=0.012$), ultrafiltration volumes below 2 L ($p=0.020$), and, most notably, the use of antihypertensive medications ($p<0.001$) and dialyzable agents ($p<0.001$). Additional associations were observed with age 30 years or younger ($p=0.018$) and smoking ($p<0.001$). The findings indicate that IDHTN is a common finding in this cohort and is strongly linked to clinical and treatment-related factors. The results suggest that interventions focused on optimizing ultrafiltration targets and tailoring antihypertensive regimens, particularly by selecting non-dialyzable agents, may be crucial for reducing the incidence of this condition and improving patient outcomes.

Keywords: Intradialytic Hypertension, Hemodialysis, Systolic Blood Pressure, End-Stage Renal Disease, Ultrafiltration

INTRODUCTION

Hypertension is a substantial global public health concern and stands as a major cause and complication of end-stage renal disease (ESRD), affecting up to 90% of patients receiving maintenance hemodialysis (HD)(1, 3, 4). The process of hemodialysis, which involves the removal of excess fluid and uremic toxins, is typically expected to result in a decrease in blood pressure (BP) as a physiological response to the reduction in circulating blood volume (1, 5). However, a paradoxical phenomenon known as intradialytic hypertension (IDHTN) occurs in a notable subset of these patients, where blood pressure increases during or immediately following the procedure (1, 6, 7, 8).

The clinical implications of this paradoxical BP rise are profound and have been consistently linked to adverse cardiovascular outcomes. Intradialytic hypertension is commonly defined as an increase in systolic blood pressure (SBP) of at least 10 mmHg from pre- to post-dialysis measurements (1, 5, 8, 9). Research has shown a strong association between IDHTN and an elevated risk of increased hospitalization and mortality (1, 2). For example, a secondary analysis of the Dialysis Morbidity and Mortality Wave 2 Study found that an increase in BP during HD was associated with a 37% higher two-year mortality rate and doubled the odds of hospitalization or death at six months when compared to patients whose BP declined (1, 2, 5, 8). This highlights the significant prognostic bearing of intradialytic BP phenomena and underscores the need for effective management strategies (10). Furthermore, a meta-analysis of randomized controlled trials demonstrated that lowering BP with antihypertensive therapy can significantly reduce the risk of cardiovascular events by 29% and all-cause mortality by 20% in dialysis patients, confirming the importance of BP control in this high-risk population (11).

The pathophysiology of IDHTN is complex and multifactorial, involving a combination of volume-related and neurohumoral mechanisms (1, 9, 12). Key contributing factors include endothelial dysfunction with impaired nitric oxide release and activation of endothelin-1, which can lead to increased peripheral vascular resistance and a subsequent rise in BP (1, 5, 13, 14). While some studies suggest that overzealous fluid removal can activate the renin-

angiotensin-aldosterone axis (RAAS) and the sympathetic nervous system (SNS), leading to vasoconstriction and BP rise, other evidence points to the opposite, where subclinical fluid overload is the primary driver of IDHTN (1, 9, 15, 5). Another critical factor is the dialytic clearance of antihypertensive medications, especially those that are water-soluble and have a low molecular weight, which can leave the patient with inadequate BP control at a critical point in the session (1, 7, 9).

Despite the growing body of evidence on IDHTN, there is a notable scarcity of data from resource-constrained settings in South Asia. Given the unique patient demographics, disease profiles, and potential differences in care practices in these regions, a deeper understanding of IDHTN in this context is essential. This study was therefore conducted to determine the frequency and identify the associated clinical and treatment-related factors of intradialytic hypertension in a cohort of patients undergoing maintenance hemodialysis at a tertiary-care unit in Karachi, Pakistan. The findings aim to provide crucial local data and contribute to the global understanding of this important complication.

METHODS

Study Design and Setting

This cross-sectional study was conducted over a six-month period, from December 22, 2022, to June 22, 2023. The research was carried out at the Nephrology Outpatient Department and Dialysis Unit of the Dr. Ziauddin Hospital in Karachi, Pakistan.

Patient Population and Sampling

The sample size was calculated using the World Health Organization (WHO) sample size calculator. Based on a proportion of 33.6% for diabetes in patients with IDHTN, a power of test at 80%, and a 95% confidence interval, a sample size of 134 participants was determined to be appropriate for the study. A non-probability consecutive sampling technique was employed to enroll participants who met the following inclusion criteria: all patients aged between 18 and 80 years who had been undergoing maintenance hemodialysis as outpatients at the study site for a minimum of three months and who provided informed consent. Patients who were either below 18 or above 80 years of age or who declined to participate were excluded from the study.

Data Collection Procedure

A standardized proforma questionnaire, included as an appendix in the full manuscript, was used to collect data. Trained nursing staff measured the blood pressure of patients before and after each dialysis session. Pre-dialysis blood pressure was measured after the patient had been seated for at least five minutes, before the placement of dialysis access needles. Post-dialysis blood pressure was measured at least five minutes after the conclusion of the procedure. For a stable measure, the average of three consecutive hemodialysis sessions' readings was recorded. Pre- and post-dialysis weights were also recorded during these sessions. Patients were specifically instructed not to withhold their antihypertensive medications before their hemodialysis appointments. Additional patient information, including the history of ESRD, comorbidities (e.g., hypertension, diabetes), smoking status, duration of dialysis, and interdialytic weight gain, was obtained through interviews and a review of medical records. Body Mass Index (BMI) data were extracted from outpatient department records.

Ethics Statement

The study protocol, which involved human participants, received approval from the Institutional Ethics Committee. The study was conducted in full compliance with the ethical standards of the responsible institutional committee on human experimentation and in accordance with the Declaration of Helsinki. All participants provided written informed consent prior to their enrollment(1, 3). The privacy and anonymity of the participants were strictly protected by ensuring that no identifying information was included in the data collection forms or subsequent analysis.

Statistical methods

All collected data were analyzed using Statistical Package for Social Sciences (SPSS version 22.0). Continuous variables, such as age, BMI, and ultrafiltration volumes, were described using mean and standard deviation, along with a 95% confidence interval for the mean. Categorical variables, including gender, smoking status, and the presence of IDHTN, were presented as frequencies and percentages. The Chi-square test was used to compare the frequency of IDHTN with its potential predictors, while Fisher's exact test was used as an alternative when cell counts were low. A *p*-value of less than 0.05 was considered statistically significant for all comparisons.

RESULTS

A total of 134 patients on maintenance hemodialysis for at least three months were included in the study. The mean age of the cohort was 48.9 ± 12.1 years (95% CI 46.8–50.9), with a substantial majority being male patients (110/134, 82.1%). The mean body mass index was 23.5 ± 2.0 kg/m² (95% CI 23.17–23.86). The average ultrafiltration volume per session was 2.8 ± 0.9 L (95% CI 2.65–2.96), and the average interdialytic weight gain was 1.53 ± 1.73 kg (95% CI 1.24–1.83). The baseline characteristics of the patient cohort are summarized in Table 1.

Table 1. Demographic and basic study characteristics of the Patient Cohort

Variable	Mean ± SD	95% Confidence Interval for Mean
Age (Years)	48.87 ± 12.14	46.80 to 50.94
Height (cm)	154.44 ± 5.51	153.50 to 155.37
Weight (kg)	56.08 ± 5.41	55.16 to 56.99
BMI (kg/m^2)	23.52 ± 2.04	23.17 to 23.86
Duration of Hemodialysis (Hours)	3.44 ± 0.49	3.36 to 3.53
Interdialytic Weight Gain (kg)	1.53 ± 1.73	1.24 to 1.83
Ultra-filtrate Volumes (L)	2.81 ± 0.90	2.65 to 2.96

Intradialytic hypertension, defined as a post-dialysis systolic blood pressure rise of at least 10 mmHg, was observed in 48 out of 134 patients, yielding a prevalence of 35.8%.

Factors Associated with Intradialytic Hypertension

Analysis of the cohort revealed several significant associations with the occurrence of IDHTN. As presented in Table 2, patients with a history of hypertension were more likely to experience IDHTN. Of the 48 patients with IDHTN, 21 (43.8%) had a history of hypertension, compared to 18 of 86 patients (20.9%) without IDHTN ($\chi1^2 = 8.02$, $p = 0.005$, Cramer's V = 0.24). A similar trend was observed for diabetes mellitus, which was present in 17 of 48 patients (35.4%) with IDHTN versus 14 of 86 patients (16.3%) without IDHTN ($\chi1^2 = 6.32$, $p = 0.012$, Cramer's V = 0.22).

Patients with ultra-filtration volumes below 2 L had a higher frequency of IDHTN (36/48, 75.0%) compared to those without IDHTN (47/86, 54.7%) ($\chi1^2 = 5.41$, $p = 0.020$, Cramer's V = 0.18). The strongest association was observed with the use of antihypertensive medications, where nearly 90% of patients with IDHTN (34/38) were taking these drugs, a significantly higher proportion than in the non-IDHTN group (14/96, 14.6%) ($\chi1^2 = 87.30$, $p < 0.001$, Cramer's V = 0.81). Furthermore, the use of dialyzable antihypertensive agents was very strongly linked to IDHTN; 20 of 22 patients who took dialyzable drugs experienced IDHTN, while none of the 112 patients without IDHTN were on these agents (Fisher's exact $p < 0.001$).

Table 2: Key Factors Associated with Intradialytic Hypertension in the Overall Cohort (n=134)

Factors	IDHTN (n=48)	No IDHTN (n=86)	Statistical Results
Hypertension	21 (43.8%)	18 (20.9%)	χ12=8.02, p=0.005, V = 0.24
Diabetes Mellitus	17 (35.4%)	14 (16.3%)	χ12=6.32, p=0.012, V = 0.22
Ultrafiltration <2 L	36 (75.0%)	47 (54.7%)	χ12=5.41, p=0.020, V = 0.18
Antihypertensive Use	34 (89.5%)	14 (14.6%)	χ12=87.30, p<0.001, V = 0.81
Dialyzable Agents	20 (90.9%)	0 (0%)	Fisher's exact p<0.001
Age ≤30 years	10 (66.7%)	5 (33.3%)	χ12=5.63, p=0.018, V = 0.21
Smoking	8 (23.5%)	0 (0%)	Fisher's exact p<0.001

Patients aged 30 years or younger had a higher frequency of IDHTN (10/15, 66.7%) compared to older patients (5/15, 33.3%) ($\chi 1^2 = 5.63$, $p = 0.018$, $V = 0.21$). Among smokers, 8 out of 34 patients (23.5%) experienced IDHTN, whereas no associations were found in the non-smoking group (Fisher's exact $p < 0.001$).

A sub-group analysis confirmed these trends and provided additional details. For instance, among male patients, both hypertension ($p = 0.018$) and diabetes mellitus ($p = 0.015$) were significant factors for IDHTN. Similarly, patients with a BMI of 25 kg/m² or less had significant associations with hypertension ($p = 0.011$) and diabetes mellitus ($p = 0.008$) as contributing factors for IDHTN. The duration of hemodialysis did not appear to be a factor in the overall study cohort.

DISCUSSION

The findings of this study provide a detailed view of the prevalence and risk factors for intradialytic hypertension in a South Asian population. The overall prevalence of 35.8% stands in stark contrast to the rates of 5–15% commonly reported in the international literature from Western cohorts (1, 8, 9, 14, 5). This elevated prevalence is, however, consistent with other findings from similar resource-constrained settings in India (22%) and Africa (31–34.5%), and a similar incidence of 37% was observed in the Philippines (1, 2, 11, 2). This high prevalence is not an isolated local anomaly but may be a recurring systemic issue in these regions, reflecting shared challenges such as delayed patient presentation, inadequate access to advanced diagnostic tools, or differences in care practices and medication availability that contribute to the pathogenesis of IDHTN.

The findings related to ultra-filtration volume provide a compelling perspective on the possible underlying mechanisms. A significant association was found between IDHTN and ultrafiltration volumes of less than 2 L, a finding that at first appears counterintuitive. While one might expect higher ultrafiltration rates to be associated with hemodynamic stress and a BP rise, this result suggests a more complex interplay.(15) In the absence of advanced diagnostics like bioimpedance spectroscopy (BIS), which is a valuable tool for objectively assessing fluid status, clinicians may be hesitant to set aggressive ultrafiltration targets due to a fear of inducing intradialytic hypotension.(1, 9, 16) This conservative approach may inadvertently perpetuate a state of chronic subclinical volume overload.(9, 16) Consequently, the modest fluid removal may be insufficient to resolve the underlying volume excess, allowing the neurohumoral mechanisms of IDHTN, such as RAAS and SNS activation, to remain unopposed and lead to a BP increase.(12, 14) Therefore, the low ultrafiltration volume may not be the cause of IDHTN but rather a marker of an underlying, uncorrected fluid overload that drives the pathological increase in blood pressure.(5,15)

The strong associations found between IDHTN and both antihypertensive medication use and the dialyzability of these drugs are particularly instructive. The data showed that a high proportion of patients with IDHTN were using antihypertensives, and a significantly higher number were taking dialyzable agents. This observation underscores the hypothesis that the clearance of medications during hemodialysis can directly contribute to a post-dialysis BP rebound. As dialyzable agents are rapidly removed from the bloodstream, the patient is left with minimal BP coverage at a time when the body is activating vasoconstrictive pathways (1, 9). The very strong effect size of this association ($V = 0.81$) suggests that it is a dominant contributor to IDHTN in this cohort. A more nuanced aspect of the findings is the observation that a substantial number of diabetic patients on non-dialyzable antihypertensive agents still experienced IDHTN. This suggests that while medication removal is an important factor, it is not the sole driver of the phenomenon, particularly in this high-risk subgroup. The elevated BP in these patients, independent of drug kinetics, is likely a manifestation of the profound endothelial dysfunction, arterial stiffness, and sympathetic overactivity that are hallmarks of both diabetes and chronic kidney disease (10, 13, 14). This finding highlights that effective management of IDHTN in diabetic patients may require addressing the underlying physiological mechanisms rather than simply adjusting medication timing or type.

A final noteworthy finding is the higher frequency of IDHTN in the younger age group (30 years or younger), which appears to contradict the general consensus in the literature that IDHTN is more common in older patients (1, 8). This paradoxical result is likely not a statistical anomaly but a reflection of the unique disease etiology within this population. The underlying causes of ESRD in younger patients in this region, such as glomerulonephritis or other inflammatory conditions, may be associated with heightened sympathetic tone and chronic inflammatory states that predispose them to IDHTN. This finding, therefore, warrants further research to explore whether there are distinct pathophysiological pathways that require a tailored approach to management for this specific demographic.

This study, while providing valuable data from an under-represented population, has several limitations inherent to its design. The cross-sectional design limits the ability to establish a definitive causal relationship between the identified factors and the occurrence of IDHTN. For instance, while a strong association was found between antihypertensive use and IDHTN, it is not possible to conclude whether the medications are causing the BP rise or if the BP rise necessitates the prescription of more drugs. The single-center nature of the study may also limit the generalizability of the findings to other patient populations or healthcare settings, especially given the specific characteristics of this resource-constrained environment. Furthermore, several potential confounders that could influence the development of IDHTN were not measured or controlled for, including dietary sodium intake and the concentration of sodium in the dialysate. The study also did not objectively measure blood levels of antihypertensive medications to confirm their removal during dialysis, relying instead on a general classification of dialyzability. The absence of advanced diagnostics, such as bioimpedance spectroscopy (BIS), meant that subclinical fluid overload in the IDHTN group could not be quantified, a factor that could have further elucidated the underlying mechanisms.

CONCLUSION

In this cohort of patients with end-stage renal disease undergoing maintenance hemodialysis in a resource-constrained setting, intradialytic hypertension was a common complication. The prevalence was higher than rates commonly reported in the international literature, which may reflect the unique patient population and care practices. The condition was significantly linked to several factors, including pre-existing hypertension and diabetes mellitus. Notably, strong associations were found with modifiable factors such as ultrafiltration targets and the use of dialyzable antihypertensive agents. These findings underscore the importance of optimizing fluid removal strategies and carefully selecting antihypertensive drug regimens, preferentially favoring non-dialyzable agents, as potential interventions to mitigate the incidence of intradialytic hypertension and improve patient outcomes. Further research is necessary to explore the specific pathophysiological mechanisms in this population and to confirm these findings through prospective studies.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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Original Article

PREDICTORS OF LEFT VENTRICULAR DYSFUNCTION (LVD) IN PATIENTS WITH ACUTE MYOCARDIAL INFRACTION (AMI) UNDERGOING PRIMARY PERCUTANEOUS CORONARY INTERVENTION (PPCI)

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ABSTRACT:

Acute Myocardial Infarction (AMI) leads to significant myocardial damage if not promptly addressed. The aim of this study was to determine the frequency, predictors and assessing the associated factors with LV dysfunction in patients with AMI undergoing PPCI. This descriptive cross-sectional study conducted at department of Cardiology SICVD hospital, Larkana, Pakistan for the period of six month including 340 patients. All the patients from the age range between 30 to 70 years old with confirmed diagnosis of AMI based on angiography and undergone PPCI were included in the study. Primary PCI procedures were performed by senior cardiologists; pre- and post-procedure clinical and pharmacological management were kept uniform. The results showed a male majority in the sample, with 264 (77.6%) of these being male and 76 (22.4%) being female. Only 6 patients (1.8%) were under 30 years old. The mean age score for patients with intact LVEF (>50%) was 3.76, while the averages for gender and hypertension were 1.23 and 1.36, respectively. The mean age of those with slightly decreased LVEF (40–50%) was 3.85, whereas the averages for gender and hypertension were 1.23 and 1.32, respectively. A significant percentage of patients experienced severe LV systolic dysfunction, which is linked to unfavourable clinical outcomes. This dysfunction following PPCI is independently predicted by larger myocardial infarction, renal impairment, and severe coronary artery disease.

Keywords: Left ventricular Dysfunction, Acute Myocardial Infraction, primary percutaneous coronary intervention, myocardial infarction

INTRODUCTION

Left ventricular thrombus (LVT) is a severe consequence of myocardial infarction (MI), leading to systemic embolism and heightened morbidity and mortality (1). Despite the use of quick reperfusion and effective anticoagulant therapy, the occurrence of LVT remains between 2.5% to 15% in patients with acute myocardial infarction (AMI) (2). Primary Percutaneous Coronary Intervention (PPCI) is the gold standard for treating STEMI, aiming to restore blood flow and minimize myocardial injury. Despite PPCI success in salvaging myocardial tissue and improving survival rates, a notable proportion of patients continue to experience left ventricular (LV) dysfunction, which can complicate recovery and affect long-term outcomes (3).

Nevertheless, information about the incidence and outcome of LVT in patients with LV dysfunction and post-MI who received PCI is rarely available. To assess the determinants and clinical prognosis of LVT in a high-risk population of post-MI and LV dysfunction patients who received modern PCI treatment, in the current study, we examined the consecutive patients from a prospectively enrolled single centre PCI database. In several contexts, the epidemiology of heart failure and ventricular dysfunction has been investigated (4).

The ”Implantable cardioverter defibrillator (ICD) implantation” early after myocardial infarction (MI) showed mortality benefit in patients with impaired LV ejection fraction (LVEF), according to earlier randomised trials investigating early primary prevention measures (5), Probably for a variety of reasons: First, because the same causes are linked to an increased risk of both arrhythmic and non-arrhythmic mortality, the decrease in life-threatening arrhythmias was counterbalanced by a concurrent increase in non-arrhythmic death(6). There is a shortage of recent research on accurate prevalence data based on sufficient echocardiographic evaluation in the general older population. Furthermore, the epidemic of heart failure appears to be shifting as a result of population ageing, better therapy for heart failure, increased comorbidities, and greater survival of acute coronary disease (7).

By evaluating a comprehensive range of variables, including patient demographics, clinical characteristics, procedural details, and biochemical markers, this study aims to elucidate the factors most strongly associated with LV dysfunction. Insights from this research could lead to more targeted and personalised treatment strategies, ultimately improving outcomes and quality of life for patients undergoing PPCI (8). The aim of this study is to determine the frequency and factors associated with LV Dysfunction in patients with AMI undergoing PPCI.

METHODS

A descriptive cross-sectional study was conducted at Department of Adult Cardiology, Sindh Institute of Cardiovascular Diseases (SICVD) Larkana, Pakistan for the period of six months (January 2025 to June 2025). The calculated minimum required sample size was 355. All the patients aged between 30 to 70 years, confirmed diagnosed cases of AMI based on angiography and underwent PPCI were included in the study. Whereas the patients having serious comorbid conditions and poor cognitive potentials, and patients not willing to participate were excluded from the study. The data was collected after the approval obtained from the ethical review committee, the patient undergoing PPCI meeting with inclusion criteria were enrolled in the study. Informed consent was obtained for study participation and publication of collected data without disclosing patients' identity.

Primary PCI procedures were performed by senior cardiologists; pre- and post-procedure clinical and pharmacological management were standardised for all patients as per clinical practice guidelines and institutional policies. Data was collected for various patient, system, and procedure-related characteristics with the help of a predefined structured proforma that consisted of demographic data, clinical presentation, history and co-morbid conditions, and angiographic and procedural characteristics. Post-procedure transthoracic echocardiography (TTE) was performed, and left ventricular dysfunction (LVD) was documented.

Statistical methods

Descriptive analysis was conducted to evaluate the association between LVD and various demographic and clinical characteristics, using the Chi-square test, t-test, or Mann-Whitney U test, as appropriate. The statistical significance criteria are set as p-value<0.05.

RESULTS

A total of 340 patients were enrolled, based on the research population's demographic profile. The sample was male-majority, with 264 (77.6%) of these being male and 76 (22.4%) female. Only 6 patients (1.8%) were under 30 years old, whereas the majority of cases occurred in middle-aged and older age groups.

Table 1. Demographic details of patients

Variable	Category	n (%)
Gender	Male	264 (77.6%)
	Female	76 (22.4%)
Age Groups	<30	6 (1.8%)
	30–40	31 (9.1%)
	41–50	94 (27.6%)
	51–60	113 (33.2%)
	61–70	74 (21.8%)
	>70	22 (6.5%)
	Total	340 (100%)
Family History of CVD	Yes	126 (37.1%)
	No	214 (62.9%)
Marital Status	–	–
Procedure Performed	Angiography	3 (0.9%)
	POBA	11 (3.2%)
	Stenting	326 (95.9%)

Table 2. comparison of means with dependent variables

Age Gender Hypertension * Left Ventricular LVEF				
Left Ventricular LVEF		**Age**	**Gender**	**Hypertension**
- > 50%	**Mean**	3.7612	1.2388	1.3582
	n	67	67	67
	Std. Deviation	1.10220	.42957	.48309
- 40-50%	**Mean**	3.8496	1.2256	1.3158
	n	133	133	133
	Std. Deviation	1.16448	.41953	.46659
- 30-39%	**Mean**	3.8130	1.2358	1.3008
	n	123	123	123
	Std. Deviation	1.09656	.42622	.46049
- < 30%	**Mean**	4.1765	1.0588	1.1765
	n	17	17	17
	Std. Deviation	1.01460	.24254	.39295
Total	**Mean**	3.8353	1.2235	1.3118
	n	340	340	340
	Std. Deviation	1.11939	.41722	.46390

A total of 9.1% of the patients in the study were between the ages of 30 and 40, while 27.6% were between the ages of 41 and 50. The age group of 51–60 years old had the highest frequency, making up 33.2% of the research population. Patients between the ages of 61 and 70 made up 21.8% of the total, while those above 70 made up 6.5%. Correlation analysis was performed between age, gender, and hypertension and left ventricular ejection fraction (LVEF). The mean age score for patients with normal LVEF (>50%) was 3.76, while the averages for gender and hypertension were 1.23 and 1.36, respectively. The mean age of those with mildly reduced LVEF (40–50%) was 3.85, whereas the averages for gender and hypertension were 1.23 and 1.32, respectively. The considerably decreased group (LVEF 30–39%), with mean age score of 3.81, gender 1.24, and hypertension 1.30. On the other hand, patients with LVEF <30% had lower mean gender (1.06) and hypertension (1.18) ratings, as well as a higher mean age of 4.17. The findings show that a slight variance in the distribution of hypertension and gender, as well as growing age, are linked to decreasing LVEF. The distribution of left ventricular (LV) dysfunction across patients in different age groups undergoing various treatments is shown in the table. The most common intervention was primary PCI (n=337), which was more common in patients between the ages of 51 and 60. A total of 142 patients had LV dysfunction, with the majority being between the ages of 41 and 60. Rarely were thrombolysis (n=2) and medical management alone (n=1) carried out. The table summarizes the distribution of left ventricular (LV) dysfunction across different interventions and age groups. Primary PCI was the most frequently performed intervention (n=337), with LV dysfunction present in 42.1% of cases, most commonly in the 41–60-year age range. Thrombolysis (n=2) and medical management (n=1) were rarely used, with no LV dysfunction observed. Overall, LV dysfunction was present in 41.8% of the study population (n=340). Chi-square analysis showed no statistically significant association between age and LV dysfunction in either the PCI subgroup (p=0.373) or the total study population (p=0.413).

Table 3. Statistical presentation and details of procedures

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Killip Classification at presentation	50.030	339	.000	1.13235	1.0878	1.1769
No of stents used	29.117	339	.000	1.18824	1.1080	1.2685
Procedure	212.801	339	.000	2.95000	2.9227	2.9773
Initial Electrocardiogram ECG	45.457	339	.000	1.62647	1.5561	1.6969

DISCUSSION

Left Ventricular dysfunction following STEMI is associated with increased morbidity and mortality, underscoring the importance of identifying factors that predict adverse LV remodelling (9-10). A variety of clinical, procedural, and biochemical parameters have been identified as potential predictors of LV dysfunction. For example, pre-existing conditions such as diabetes mellitus and hypertension, as well as the extent of myocardial damage indicated by biomarkers like troponin and creatine kinase, are shown to correlate with LV dysfunction (11). Additionally, procedural factors such as the duration of ischaemia and the efficacy of thrombus aspiration can impact post-procedural LV function (12).

According to research, the incidence of LVDD in individuals with type 2 diabetes ranges from 23 to 75% (13), while the prevalence of HF in these patients is reported to be 12–57%. The variations in patient cohorts (demographics, inclusion/exclusion criteria, and prescribed drugs) and diagnostic techniques were explained by this variability. In the general population with type 2 diabetes, the prevalence of LVDD was 35.0%, according to a study conducted on LV dysfunctions (14). The frequency of LVD in Asian populations ranges from 54.3% to 65.0%, according to a small number of studies (patient population <150).

These data are consistent with our finding that 70.1% of Malaysian patients with established type 2 diabetes under therapy have asymptomatic, mostly Grade 1/mild LVDD (15).

Table 4. Comparison of clinical intervention and Left Ventricular dysfunction of patients

Intervention	Age Group	No LV Dysfunction (%)	LV Dysfunction n (%	Total n (%)	χ^2 Value	df	p-value
Primary PCI	<30	2 (33.3%)	4 (66.7%)	6 (100%)			
	30–40	16 (53.3%)	14 (46.7%)	30 (100%)			
	41–50	59 (62.8%)	35 (37.2%)	94 (100%)			
	51–60	63 (56.3%)	49 (43.7%)	112 (100%)			
	61–70	39 (53.4%)	34 (46.6%)	73 (100%)			
	>70	16 (72.7%)	6 (27.3%)	22 (100%)			
	Subtotal	**195 (57.9%)**	**142 (42.1%)**	**337 (100%)**	**5.363**	5	0.373
Thrombolysis	51–60	1 (100%)	0 (0%)	1 (100%)			
	61–70	1 (100%)	0 (0%)	1 (100%)			
	Subtotal	**2 (100%)**	**0 (0%)**	**2 (100%)**	–	–	–
Medical Management Only	30–40	1 (100%)	0 (0%)	1 (100%)			
	Subtotal	**1 (100%)**	**0 (0%)**	**1 (100%)**	–	–	–
Total	<30	2 (33.3%)	4 (66.7%)	6 (100%)			
	30–40	17 (54.8%)	14 (45.2%)	31 (100%)			
	41–50	59 (62.8%)	35 (37.2%)	94 (100%)			
	51–60	64 (56.6%)	49 (43.4%)	113 (100%)			
	61–70	40 (54.1%)	34 (45.9%)	74 (100%)			
	>70	16 (72.7%)	6 (27.3%)	22 (100%)			
	Grand Total	**198 (58.2%)**	**142 (41.8%)**	**340 (100%)**	**5.020**	5	0.413

According to several Western researches, among individuals without documented coronary artery disease, LVDD is more common than LVSD. In this cohort, 3.6% had EF < 50%, and 42% had verified LVDD, most with Grade 1 dysfunction. This sample had a mean age of over 60 and a short duration of type 2 diabetes (mean of 4–5 years). Statins were used by 45% of patients, and renin-angiotensin system (RAS) blockers by 72%. The short mean duration of type 2 diabetes, the extensive use of RAS blockers, and the elimination of inducible ischaemia by stress echocardiography all contribute to the low prevalence of LVSD and LVDD in this study (16).

However, the prevalence of Grade 2 LVDD was somewhat greater (18%) and the total LVDD was lower (40%) in a cohort studyT2DM patients who did not have overt heart disease or coronary artery disease. These patients' mean age was comparable to that of our study, but their mean duration of T2DM was shorter (4.5 years), which could explain why it was less common in this group (17).

The AMI-related mortality rates have dramatically dropped in recent years. Furthermore, it has been demonstrated that early reperfusion therapy, which includes mechanical methods and adjuvant antithrombotic treatment, reduces mortality. Notably, in patients with AMI, the mechanical reperfusion approach combined with PPCI can reduce the size of the infarct and maintain left ventricular systolic function. Even after a successful PPCI procedure, certain patients may still exhibit diminished cardiac function and be at risk for developing congestive heart failure (18). Significant early impairment and varied recovery are also noted in studies monitoring LVEF trajectories following STEMI, which is in line with your greater in-hospital proportion (19).

the study showed Age group and LV dysfunction did not significantly correlate, according to your chi-square tests (PCI subgroup p=0.373; overall p=0.413). Previous research indicates that ischaemia time, infarct location, and disease burden are stronger predictors of decreased LVEF than age alone, which makes a non-significant univariate age–LVEF correlation conceivable (20). The clinical significance

stratified reporting is supported by the fact that, regardless of age, lower LVEF following MI is still a significant prognostic marker for mortality and hospital readmission and improves with efficient reperfusion and/or optimal therapy (21).

CONCLUSION

After undergoing PPCI, a significant percentage of patients experience severe LV systolic dysfunction, which is linked to unfavourable clinical outcomes. significant LV systolic dysfunction after PPCI is independently predicted by larger myocardial infarction, renal impairment, and significant coronary artery disease. The clinical significance stratified reporting is supported by the fact that, regardless of age, lower LVEF following MI is still a significant prognostic marker for mortality/readmission and improves with efficient reperfusion/optimal therapy.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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Original Article

RETINAL THICKNESS IN DIABETIC AND NON-DIABETIC PATIENTS USING SPECTRAL DOMAIN OPTICAL COHERENCE TOMOGRAPHY (SD-OCT)

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ABSTRACT:

This study aimed to determine the average retinal thickness with and without diabetes using Spectral Domain Optical Coherence Tomography (SD-OCT). Known diabetic and non-diabetic respondents from Diabetic Eye Clinic & General OPD having no clinical signs of diabetic retinopathy on fundus examination were selected in this study. All the participants gave informed written informed consent. A total of 80 patients (n=156 eyes) were recruited in this study. Average central thickness was 249 µm and 246 µm in diabetic and non-diabetic patients respectively. On quadrant wise evaluation, retinal thickness in diabetic and non-diabetic (Healthy Eye) were: Nasal =310 µm and 324 µm), Temporal =291 µm and 304 µm, Superior =297 µm and 316µm, and Inferior= 292 µm and 314 µm). Retinal thicknesses were greater at nasal and lesser at temporal areas.

In conclusion retinal thickness measured in diabetic patients was found to be less in non-diabetic patients. Age and gender were other related demographic factors that influenced macular thickness measurements.

Keywords: Retinal thickness, Diabetes mellitus, Spectral-domain optical coherence tomography (SD-OCT), Macular thickness, Diabetic eye

INTRODUCTION

Diabetes is a Greek word meaning to siphon, while *Mellitus* is a Latin word meaning honey. The complete term was described by Thomas Willis in 1674. He described the urine of diabetic patients as if it was permeated with honey and sugar. By the mid-1800s, treatments for diabetes were often harsh, including "fad" diets, starvation diets, and other therapies. Among all these treatments, the starvation diet was considered the most successful (1).

In Pakistan, the prevalence of type 2 diabetes, also known as Diabetes Mellitus (DM), has been recorded to be 27%, and it is a progressive chronic disease. Complications of DM arise from hyperglycemia, caused by impairment of insulin metabolism and alterations in biological macromolecules such as carbohydrates, lipids, proteins, and nucleic acids (2). Jagar et al noticed some "yellowish," oval spots on the diabetic human retina in 1939. The condition is known as diabetic retinopathy (DR). The term "diabetic retinopathy" refers to changes in the retina that occur over the course of diabetes. It is one of the leading causes of blindness in the population. Diabetic retinopathy is a silent disease because it is usually recognised by the patient only when the disease reaches a stage where treatment is no longer effective. Therefore, effective treatment for diabetic retinopathy must be administered at the early stages of the disease (3).

Diabetic retinopathy is a common complication of diabetes, in which the retina (a layer of tissue at the back of the eye) becomes progressively damaged. Diabetic retinopathy is the most common microvascular complication of diabetes mellitus. It is a microangiopathy that affects small vessels in the retina, such as arterioles, capillaries, and venules. It is characterized by increased vascular permeability, ocular hemorrhages, lipid exudates, and vascular closure, often mediated by the formation of new blood vessels on the retina (4). The DR can be broadly classified as non-proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR). The stage of the DR can be determined on the presence of specific DR features (5,6).

Optical Coherence Tomography (OCT) is a non-invasive modality that produces cross-sectional or three-dimensional, high-resolution images of the retinal layers and allows quantitative assessment of retinal thickness. OCT has emerged as an important imaging tool in the evaluation and management of retinal diseases. It is based on low-coherence light reflection. The OCT is one of the fundamental diagnostic imaging techniques in the fields of ophthalmology and optometry. Additionally, OCT provides quantitative data on retinal thickness, which is essential for monitoring changes in clinical symptoms of diabetic retinopathy and for use in research settings (7, 8).

Spectral Domain Optical Coherence Tomography (SD-OCT), also known as Fourier Domain OCT, is a relatively new imaging technique based on Fourier transformation to gather depth-resolved data from the spectra of OCT signals. This advanced technology has replaced Time Domain OCT (TD-OCT). Therefore, data are needed to describe normal macular thickness in individuals with or without DM using SD-OCT. The main advantages of SD-OCT over TD-OCT include increased speed of data collection and higher-resolution imaging. The SD-OCT also provides three-dimensional images of the retina, which was not possible with TD-OCT. The TD-OCT uses an interferometer to measure the echo delay time of light reflected and backscattered from various retinal microstructures and samples only one point at a time, making it relatively slow to obtain A-scan and B-mode retinal images (9, 10).

In SD-OCT, light beams returning from the sample and reference paths are combined at the detector, which is a spectrometer that resolves the interference signals throughout the depth of each A-scan without varying the length of the reference path. The SD-OCT provides scans that are 50 times faster than those of TD-OCT (11).

The recent introduction of SD-OCT enables imaging of the macula at a much faster scan rate and with higher resolution. Compared with commercially available TD-OCT, which collects 400 axial measurements per second with an axial resolution of approximately 10 μm. The SD-OCT achieves at least 18,000 axial measurements per second with an axial resolution of 5 μm. The basic working principle of SD-OCT is similar to that of TD-OCT, as both systems measure the echo time delay of backscattered light signals via an interferometer. In TD-OCT, depth information of the retina is collected as a function of time by moving the reference mirror.

The SD-OCT has been modified to perform three-dimensional (3D) OCT. The 3D OCT uses a superluminescent diode laser with a centre wavelength of 840 nm and a bandwidth of 50 nm as the light source. The acquisition rate of 3D OCT is up to 18,000 A-scans per second. The transverse and axial resolutions are 20 μm and 5 μm, respectively. This is achieved through a raster scan composed of 256 × 256 (vertical × horizontal) axial scans, covering a 6 × 6 mm macular region. A built-in correlation-based algorithm is used to cancel axial eye motion artefacts. All images were obtained with an image quality score of at least 60 (12).

Optical Coherence Tomography is a useful tool for quantifying the structural complications of the diabetic retina. OCT provides high-quality examination in patients with DM. It helps measure central macular thickness and central macular volume. There is no such automated and accurate screening system available for diabetic patients to evaluate early central macular changes in the diabetic human retina (13).

According to protocol, central macular thickness is measured using 3D macular scans in SD-OCT. Each macular scan consists of 256 × 256 (vertical × horizontal) axial scans covering a 6 × 6 mm region of the macula. The scan reconstructs a false-color topographic image displayed with numeric averages of thickness measurements for each of the nine regions within the 6 × 6 mm area centered on the fovea. The macula is divided into nine regions: a 3 mm inner ring and a 6 mm outer ring, both centered on the fovea. The inner and outer rings are further divided into four quadrants: nasal, temporal, superior, and inferior. SD-OCT identifies the retinal layers and determines central macular thickness by measuring the distance between the inner limiting membrane (ILM) and the inner boundary of the retinal pigment epithelium (RPE) in all nine regions.

METHODS

This was a hospital-based observational prospective comparative cross sectional study, including 40 diabetic and 40 non-diabetic participants, with an equal distribution of 20 males and 20 females in each group. Purposive sampling was used to select the participants. Type 2 diabetic patients with healthy eyes were included in the study. Participants aged between 20 and 60 years were selected. Both male and female patients were considered. Non-diabetic patients with healthy eyes were also included. Patients with any systemic or ocular problems other than diabetes were excluded. Uncooperative patients were not included. Individuals with type I diabetes or significant diabetic retinopathy were also excluded from the study. After diagnosis by using fundoscopy, retinal photographs and retinal thickness measurements were taken using a SD-OCT machine. The data were recorded on a proforma in the investigation room. Nine standard ETDRS grid regions were used for assessment and analysis.

Ethical Statement:

All participants were provided with a copy of project details sheet with complete description of the study, once they understood and signed a written consent form (English as well as Urdu), they were recruited in the study. Any information obtained in this study that could identify participants was kept confidential and any answers to the questionnaire were kept in a safe place on campus. All participants were given a unique study identification code. Data were de-identified at the time of collection such that only participants' name initial and a study identification

number were used to identify the data for each participant. Any data included in reports, publication, or presented at a meeting were provided in the form of group response or studies identify numbers, such that the participants cannot be identified.

RESULTS

Average central Foveal thickness was (249 ± 19µm) in diabetic patients without DR and (246 ± 16µm) in non-diabetic with healthy eye patients. While Average retinal thickness in different quadrants were (297 ± 21) in Diabetic without DR and (315 ± 13) in non-diabetic. The Average Retinal thickness was decreased in Diabetic subjects when compared to non-diabetic.(Table 1).

On Quadrant wise evaluation, Retinal Thickness in Diabetic and Non-Diabetic (Healthy Eye) were at Nasal (310 ± 17 & 324 ± 14 µm), Temporal (291 ± 31 & 304 ± 14 µm), Superior (297 ± 20 & 316 ± 14µm), and Inferior (292 ± 19 & 314 ± 13µm). Retinal thickness was greater at nasal and lesser at temporal areas. (Table 2)

Foveal Thickness in Diabetes Mellitus subjects Male (260 µm) & Female (237 µm) while the average Retinal Thickness were in Male (312µm) & Female (295 µm). (Table 3).

Table 1: Compression between retinal thickness with Diabetic and Non-Diabetic patients

Thickness	Diabetes	Non-Diabetes
Foveal	249 ± 19µm	246 ± 16µm
Retinal	297 ± 21µm	315 ± 13µm

Table 2: Compression between Retinal Quadrant with Diabetic and Non-Diabetic patients

Region	Diabetes	Non-Diabetes
Nasal	310 ± 17µm	324 ± 14 µm
Temporal	291 ± 31µm	304 ± 14 µm
Superior	297 ± 20µm	316 ± 14µm
Inferior	292 ± 19µm	314 ± 13µm

Table 3: Compression between Retinal thickness with Male and Female

Thickness	Male	Female
Foveal	260 µm	237 µm
Quadrants	305.5 µm	282 µm

DISCUSSION

In this study, we examined retinal thickness in non-diabetic and type-2 diabetic individuals with no signs of DR using SD-OCT. Because diabetic retinopathy is a common complication of diabetes, early diagnosis and proper management can reduce the incidence of vision loss. The OCT studies have consistently demonstrated retinal structural changes and alterations in macular thickness in patients with diabetic retinopathy. However, it is still not clearly established whether changes in macular thickness exist in diabetic individuals without clinical DR. The new OCT devices are reliable tools for easy and repeatable evaluation of the retina because OCT evaluates retinal morphology. Diabetes in humans has been classified into two types: insulin-dependent diabetes mellitus and non-insulin-dependent diabetes mellitus, according to pathogenesis. Although these two types of diabetes differ in pathophysiology and prevalence, type-1 DM generally has an earlier onset and prolonged course, whereas type-2 DM occurs in slightly older individuals. In our research, we included only patients with type-2 DM.

We examined retinal thickness in normal and type-2 diabetic individuals without DR using SD-OCT and analyzed possible factors affecting retinal thickness. Previous studies noted significant differences in central foveal thickness between diabetic patients with and without DR. Our study provides an overall profile of retinal thickness in individuals with diabetes without clinically visible DR. We observed that retinal thickness was generally decreased in diabetes, particularly in the temporal (perifoveal) areas.

One report found that the fovea was significantly thinner in patients with longer disease duration but no or mild DR (14). Another study reported decreased thickness only at the inner plexiform layer (IPL) (15); however, the present study did not demonstrate these features. Another study claimed that subjects with no or mild DR had significantly thinner macular and foveal thickness with longer disease duration (16). Conversely, a few studies found no significant difference in foveal thickness between diabetic and non-diabetic individuals (17,18), which is consistent with our findings.

Two different studies reported significant differences in retinal thickness between diabetic and non-diabetic individuals. One study comparing macular thickness in controls (healthy eyes) and diabetic patients without DR demonstrated greater retinal thickness in males compared with females (19). Another study found greater retinal thickness in males than females among diabetic patients without DR using two different OCT devices (SD-OCT and Stratus OCT) (20). Our study also observed that central foveal and average retinal thickness in different quadrants were greater in males (260 μm and 305.5 μm) than in females (237 μm and 282 μm) in type-2 diabetic subjects without clinical DR using SD-OCT. The present study did not compare data between different OCT machines.

Studies have reported increased retinal thickness in the superior nasal quadrant of the macula in diabetic patients without DR (21). In the present study, we noted differences in retinal thickness across different quadrants in both groups. Retinal thickness in various sectors was significantly thinner in diabetic subjects without DR than in non-diabetic controls. We also found that retinal thickness was greater on the nasal side of the retina and less on the temporal side in both non-diabetic and diabetic subjects without DR. Compared with previous studies, our study included a larger number of subjects and sampled more retinal thickness points. Our inclusion of only eyes without retinopathy may explain the lack of thickness differences between these eyes and control eyes.

CONCLUSION

In conclusion, our study suggests that SD-OCT is capable of detecting subclinical changes in macular thickness in diabetic eyes with no or minimally visible DR when compared with non-diabetic control eyes. Future studies using OCT devices with higher resolution may be able to detect subtle differences in macular thickness in this subset of diabetic eyes.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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Original Article

DETERMINANTS OF SPECTRUM AND FETOMATERNAL OUTCOME OF MORBID ADHERENT PLACENTA: AN OBSERVATIONAL STUDY

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ABSTRACT:

The objective of the study was to determine the factors underlying maternal and fetal outcomes of Placenta Accreta Spectrum (PAS). This observational, prospective study was conducted during a period of four years. A total of 9080 patients were admitted in Obstetrics & Gynaecology department throughout this duration. Out of which 147 were diagnosed with the history of antepartum haemorrhage with pregnancy. Full term, near term patients or patients with massive antepartum haemorrhage underwent emergency or elective caesarean section while patients diagnosed in the second or early third trimester on ultrasound or with mild antepartum haemorrhage treated conservatively. In our study, we found that the frequency of Placenta Accreta Spectrum was 1.6%. The average age of the participants was 28.08 years, with age ranging between 17 to 42 years. Most participants lived in urban areas (46%), and a significant number were grand multiparous (70%). We observed that a history of previous caesarean section (62%) and previous placenta previa (68%) increased the risk of PAS. During surgery, the most common complication was bleeding (11.5%), followed by bladder injury (8.8%). The occurrence of PAS cases has significantly risen in the recent years. The PAS is linked with serious health risks for both the baby and the mother. It's crucial to implement strategies aimed at reducing the rate of caesarean sections to mitigate the associated complications, such as placenta previa and PAS, which pose significant risks to maternal and fetal health.

Keywords: Placenta accrete spectrum (PAS), Morbidity, Mortality, Fetal outcome.

INTRODUCTION

Placenta Accreta Spectrum disorder (PAS), also known as abnormally invasive placenta (AIP), presents a multifaceted clinical scenario wherein the placenta fails to detach spontaneously following delivery, leading to a heightened risk of severe haemorrhage if forcibly extracted(1,2). This global health concern exhibits an escalating incidence, attributable primarily to the increasing prevalence of caesarean deliveries, a key predisposing factor for PAS in subsequent pregnancies (3–9). PAS manifests along a spectrum of severity, delineated as placenta accreta (invasion <50% of the myometrium), increta (invasion >50% of the myometrium), and percreta (invasion through the serosa into adjacent pelvic organs). Notably, PAS poses substantial maternal morbidity and mortality risks, thereby emerging as one of the most perilous complications during pregnancy (10).

Enhanced maternal and neonatal outcomes are evident with pre-delivery PAS diagnosis, facilitating management by a multidisciplinary team equipped with specialized expertise in the condition (11,12). The depth of placental invasiveness serves as a crucial determinant of maternal outcomes (12). Therefore, accurate assessment of invasion extent at delivery, patient stratification based on this assessment, and meticulous correlation between prenatal imaging, intra-operative findings, and pathological assessments are pivotal for optimal PAS management and comprehensive comparative analysis across studies (13,14).

The primary objective of this study was to investigate the prevalence and factors associated with PAS disorder within our local population, while also evaluating maternal and fetal outcomes in detail, thereby contributing to a deeper understanding of this intricate obstetric challenge.

The rationale for this study lies in the increasing global incidence of PAS, coupled with its significant maternal morbidity and mortality risks. By investigating the frequency and factors of PAS within our local population, alongside assessing maternal and fetal outcomes, we aimed to contribute valuable insights into the management of this complex obstetric condition. Understanding the prevalence and impact of PAS will inform clinical practice,

facilitating timely diagnosis, multidisciplinary management, and ultimately improving outcomes for both mothers and new born.

METHODS

This was an observational, prospective study conducted during a period of four years (from 1st January 2017 to31st December 2023) at Liaquat University of Medical and Health Sciences hospital and a private sector Hospital in Hyderabad. A total 9080 patients were admitted in Obstetrics & Gynaecology department throughout this duration of those 147 were diagnosed by history of antepartum haemorrhage in pregnancy and confirmed by ultrasound for fetal wellbeing and placental localization or patients diagnosed with placenta previa (morbidly adherent) on ultrasound scan during the antenatal period without antepartum haemorrhage were enrolled in the study. After taking informed consent demographic data, maternal and fetal outcome of patients with Placenta Previa & Accreta Spectrum were recorded. Full term, near term patients or patients with massive antepartum haemorrhage underwent emergency or elective caesarean section while patients diagnosed in second or early third trimester on ultrasound or mild antepartum haemorrhage were treated conservatively. Patients with antepartum haemorrhage other than Placenta Previa & Accreta Spectrum were excluded from this study.

STATISTICAL ANALYSES

Data were analysed by using Statistical Package for Social Sciences software (SPSS) version 20. Data was presented as mean and standard deviation (±SD) for continuous variables while number and percentage presented for categorical variables. *Chi*-square test was used for hypothesis testing and a p-value of ≤0.05 was considered as significant.

RESULTS

In our study, the prevalence of placenta previa and Accreta spectrum disorder was 1.6%. The mean age of affected individuals was 28.08 years, ranging from 17 to 42 years, with a predominance of urban residency observed in 68 (46%) cases. The majority of the patients (88%) had low socioeconomic status, which is a direct factor in accessing care at the right time. Patients with 0 antenatal visits accounted for 29%, while those with 1 to 3 visits accounted for 59% (Table 1). A significant association was identified between placenta previa spectrum and grand multiparity, with 103 (70%) of the participants being grand multiparous. Furthermore, a history of previous caesarean section (92 cases, 62%) and previous placenta previa (100 cases, 68%) were significantly correlated with an increased risk of placenta previa spectrum ($p<0.001$) (Table 2). This finding underscores the importance of obstetric history in identifying individuals at heightened risk for PAS.

The most frequent intraoperative complication encountered was bleeding, occurring in 17 cases (11.5%), followed by bladder injury in 13 cases (8.8%). Additionally, 17 patients (11.5%) necessitated emergency obstetrical hysterectomy to manage severe haemorrhage (Table 3). These intraoperative challenges underscore the complexity and critical nature of managing PAS during delivery. Out of the 147 cases included in our study, 97.9% had uneventful recovery, while 3 individuals succumbed to massive haemorrhage despite receiving emergency surgical intervention and intensive care upon referral from suburban areas. Regarding fetal outcomes, 44 infants (41.1%) survived, with 35 (32.7%) born preterm and 17 (15.8%) stillborn. Additionally, 11 neonates (10.2%) experienced early neonatal death immediately following birth (Table 4).

Table 1. Demographic and Socioeconomic Characteristics of PAS Patients (n=147)

Characteristic	n	%
Urban residency	68	46
Low socioeconomic status	129	88
Antenatal visits = 0	43	29
Antenatal visits 1–3	87	59

Table 2. Obstetric History and Risk Factors for Placenta Previa Spectrum (n=147)

Risk Factor	n	%	*p*-value
Grand multiparity	103	70	—
Previous cesarean section	92	62	<0.001
Previous placenta previa	100	68	<0.001

Table 3. Intraoperative Complications in PAS Patients (n=147)

Complication	n	%
Bleeding	17	11.5

Table 4. Fetal Outcomes in PAS Patients (n=147)

Outcome	n	%
Survived infants	44	41.1

Bladder injury	13	8.8	Preterm birth	35	32.7
Emergency obstetrical hysterectomy	17	11.5	Stillborn	17	15.8
			Early neonatal death	11	10.2

DISCUSSION

The term placenta Accreta was first described in 1937 by Irving and Hertig as a histopathological term as the 'abnormal adherence of the afterbirth in whole or in parts to the underlying uterine wall in the partial or complete absence of decidua(14). The terms placenta accreta and morbidly adherent placenta have been recently substituted by the terms abnormal invasion of placenta or placenta accreta spectrum disorders to encompass cases of both myometrial invasion and invasion beyond the uterus. Globally, the prevalence of AIP has grown, primarily because of the increase in caesarean section rates, which have gone from 1 in 2500 to 1 in 500 births (15). The increased morbidity and mortality among mothers and fetus make the disorder significant. Iatrogenic prematurity is the primary cause of the implications for the fetus, but the increased risk of obstetric haemorrhage and surgical complications mostly affects the mother. A blood transfusion is necessary for up to 90% of patients, with an average blood loss of 3000–5000 mL(16). Hysterectomy and injuries to the ureters, bladder, and colon are examples of surgical complications. Longer hospital stays and a greater frequency of admissions to intensive care units are the outcomes of this. Furthermore, there is an increased prevalence of psychological disorders and post-traumatic stress disorder (PTSD).

According to our study, placenta previa associated morbidly adherent placenta was found to be independently linked to a higher risk of severe maternal and fetal morbidities and mortalities including surgical morbidities, longer hospital stay, higher inpatient costs, and a higher use of surgical procedures (such as hysterectomy, cesarean delivery, cystoscopy, urinary system repair and bowel repair) bleeding, transfusion of blood products, iatrogenic fetal prematurity and its consequences. Placenta previa has also been linked to a markedly increased risk of blood product transfusion, shock, disseminated intravascular coagulation or other coagulopathy, urinary tract damage, and peripartum hemorrhage. A higher risk of bleeding persisted among patients with PAS and placenta previa. Fitzpatrick KE, Sellers S, Spark P, et al and HudonL,et al found the same results (17,18) . Placenta praevia and previous caesarean section are the two most recognized risk factors for AIP A recent systematic review by Marshall NE et al reported an increase in the incidence of abnormally invasive placenta from 3.3%–4% in women with placenta praevia and no previous caesarean section to 50%–67% in women with three or more previous caesarean deliveries(18). Pregnant patients with both PAS and placenta previa complications may have a compounded risk of maternal morbidities and worse outcomes than patients with PAS but not placenta previa, as both conditions are independently linked to significant morbidity and mortality (19-23). According to a research by Mulla et al. comprising 105 PAS patients, the median estimated perinatal blood loss volume was significantly larger in those with concurrent placenta previa than in those without it (3500 mL versus. 1200 mL; $P < .001$) (24). Additionally, Heading et al. discovered that, out of 134 PAS patients, those who had placenta previa had significantly larger estimated blood loss volumes (25).

Fetal outcome in our study was 44(41.1%) remained alive, 35 preterm (32.7 %) and 17 (15.8%) stillborn, while 11(10.2%) died just after birth (early neonatal death ENND).The findings of this investigation offer more evidence that, among patients with PAS, placenta previa is a significant risk factor linked to a higher probability of unfavorable maternal outcomes. Placenta previa may be regarded as an independent risk factor linked to a higher chance of poorer maternal outcomes among patients with PAS, in addition to being a risk factor and screening indicator for the condition. To enhance the results for patients with placenta previa-complicated PAS, routine Antenatal care, special Doppler ultrasound and magnetic resonance imaging MRI for localization &morbid adherence of placenta may need to be evaluated or improved. Our findings underscore the critical importance of comprehensive antenatal care and advanced imaging modalities in the management of placenta previa-complicated placenta accreta spectrum disorders (PAS). Healthcare providers should prioritize early detection and intervention to mitigate the heightened risks of maternal and fetal morbidity and mortality associated with this condition. Integrating Doppler ultrasound and magnetic resonance imaging (MRI) into routine protocols can enhance diagnostic accuracy and guide treatment decisions, ultimately improving outcomes for affected patients. Strategies aimed at minimizing surgical interventions, optimizing blood management, and addressing psychological well-being are essential to enhancing maternal health in PAS cases. While our study contributes

valuable insights into the implications of placenta previa complicating PAS, several limitations warrant consideration. The retrospective design of our investigation may have introduced biases and confounding variables, potentially impacting the validity of our results. Additionally, the study's sample size may have been insufficient to detect rare outcomes or subtle differences, limiting the generalizability of findings to broader populations. Future research endeavors should aim to address these limitations and further elucidate strategies for optimizing outcomes in this complex and high-risk obstetric condition.

CONCLUSION

The incidence of placenta accreta spectrum has significantly risen in recent years, a trend expected to persist due to increased rates of caesarean section deliveries and assisted reproductive technologies. PAS poses significant risks to both maternal and fetal health, with high morbidity and mortality rates. Measures are needed to decrease caesarean section rates and mitigate associated complications such as placenta previa and PAS. Prenatal diagnosis plays a crucial role in improving outcomes for both mother and fetus. With advancements in ultrasound technology and increasing expertise among physicians, ultrasound has become as effective as MRI in diagnosing anterior placental invasion, particularly as PAS reoccurrences rise.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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Original Article

CYRIAX MANIPULATION VERSUS MULLIGAN's MOBILIZATION IN SUBACROMIAL PAIN SYNDROME

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ABSTRACT:

The study aimed to compare the effectiveness of chiropractic manipulation and Mulligan's mobilization in reducing pain, improving range of motion, and enhancing functional outcomes in individuals with subacromial pain syndrome. This was a randomized controlled trial (RCT) at DHQ Jhelum, CMH Jhelum, and Jhelum Sports Complex, Pakistan. A total of 62 participants with subacromial pain syndrome were randomly assigned to a chiropractic manipulation group (n = 31) or a Mulligan's mobilization with movement (MWM) group (n = 31). Both groups received their respective interventions over a set treatment period. Pain intensity (VAS), functional disability (SPADI), and shoulder range of motion (flexion, extension, abduction, internal and external rotation) were measured pre- and post-intervention. The mean age was 46.71 ± 8.30 years in the chiropractic group and 47.03 ± 7.74 years in the MWM group. Baseline VAS scores were 7.58 ± 1.12 and 7.32 ± 1.14, decreasing post-intervention to 2.45 ± 1.34 and 4.32 ± 1.33, respectively. SPADI scores improved from 63.93 ± 6.24 to 32.97 ± 6.67 in the chiropractic group and from 62.74 ± 5.62 to 42.58 ± 5.46 in the MWM group. Flexion, extension, abduction, internal rotation, and external rotation ROM all increased in both groups, with chiropractic improving from 117.42°, 38.70°, 94.21°, 37.65°, and 52.11° to 155.32°, 47.64°, 126.68°, 50.75°, and 69.13°, and MWM from 118.10°, 38.36°, 95.82°, 37.23°, and 52.74° to 145.56°, 44.91°, 118.34°, 46.12°, and 65.70°, respectively. Both chiropractic manipulation and Mulligan's mobilization with movement effectively reduced pain, improved range of motion, and enhanced function in individuals with subacromial pain syndrome. Chiropractic manipulation consistently produced superior outcomes across all parameters, likely due to combined biomechanical and neuro-physiological effects.

Keywords: Chiropractic manipulation, Manual therapy, Mulligan's mobilization with movement, Range of motion, SPADI, Subacromial pain syndrome, Shoulder pain, VAS.

INTRODUCTION

The subacromial pain syndrome (SAPS) is a common musculoskeletal condition, characterized by shoulder pain and functional limitations. It is basically brought on by irritation or mechanical compression of the biceps tendon, subacromial bursa, or rotator cuff ligaments inside the subacromial space (1). Individuals who perform monotonous overhead tasks, such as competitors and manual laborers, as well as those who have postural variations from the norm or age-related degenerative changes, are frequently influenced by this condition. The clinical presentation regularly incorporates localized pain within the anterolateral shoulder, exacerbated by arm elevation or abduction, together with a characteristic excruciating circular segment between 60 and 120 degrees (2). Night pain and weakness during functional movements are also common complaints, essentially affecting day by day activities and quality of life. Subacromial pain syndrome patients don't have a recognized diagnostic criteria or wording (SAPS)(3). The etiology of SAPS involves both intrinsic and extrinsic factors that contribute to the narrowing of the subacromial space and subsequent tissue irritation (4). Intrinsic factors include rotator cuff tendinopathy, degenerative changes in the tendon structure, and reduced vascular supply to the supraspinatus tendon, particularly in the critical zone of hypovascularity (5). Extrinsic factors encompass structural variations such as a hooked or curved acromion, osteophyte formation, and thickening of the coracoacromial ligament, all of which may mechanically impinge on the underlying soft tissues (6). Additionally, dynamic factors like scapular dyskinesis, characterized by altered scapulohumeral rhythm, and muscle imbalances around the shoulder girdle further exacerbate subacromial compression (7). Considering the global prevalence of SAPS, Adam Witten et al conducted a study in 2025 from Denmark and found that 29% had conflicting diagnoses, most often frozen shoulder, while 71% were diagnosed with SAPS. Among those with SAPS, 42% had at least one concomitant diagnosis and 13% had multiple, with acromioclavicular osteoarthritis and full-thickness rotator cuff tears being most common (8). Considering the

prevalence of shoulder pain among overhead-throwing athletes in Pakistan, Kabeer Afsar et al conducted a study in 2022 and found that 36.7% reported mild pain, 12% reported moderate pain, and 2% of participants reported severe pain (9). In differentiate, Mulligans MWM utilizes maintained adornment floats combined with dynamic active development to rectify positional deficiencies and reestablish pain-free function (10). Chiropractic manipulation for SAPS is grounded in the principle that spinal and extremity joint dysfunctions contribute to aberrant shoulder kinematics and increased subacromial loading. By applying focused HVLA thrusts to the cervicothoracic spine, ribs, or glenohumeral joint, clinicians look for to reestablish normal joint play and reduce mechanical strain on the rotator cuff ligaments (11). The immediate effects of manipulation are thought to stem from neurophysiological mechanisms, including the stimulation of joint mechanoreceptors, which modulate pain perception at the spinal cord level, and the reflexive inhibition of hypertonic muscles surrounding the shoulder (12). Moreover, manipulation may improve proprioceptive input, leading to enhanced motor control and scapular stability during arm movements (13). The previous depends on passive, clinician-delivered thrusts, whereas the last mentioned incorporates active patient movement, which may enhance engagement and motor learning. Both techniques, however, share the common objective of decreasing pain and improving function through biomechanical and neurophysiological mechanisms (14). Subacromial pain syndrome (SAPS) is a prevalent cause of shoulder pain and functional limitation, often managed with manual therapy. Chiropractic manipulation and Mulligan's mobilization are widely used techniques, but direct comparative evidence in SAPS is scarce. Evaluating their relative effectiveness can help determine the most efficient approach for pain reduction and mobility restoration. This study's findings can guide clinicians in making evidence-based choices to optimize outcomes in SAPS management. The objective of this study is to compare the effectiveness of chiropractic manipulation and Mulligan's mobilization in reducing pain, improving range of motion, and enhancing functional outcomes in individuals with subacromial pain syndrome.

METHODS

This randomized controlled trial was conducted in various hospitals, sports complexes and clinics in Jhelum, Pakistan, over a period of six weeks, beginning from the approval date of the research proposal. The study aimed to assess the effectiveness of the comparison between Cyriax manipulation with Mulligan's mobilization in patients with subacromial pain syndrome. The sample consisted of 62 participants, including both male and female patients aged between 35 to 65 years, all of whom were suffering from shoulder impingement syndrome. The sample was selected using non-probability convenience sampling from the sports complex and participating hospitals. The inclusion criteria required participants to have a confirmed history of subacromial pain syndrome, BMI of 18.5 to 24.9 kg/m², shoulder pain >3 months, a minimum of two of four positive tests (Painful arc, Hawkins impingement test, Neer's sign, Yocum test), and minimal to no limitation of passive shoulder range of motion. Glenohumeral instability, full rotator cuff tear, rheumatoid arthritis or osteoarthritis, bilateral shoulder pain, a history of shoulder surgery (i.e., rotator cuff repair, total shoulder replacement, and arthroscopy in the last 4 months), alcohol or substance abuse, subjects with a history of shoulder corticosteroid injections, and patients with systemic pathologies that might interfere with the application of interventions (e.g., heart problems that would prevent assuming a prone position required for Maitland mobilization) were excluded.

After taking consent, participants were selected based on the inclusion criteria. Participants were then randomly divided into two groups. Group A was given Cyriax manipulation with exercises and group B was given Mulligan's mobilization with same baseline exercise. Treatment was given for 6 weeks 2 sessions/ week. The study was single-blinded. The assessor was unaware of the treatment given to both groups. For routine physical therapy, application of cold packs for 10–15 minutes covering the shoulder area, along with soft tissue mobilization around the shoulder joint for 5–7 minutes, was performed. General stretches of biceps, triceps, rhomboids, and scapular muscles, held for 7–10 seconds with 5 repetitions, along with range of motion exercises (shoulder elevation and depression, scapular protraction and retraction, shoulder internal rotation and external rotation, shoulder abduction and adduction, shoulder flexion and extension), 8–10 repetitions were performed. After every exercise, there was a 10–20 seconds rest interval. A home plan of ROM and stretching exercises was advised for off-session days: 8–10 repetitions with 1 set, twice daily.

Strengthening exercises including wall push-ups, prone push-ups, punch exercises, and punch exercises with dumbbells in supine were also added to the above routine physical therapy exercises. Participants in Group A received Cyriax manipulation with the same baseline exercise program. Participants were advised to rest for a minimum of 10 minutes, after which routine physical therapy was performed. After routine physical therapy along

with strengthening exercises, Cyriax manipulation was given. For that, participants were allowed to sit on a chair with back supported, then participants were instructed to flex their elbow and bring their hand to the neck such that the web of the hand surrounds the neck posteriorly. High velocity, low intensity (HVLA) manipulation was given by the therapist; as a result, a popping sound was heard. Pain assessment through Shoulder Pain And Disability Index (SPADI) was measured. ROM of participants was also measured before starting the above plan. The second assessment was conducted at the end of the study.

Participants in Group B received Mulligan's posterolateral glide with the same baseline exercise program. Participants were advised to rest for a minimum of 10 minutes, after which routine physical therapy was performed. After routine physical therapy along with strengthening exercises, Mulligan's posterolateral glide was given. For posterolateral glide, participants were in sitting position with back straight and supported by a chair. The therapist stood on the contralateral side, stabilizing the scapula with one hand and translating the humeral head posteriorly and laterally from the other hand along the plane of the glenoid fossa. While the glide was sustained, participants actively elevated the arm through the plane of abduction. Three sets with 10 repetitions were performed. Pain assessment through SPADI was measured. ROM of participants was also measured before starting the above plan. The second assessment was conducted at the end of the study.

STATISTICAL ANALYSES

The data were entered and analyzed using SPSS Version 26. The numerical data were presented as mean ± SD. Categorical data were presented in the form of frequency (percentage) and tested for normality using the Shapiro–Wilk method. Since the data were non-normal, non-parametric tests, the Mann–Whitney U test and the Wilcoxon test, were used for between-group and within-group comparisons; a p-value < 0.05 was considered significant.

RESULTS

The mean age was 46.71 ± 8.30 years in the chiropractic group and 47.03 ± 7.74 years in the MWM group. Baseline VAS scores were 7.58 ± 1.12 and 7.32 ± 1.14, decreasing post-intervention to 2.45 ± 1.34 and 4.32 ± 1.33, respectively. SPADI scores improved from 63.93 ± 6.24 to 32.97 ± 6.67 in the chiropractic group and from 62.74 ± 5.62 to 42.58 ± 5.46 in the MWM group. Flexion, extension, abduction, internal rotation, and external rotation ROM all increased in both groups, with chiropractic improving from 117.42°, 38.70°, 94.21°, 37.65°, and 52.11° to 155.32°, 47.64°, 126.68°, 50.75°, and 69.13°, and MWM from 118.10°, 38.36°, 95.82°, 37.23°, and 52.74° to 145.56°, 44.91°, 118.34°, 46.12°, and 65.70°, respectively.

Table 1. Descriptive statistics of VAS score pre-treatment of subjects

VAS score pre treatment	
Group	**Mean ± SD**
Chiropractic group	7.58 ± 1.12
MWM group	7.32 ± 1.14

Table 2. Descriptive statistics of VAS score post-treatment of subjects

VAS score post treatment	
Group	**Mean ± SD**
Chiropractic group	2.45 ± 1.34
MWM group	4.32 ± 1.33

Table 3. Descriptive statistics of SPADI score pre-treatment of subjects

SPADI score pre treatment	
Group	**Mean ± SD**
Chiropractic group	63.93 ± 6.24
MWM group	62.74 ± 5.62

Table 4. Descriptive statistics of SPADI score post treatment of subjects

SPADI score post treatment	
Group	**Mean ± SD**
Chiropractic group	32.97 ± 6.67
MWM group	42.58 ± 5.46

Before treatment, VAS scores were similar between the chiropractic group (7.58 ± 1.12) and the MWM group (7.32 ± 1.14), indicating comparable baseline pain intensity in both groups (Table 1, Figure 1).

After treatment, VAS scores were lower in the chiropractic group (2.45 ± 1.34) compared to the MWM group (4.32 ± 1.33), indicating that chiropractic intervention led to a greater reduction in pain intensity (Table 2, Figure 2). Before treatment, SPADI scores were similar between the chiropractic group (63.93 ± 6.24) and the MWM group (62.74 ± 5.62), indicating no meaningful difference in baseline shoulder pain and disability between the two groups (Table 3, Figure 3).After treatment, the SPADI score was lower in the chiropractic group (32.97 ± 6.67) compared to the MWM group (42.58 ± 5.46), indicating that chiropractic intervention resulted in a greater reduction in shoulder pain and disability (Table 4, Figure 4).

Figure 1. Chart showing VAS pre-treatment score of subjects

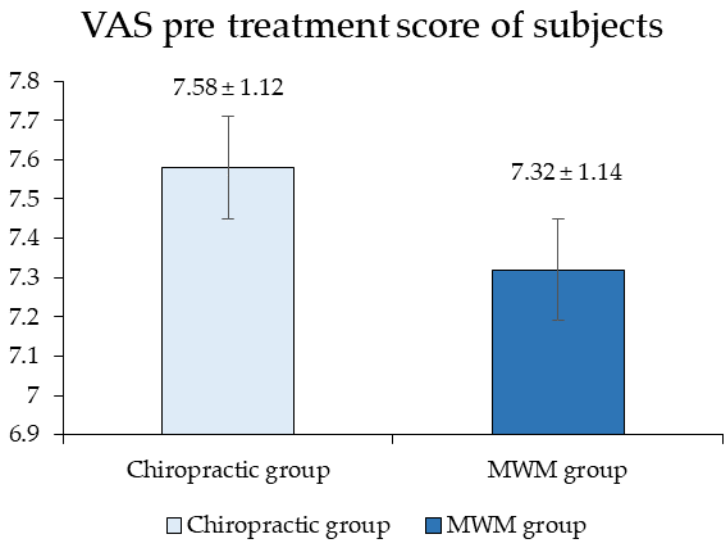


Figure.2 Chart showing VAS post-treatment score of subjects

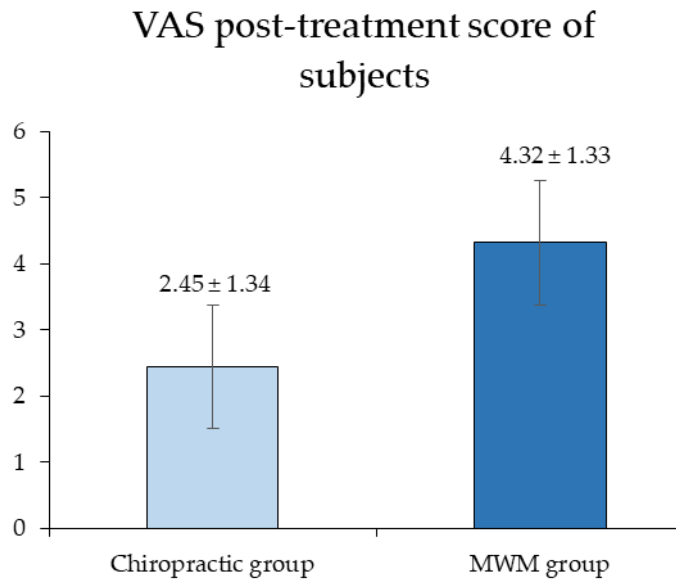


Figure 3. Chart showing SPADI pre-treatment score of subjects

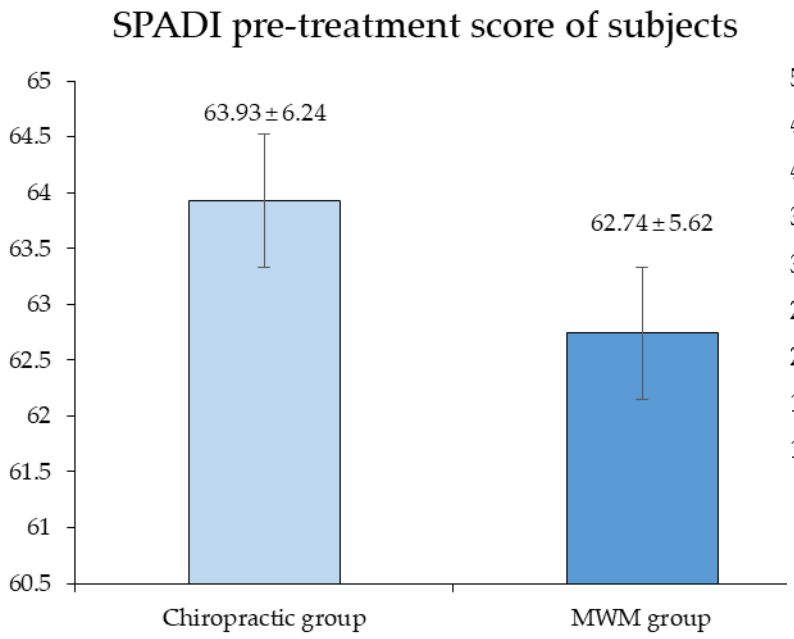
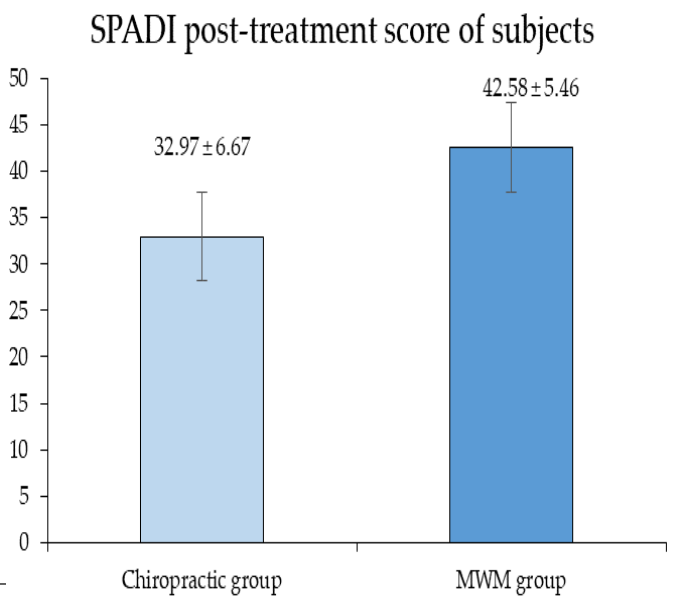


Figure 4. Chart showing SPADI post treatment of subjects



Based on the Shapiro-Wilk test, SPADI score, Abduction ROM, and External Rotation ROM showed normal distribution ($p > 0.05$), so parametric tests such as t-tests are appropriate. In contrast, VAS score, Flexion ROM, Extension ROM, and Internal Rotation ROM were not normally distributed ($p < 0.05$), hence non-parametric alternatives such as Mann–Whitney U test and Wilcoxon signed-rank test should be used for their analysis (Table 5).

At baseline, there was no significant difference in SPADI scores between the chiropractic and MWM groups ($p = 0.432$), indicating comparable levels of shoulder disability before treatment. After the intervention, however, a highly significant difference was found ($p < 0.01$), with the MWM group demonstrating a higher post-intervention mean score than the chiropractic group. This suggests that the MWM intervention was more effective in improving functional outcomes (SPADI scores) compared to chiropractic treatment (Table 6).

Table.5 Test for Normality

Tests of Normality		
	Group of subjects	Shapiro-Wilk
		Sig.
VAS score at baseline	MWM group	<0.001
SPADI score at baseline	MWM group	0.146
Flexion ROM at baseline	MWM group	0.050
Extension ROM at baseline	MWM group	0.026
Abduction ROM at baseline	MWM group	0.251
Internal Rotation ROM at baseline	MWM group	0.027
External rotation ROM at baseline	MWM group	0.068

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 6. Independent T-test of Pre- and Post-Intervention SPADI Scores Between Chiropractic and MWM Groups

Group Statistics					
	Group of subjects	**n**	**Mean**	**SD**	***P* value**
SPADI score at baseline	chiropractic group	31	63.9355	6.24465	0.432
	MWM group	31	62.7419	5.61526	
SPADI score after intervention	chiropractic group	31	32.9677	6.67075	<0.01
	MWM group	31	42.5806	5.45756	

Table 7. Wilcoxon test of Pre- and Post-Intervention VAS score Between Chiropractic and MWM Groups

Descriptive Statistics				
	VAS score at baseline	VAS score after intervention	Z	*P* value
Chiropractic group	7.58 ± 1.12	2.45 ± 1.34	-4.941	<0.01
MWM group	7.32 ± 1.14	4.32 ± 1.32		

The descriptive statistics reveal that the Chiropractic group showed a significant reduction in VAS scores, decreasing from 7.58 ± 1.12 at baseline to 2.45 ± 1.34 after the intervention, with a Z-value of -4.941 and a p-value less than 0.01, indicating a statistically significant decrease in pain. The MWM group also demonstrated a decrease in VAS scores from 7.32 ± 1.14 to 4.32 ± 1.32, but no statistical test results are provided here to confirm the significance of this change. Overall, the Chiropractic group experienced a more pronounced and statistically confirmed reduction in pain compared to the MWM group (Table 7).

Table.8 Paired *t*-test of Pre- and Post-Intervention SPADI score Between Chiropractic and MWM Groups

Paired Samples Statistics				
	Mean	n	Std. Deviation	*P* value
SPADI score at baseline	63.3387	62	5.92008	<0.01
SPADI score after intervention	37.7742	62	7.74685	

The paired samples statistics show a significant reduction in SPADI scores from baseline (Mean = 63.34) to after intervention (Mean = 37.77), with $p < 0.01$. This indicates that, overall, the intervention led to a statistically significant improvement in shoulder function and disability levels across the participants (Table 8).

DISCUSSION

The current study shows that both chiropractic manipulation and Mulligan's mobilization with movement (MWM) can reduce pain, increase shoulder range of motion (ROM), and improve functional outcomes in people with subacromial pain syndrome (SAPS). However, chiropractic manipulation presented greater improvements across all measures including pain intensity, functional disability, and active ROM. This study's findings corroborate literature demonstrating the clinical benefit of spinal manipulation for the treatment of SAPS and adds new evidence as it directly compared spinal manipulation and MWM. The better results in the chiropractic manipulation group are also comparable to previous reports that highlighted the positive outcomes of HVLA (high-velocity low-amplitude). Haider et al. (2018) and Bukhari et al. (2023) have reported that the addition of thoracic spinal manipulation added to exercise therapy resulted in greater pain and disability reductions and greater gains in ROM, especially abduction and internal rotation, than exercise therapy alone (15, 16). The trend of our study appeared consistent and the most significant difference in flexion, abduction, and rotational movements took place with chiropractic adjustment. These improvements can be explained by the mechanical restoration of optimal arthrokinematics, decreasing periarticular soft tissue tone/problematic tension, and better-than-usual neuromuscular activation patterns; all proposed physiological effects of HVLA manipulation. Our findings are also consistent with Dunning et al.'s (2020) study which found cervicothoracic thrust manipulations with electrical dry needling had statistically significantly greater improvements in pain, disability, and even medication reduction when compared to nonthrust mobilization and exercise (17). This reinforces the notion that HVLA techniques may possess a greater hypoalgesic effect, possibly via a neurophysiological mechanism including modulation of nociceptive input, decreased central sensitization, and recruitment of descending inhibition. These likely interact with the biomechanical correction to generate clinically meaningful effects. In a similar study, Grimes et al. (2019) found that Thoracic spine thrust manipulation (TSTM) had a successful effect on pain, function, scapular upward rotation, pectoralis minor length, scapulothoracic force, and thoracic spine range of motion (particularly flexion, extension, and bilateral rotation) (18). These results corroborate the findings of the present study, which concluded that chiropractic thrust mobilization substantially enhances pain reduction, decreases disability, and improves shoulder range of motion. The ROM improvements seen in our chiropractic group were more substantial and more widespread than those reported by Silva et al. (2019), who found only abduction exceeded the minimal detectable change after thoracic spinal manipulation (19). This discrepancy could be attributed to differences in treatment dosage, patient characteristics, or methods. Perhaps our process led to a repeated experience of HVLA manipulation and MWM that was combined with progressive mobilization to produce a greater carryover effect on shoulder kinematics and functional performance. Finally, the current results should be considered in the context of planning rehabilitation protocols for SAPS. While both chiropractic manipulation and MWM were found to be effective, given the larger effect of chiropractic manipulation the results may suggest more justification for use in

clinical practice, particularly in patients with significantly restricted ROM or presenting with higher levels of baseline pain. MWM is still a great option and is especially useful when manipulation is contraindicated, or when a patient prefers a more progressive lower-velocity mobilization. All in all, this study supports the clinical utility of chiropractic HVLA manipulation as a very effective intervention in patients with SAPS and adds comparative evidence that it may provide greater benefit than MWM for pain relief, functional improvement, and restoration of ROM. These findings support the vast body of literature on manipulation and reconcile differences in the literature by demonstrating that differences between types of manual therapy, such as HVLA manipulation and MWM, can be substantial if compared directly.

CONCLUSION

Both chiropractic manipulation and Mulligan's mobilization with movement effectively reduced pain, improved range of motion, and enhanced function in individuals with subacromial pain syndrome. Chiropractic manipulation consistently produced superior outcomes across all parameters, likely due to combined biomechanical and neurophysiological effects. Further studies are needed to confirm long-term benefits and optimize patient selection.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

The study was approved by local research ethics committee.

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Case Report

ACUTE NECROTISING PANCREATITIS IN A PEDIATRIC PATIENT WITH PSEUDOCYSTS AND PORTAL VEIN THROMBOSIS: A RARE CASE REPORT

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ABSTRACT:

Acute necrotising pancreatitis (ANP) is a severe and rare form of acute pancreatitis (AP) in children. It can present with complications like pancreatic pseudocysts and vascular thrombosis which significantly increase chances of morbidity in patients and require a comprehensive diagnostic and therapeutic approach. We report the case of a 3-year-old male presenting with abdominal pain, vomiting and fever. Radiological imaging revealed findings consistent with acute on chronic necrotizing pancreatitis complicated by multiple intra- and peripancreatic pseudocysts with partial portal vein thrombosis. The patient was conservatively managed with intravenous fluids, antibiotics, anticoagulation and nutritional support. This case highlights the significance of considering severe pancreatic pathology in pediatric patients who present with non-specific abdominal complaints and emphasises the critical role of imaging and multidisciplinary care in improving clinical outcomes.

Keywords: Pediatric pancreatitis, necrotising pancreatitis, ANP, pseudocyst, portal vein thrombosis, abdominal pain

INTRODUCTION

Paediatric acute pancreatitis has become increasingly recognised over recent decades with reported incidence ranging from 3.6 to 13.2 per 100,000 children annually (1). While the majority of these cases are mild and self-limiting, a small subset does progress to necrotising pancreatitis which accounts for approximately 10% of pediatric AP. It is associated with significantly increased morbidity due to complications such as peripancreatic fluid collections, pseudocyst formation and vascular involvement (2). ANP results from the autodigestion of the pancreas secondary to inappropriate activation of zymogens. This phenomenon leads to tissue necrosis, systemic inflammation and multi-organ involvement (3). It The aetiology differs from that in adults, where alcohol and gallstones are predominant triggers, whereas the causes in children include trauma, medications, metabolic derangements, infections and inherited or structural pancreatic disorders (4). The diagnosis in pediatric populations is often delayed due to non-specific symptoms and atypical presentations, thus making imaging and enzyme markers critical to diagnosis and staging.

Case Report

A 3-year-old male, weighing 9 kg, was admitted with the complaints of a 5-day history of abdominal pain and vomiting, and 3 days of fever. The child appeared irritable but alert on presentation, and his vitals were stable. Anthropometric parameters demonstrated significant growth delay in the patient with weight, height, and head circumference all below the 5th percentile. His physical examination was unremarkable, except the abdominal examination revealed generalised tenderness which limited deep palpation. No organomegaly or visible vascular signs were noted, and bowel sounds were present.

Laboratory investigations revealed anaemia (Hb 9.5 g/dL), microcytic indices and leukocytosis with neutrophilia. The patient's platelet count was markedly elevated at 839,000 / mm^3. Serum pancreatic enzymes were significantly elevated with amylase at 307 U/L and lipase at 582 U/L, exceeding three times the upper limit of normal, and thus confirming acute pancreatitis (5). Mild hypoalbuminemia (3.7 g/dL) and raised LDH (515 U/L) were also noted. Imaging also revealed peripancreatic fluid collections and thrombus within the portal vein (as shown in Figure 1 and Figure 2 respectively).

Abdominal ultrasound revealed a swollen pancreas with heterogeneous echotexture and ductal dilatation. Two pockets of acute necrotic collection were seen; one posterior to the pancreatic head measuring 2.0 × 1.6 cm and another anterior to the tail measuring 4.7 × 3.5 cm. Contrast-enhanced CT abdomen confirmed acute on chronic

necrotising pancreatitis with multiple intra- and peripancreatic pseudocysts along with partial thrombosis of the portal vein (6).

In response to the identified thrombus, anticoagulation therapy was started promptly with enoxaparin (1 mg/kg/dose SC every 12 hours) and later transitioned to oral rivaroxaban (2.5 mg once daily for 2 months). Supportive management, which included bowel rest, intravenous (IV) fluids (0.45% dextrose-saline), analgesics, antiemetics, and intravenous antibiotics consisting of meropenem and vancomycin, was continued. Omeprazole was used for acid suppression and paracetamol was given for fever.

Doppler ultrasonography later revealed normalised portal vein flow with no residual thrombus. Gastroenterology and surgical teams advised deferral of MRCP until clinical stabilisation of the patient. Follow-up was planned with interval imaging and outpatient reassessment.

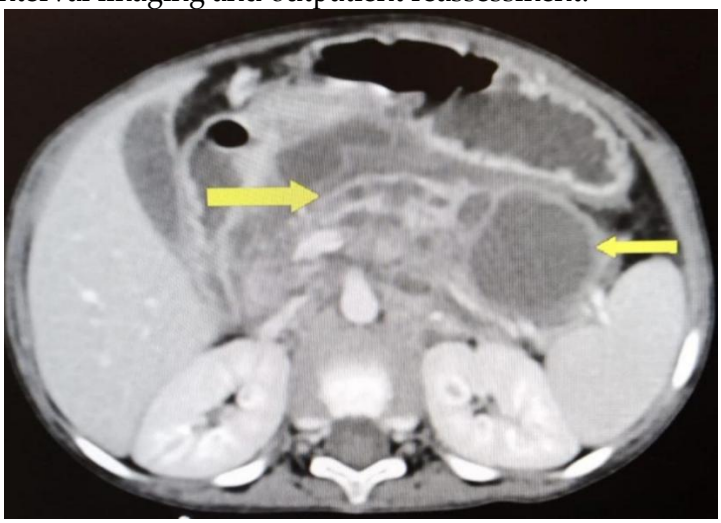

Figure 1. Axial contrast-enhanced CT scan showing peripancreatic fluid collections surrounding the pancreas, consistent with acute necrotizing pancreatitis

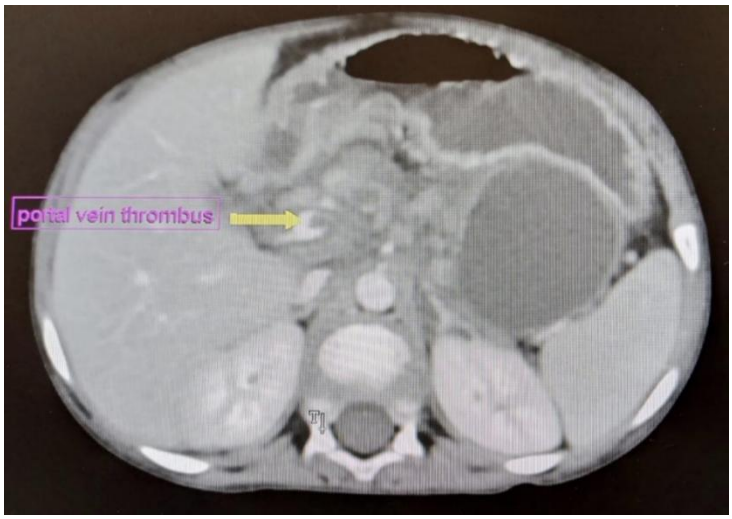

Figure 2. CT image demonstrating partial thrombosis of the portal vein, a vascular complication secondary to peripancreatic inflammation

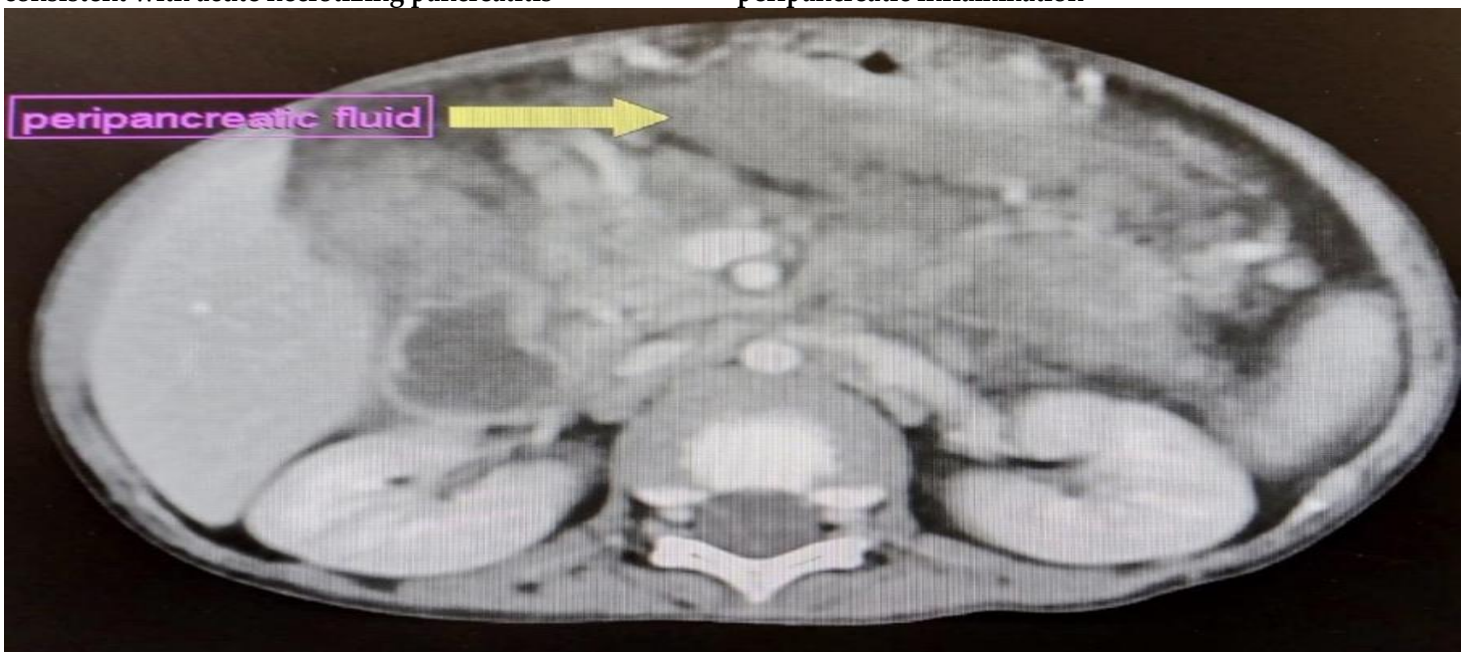

Figure 3. CT scan showing well-defined intra- and peripancreatic fluid collections consistent with pseudocysts, representing sequelae of prior inflammatory episodes in chronic pancreatitis

DISCUSSION

Although acute pancreatitis in children is often self-limited, severe forms such as ANP require increased vigilance. Necrosis most frequently involves both pancreatic and peripancreatic tissues while carrying a high risk for complications including vascular thrombosis and secondary infection. In our patient, the presence of pseudocysts indicated prior episodes of inflammation, while portal vein thrombosis suggested extension of peripancreatic inflammation to vascular structures. These findings were visualised on CT imaging (Figure 3). Pseudocysts

generally develop over weeks and are defined by a fibrous capsule enclosing enzymatic fluid, in contrast to acute necrotic collections which appear earlier and contain both fluid and necrotic debris.

While serum amylase and lipase remain central to diagnosis. Imaging especially contrast-enhanced CT is the gold standard for evaluating extent of necrosis, pseudocyst development and vascular complications (7). Although common, portal vein thrombosis has been reported in paediatric ANP and timely anticoagulation is essential to prevent propagation or portal hypertension (8). Our patient showed successful recanalization on follow-up Doppler, hence highlighting the efficacy of early intervention in such cases. Current guidelines reserve antibiotic use for proven infections but in our case, antibiotics had to be administered empirically due to suspicion of infected necrosis (9).

Nutritional support, preferably via enteral feeding, is highly essential in recovery and reduces the risk of complications. Early refeeding has been associated with shorter hospital stays and improved outcomes once vomiting resolves. Endoscopic or surgical drainage may be required for persistent or symptomatic pseudocysts unresponsive to conservative management (10). Long-term follow-up for the patient is much needed to monitor for recurrence, chronic pancreatitis or exocrine and endocrine insufficiency.

CONCLUSION

This case highlights the diagnostic and therapeutic challenges posed by necrotising pancreatitis in children. Complications such as pseudocyst formation and vascular thrombosis can occur even in the absence of classic predisposing factors. Early recognition, advanced imaging, multidisciplinary coordination, and tailored anticoagulation are critical for favourable outcomes. Even rare, paediatric pancreatitis should be considered in all patients in the differential diagnosis of persistent abdominal pain with elevated pancreatic enzymes.

Conflict of Interest

Authors declare no conflict of interest.

Ethical consideration

Informed consent of the patient was taken, and imaging was obtained from the patient's legal guardian. This case report was reviewed and approved by the institutional ethics committee.

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