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OP-001: From Scarcity to Safety: The Landscape of Platelet Transfusion in Pakistan

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Background: Platelet transfusion plays a pivotal role in the management of bleeding disorders, hematologic malignancies, and thrombocytopenic conditions. In low- and middle-income countries like Pakistan, the landscape of platelet transfusion is shaped by challenges of availability, safety, standardization, and awareness. Transitioning from reactive, scarcity-driven practices toward structured, safety-oriented transfusion systems remains a national priority.

Objective: To evaluate the current status, challenges, and evolving practices of platelet transfusion in Pakistan, and to highlight strategies aimed at improving safety, rational utilization, and sustainability.

Methodology: This review draws upon data from tertiary care centers, blood banks, and national transfusion reports, alongside published literature and institutional experiences. Key indicators such as donor availability, component preparation practices, quality control measures, and clinician awareness were analyzed to assess progress and gaps.

Results: Findings indicate a gradual but uneven shift from whole blood–based transfusions to component therapy. Major challenges include inconsistent platelet product availability, limited apheresis facilities, inadequate donor screening, and variable adherence to transfusion guidelines. Encouragingly, several centers have initiated hemovigilance programs, implemented pathogen-reduction technologies, and promoted rational use through education and policy reforms.

Conclusion: Pakistan's platelet transfusion landscape is undergoing transformation, from scarcity and reactive practices toward structured, evidence-based, and safer systems. Continued investment in infrastructure, training, national policy alignment, and public awareness is essential to ensure equitable and safe platelet support for all patients in need.

OP-002: Haemovigilance and Beyond

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Blood transfusion is a vital therapeutic intervention supported by a complex pathway that includes donor recruitment, blood collection, processing, testing, storage, distribution and clinical administration. At every stage, adverse events may occur, affecting donors, recipients or the blood products themselves. These events include reactions, errors, near misses, deviations from standard procedures and accidents. Systematic identification, reporting and analysis of such occurrences provide opportunities to strengthen safety, quality and efficiency across the transfusion chain.

Haemovigilance refers to the comprehensive surveillance system of the entire transfusion chain that monitors and evaluates adverse events associated with blood donation, processing of blood and its components and transfusion, and impart necessary corrective and preventive action to prevent occurences and recurrences. Established in the mid-1990s in response to concerns regarding transfusion-transmitted viral infections, haemovigilance has played a significant role in reducing transfusion-related risks and has contributed to the development of improved standards, policies and clinical practices. The scope of haemovigilance has further broadened in recent years to incorporate donor safety, emphasizing the commitment to protecting both blood donors and patients.

Integrating haemovigilance into the quality systems of all institutions involved in blood supply and transfusion is essential for achieving optimal patient and donor safety. However, while some countries maintain robust national haemovigilance programs, many regions still lack effective and comprehensive surveillance systems, indicating a continued need for global expansion and strengthening of haemovigilance practices.

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OP-003: Digital Transformation in Transfusion Medicine: Building Reliable IT and Traceability Systems

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Summary: Transfusion medicine is experiencing a profound digital transformation. Modern information systems are no longer optional add-ons - they are essential to ensure blood safety, quality assurance, and traceability throughout the entire transfusion chain.According to the World Health Organization (WHO) and the European Union (EU), data integrity and end-to-end traceability are the foundation of a safe and sustainable blood system.

Regulations such as EU Directives 2002/98/EC, 2005/61/EC, 2005/62/EC, the SOHO Regulation (2024/1860), and GMP Annex 11/15 set the international standards for computerized and validated blood management systems.

Key Challenges:

Fragmented data between donor registration, testing, and distribution units; Limited integration between equipment, laboratory, and IT infrastructure; Manual data entry errors and inconsistent traceability; Weak feedback loops between laboratory results, donor deferral, and look-back processes; Absence of real-time monitoring in storage and transport (cold chain); Lack of harmonized national donor identification systems

Digital Transformation Approach: A fully digital and traceable blood system connects donor-to-patient data in one integrated environment.

Core elements include:

1. Unified Donor Identification and Barcoding System. Each donor, donation, and component is assigned a unique barcode that follows the blood product throughout all stages: registration, screening, testing, processing, storage, and issue.
2. Integrated Laboratory and Equipment Data. Automated interfaces ensure test results and process data are captured directly from laboratory analyzers and apheresis devices, reducing manual input and error risk.
3. Validated Process Control. Each production step (e.g., component preparation, centrifugation, freezing) is monitored and validated according to GMP and WHO standards, enabling real-time quality control.
4. Cold Chain Digital Monitoring. Temperature sensors and alarm systems continuously record conditions of refrigerators and freezers, ensuring compliance and auditability.
5. Quality Management Integration (QMS). All deviations, CAPA actions, document changes, and audits are recorded electronically, providing transparency and accountability across the organization.
6. Data Integrity and Security. Following the ALCOA and GDPR (General Data Protection Regulation) principles, all data are stored securely, attributable, and traceable.

Examples of Implementation:

Lithuania: All national blood establishments are linked to a centralized National Donor Registry, allowing immediate access to donor history at any donation site. This guarantees national-level traceability and ensures that infected or deferred donors are recognized system-wide.

Azerbaijan: A modern blood center equipped with automated component preparation systems (e.g., Reveos, Trima) is integrated with an internal IT platform that automatically records platelet yield, quality parameters, and alarms. This digital link between equipment and IT improves both efficiency and data accuracy.

Impact:

- 100% traceability from donor to recipient
- Reduced human error and improved compliance
- Real-time control of all critical processes
- Transparent quality management with full audit trails
- Strengthened national hemovigilance and regulatory oversight

Conclusion: Digital transformation in transfusion medicine is no longer a future goal - it is an operational necessity.

Reliable IT and traceability systems:

- protect patient safety,
- ensure quality and regulatory compliance,
- enable proactive risk management, and
- build public and institutional trust in the blood system.

From vein to vein – from donor to patient – every drop of blood must keep its digital identity.

This is the essence of modern transfusion safety.

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OP-004: Evaluation of Apolipoprotein E Gene Polymorphisms and its Association with Left Ventricular Dysfunction Among Beta Thalassaemia Najor Patients in Pakistan

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Background: Cardiomyopathies are amongst the main causes of mortality for 71% of people with thalassaemia major, which is an important concern. Thalassaemia major is a serious health issue in Pakistan with approximately 5,000 children being diagnosed each year. Left ventricular dysfunction is a major cause of morbidity and mortality in beta-thalassaemia major patients, yet the genetic determinants of it are still not clear.

The apoE4 allele has been associated with an increased risk of cardiovascular complications in the general population. Apolipoprotein E has been important because it is a modulator of lipid metabolism and plays a role in imflammation and oxidative stress injuries. There is limited research on genetic factors in cardiac dysfunction among Pakistani BTM patients. While iron overload and anemia are well-studied, ApoE polymorphisms remain unexplored.

Objectives:

1. Cardiac impairment in individuals with Thalassaemia Major through Doppler Echocardiography
2. Apolipoprotein E gene polymorphisms using Allele-specific Polymerase Chain Reaction

Methodology: This was a comparative cross-sectional study with a total of 100 participants (50 thalassaemia major and 50 healthy controls). Informed consent was obtained from all. Study was ethically approved by IREB of Baqai Medical University. Study was conducted in Muhammadi Thalassaemia Centre.

Doppler M-mode Echocardiography was performed in all patients. Patients were classified into three categories based on ECHO findings: Group I (n = 25): Patients with serum ferritin < 2500 ng/mL, normal cardiac function (ejection fraction [EF] > 55%, fractional shortening [FS] > 28%) and their respective ApoE genotypes. Group II (n = 13): Patients with serum ferritin between 2501–5000 ng/mL, mild cardiac dysfunction (EF 50–55%, FS 25–28%) and their ApoE genotypes. Group III

(n= 12): Patients with serum ferritin > 5000 ng/mL, severe cardiac dysfunction (EF < 50%, FS < 25%) and their ApoE genotypes.

Results:

Table 1: Echocardiography parameters of β-thalassaemia major patients

Echo cardio graphic indices	Group I n=25	Group II n=13	Group III n=12	P-Value
LVEDD	30.08±7.85	39.38±6.29	44.58±6.59	0.0005[ab]
LVESD	24.44±4.91	28.69±4.95	32.17±3.85	0.0005 [ab]
IVS Thickness	6.82±1.58	7.35±1.02	6.73±0.95	0.412
PWT	6.85±1.38	8.15±1.07	7.79±0.73	0.004 [a]
LVIDD	36.98±4.49	38.38±3.73	37.74±2.24	0.567
LVISD	25.44±4.84	24.31±1.97	24.21±2.19	0.542

Table 2: Distribution of Apo E genotyping of β-thalassaemia major patients according to case and control

Apo E genotyping	Case n=50			Control n=50	P-Value
	Group I n=25	Group II n=13	Group III n=12		
E2/E2	3(12%)	0	0	10(20%)	0.115
E3/E3	3(12%)	1(7.7%)	0	17(34%)	0.012
E4/E4	0	2(15.4%)*	9(75%)**	0	0.0005
E2/E3	7(28%)	1(7.7%)	0	15(30%)	0.0171
E2/E4	6(24%)	2(15.4%)	2(16.7%)	8(16%)	0.845
E3/E4	6(24%)	7(53.8%)	1(8.3%)	0	0.0005

Significantly, nearly every patient in Group III showed positivity for the E4 allele, reinforcing its possible involvement in cardiac dysfunction.

Conclusion: In my study, the ApoE E4/E4 genotype was significantly associated with severe cardiac dysfunction (Group III), indicating that it might contribute to the acceleration of myocardial iron accumulation. ApoE4 has been shown to affect inflammation, oxidative stress, and lipid metabolism—all of which may increase the heart's susceptibility to iron overload. The E4/E4 genotype participants in my study had much decreased ejection fractions, supporting the hypothesis that certain ApoE variants may exacerbate iron-related heart injury.

OP-005: First Confirmed Case of Transfusion - Transmitted Hepatitis E in a Thalassaemia Patient in Pakistan

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Background: Hepatitis E Virus (HEV) is considered an emerging threat to blood safety. Since 2004, there have been 86 cases of HEV transmission by blood transfusions. Even at relatively low blood levels of the virus, HEV can be transmitted. There is ongoing discussion on the significance of universal HEV screening for blood donations.

Objective: To investigate the post-transfusion transmission of HEV in a thalassaemia patient.

Methodology: On October 20, 2023, a single unit of red cell concentrate (RCC) was administered to a thalassaemia major patient (aged 14 years) admitted to the Thalassaemia Centre of the Divisional Headquarters Teaching Hospital, Mirpur, AJK, Pakistan. The transfused RCC had passed all mandatory blood screening tests at the Mirpur Regional Blood Centre. On December 5, 2023, routine blood testing of the patient revealed deranged liver function tests, i.e., alanine aminotransferase (302 U/L; reference interval, < 40 U/L), aspartate aminotransferase (79 U/L; reference interval, < 35 U/L), and bilirubin (2.4 mg/dl; reference interval, < 1.0 mg/dl). The patient was tested negative for Hepatitis B (HBsAg) and Hepatitis C (anti-HCV) through chemiluminescence immunoassay (CLIA). Follow-up of the donor and patient for HEV was carried out by means of serological and molecular assays. For RT-PCR, the RNA extraction and cDNA synthesis were done using commercial kits. The HEV ORF2 (Open Reading Frame-2, capsid protein) was amplified using nested PCR targeting a 348-bp segment. Informed consent was obtained from the patient's father concerning the presentation of the case. The study protocol followed the ethical guidelines of the Helsinki Declaration of 2013.

Results: The transfused patient had developed typical symptoms, including abdominal pain, reduced appetite, and joint pain. HEV RNA was detected in the patient's sample, the archived sample of the donor's blood, and also in the fresh frozen plasma (FFP) present in the blood bank's inventory. The donor and patient samples were sequenced, analysed, and compared with reference sequences available in the NCBI data bank. Multiple alignment sites with gaps in any of the sequences were omitted. The sequencing data were analysed through Bio-Edit sequence alignment software. Phylogenetic trees were constructed using the neighbor-joining method. The full genome sequences from both the donor and the person who got acute hepatitis E showed that they were both genotype 1 and had a match for 326 nucleotides in ORF-2. Phylogenetic analysis indicated that HEV genotype 1 detected in both samples is closely related to genotype 1 from London, UK (MH504163). The donor, a 37-year-old male living in Mirpur, was followed up by telephone. He had remained asymptomatic but had a history of recent travel abroad (UK). Hence, it was confirmed that the patient contracted HEV by RCC transfusion, despite the fact that blood components with larger plasma quantities, primarily FFP and platelet concentrates, are believed to transmit HEV more easily.

Conclusion: This is the first report of transfusion-transmitted Hepatitis E Virus (HEV) in Pakistan. It is imperative to establish an evidence-based screening policy for asymptomatic HEV positive blood donors to safeguard public health.

OP-006: Therapeutic Plasma Exchange in Children and Clinical Practices in Paediatrics

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Therapeutic Plasma Exchange (TPE) is an essential extracorporeal therapy that is increasingly utilized in paediatrics for the management of immune-mediated, metabolic and neurological disorders. The procedure selectively removes and replaces plasma to eliminate pathogenic antibodies, immune complexes and cytokines while allowing replacement of deficient plasma factors such as ADAMTS-13 in thrombotic thrombocytopenic

purpura. TPE also induces immunomodulatory effects by influencing cytokine balance and T-cell function which contributes to the resolution of immune dysregulation.

Principles, techniques and clinical applications of TPE in children includes careful patient selection, pre-procedure evaluation, appropriate vascular access, anticoagulation methods and the rational use of replacement fluids. Crystalloids, albumin and plasma each have distinct advantages and limitations in maintaining intravascular volume, oncotic pressure and coagulation balance. Awareness of potential complications, including issues related to vascular access, citrate toxicity, transfusion reactions, thrombosis and infection, is of utmost importance, together with evidence-based management strategies. TPE plays a crucial role in several paediatric neurological conditions such as autoimmune encephalitis, acute disseminated encephalomyelitis, acute necrotizing encephalopathy, Guillain-Barré syndrome, transverse myelitis, optic neuritis and neuromyelitis optica spectrum disorders. Early initiation of therapy, particularly in corticosteroid or IVIG refractory cases, has been associated with improved neurological recovery and better clinical outcomes. Early recognition of clinical conditions requiring TPE, comined with timely intervention, can be lifesaving in critically ill children, especially when conventional treatment modalities offer limited benefits to achieve the desired therapeutic outcomes.

OP-007: Grouping to Genotyping, Applying Immuno-haematology for Safer Transfusions

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Immunohaematology (IH) is an essential element in ensuring safe and effective transfusions. IH testing includes ABO and D typing, antibody screening, crossmatching, antibody identification and more complex investigations requiring specialist serological and molecular techniques to resolve anomalies. Investigation of complex cases to reveal novel antigens, identify mixtures of antibodies and find compatible units supports patients requiring rare blood. The ISBT working parties for immunohaematology, red cell immunogenetics and blood group terminology and for rare donors collaborate to provide educational resources in these areas that are accessible on the ISBT website.

However, the relevance, quality and reliability of basic IH tests performed every day in hospital laboratories around the world make an even more significant contribution to patient safety, and all rare cases are first identified by recognising and acting on anomalies in routine testing. Selection of tests for patients and donors to optimise available resources, reduce unnecessary work and maximise patient safety requires an understanding of the relevance of grouping and screening anomalies in the context of the patient or donor.

Selecting antibody screening methods optimised to detect clinically significant antibodies, interpreting antibody identification results and decision making on whether to transfuse or to refer for further testing all require an understanding of the characteristics of antibody specificities. Quality assurance ensures reliability of reagents, equipment and methods, staff competence, and continuity of patient and sample identity for safe and compatible transfusions.

Underpinning IH knowledge and practical training are required for staff to ensure safe testing and issue of blood components. ISBT provides eLearning modules on the principles of immunohaematology, a downloadable book that includes basic IH testing and hospital blood bank procedures. The ISBT Academy also supports valuable hands-on training designed and delivered by local experts who have full understanding of the educational opportunities and resource constraints in their country and/or region.

OP-008: Blood Donor Haemovigilance in a Tertiary Care Teaching Hospital: A Single-Centre Cross-Sectional Study from Mirpur, Azad Jammu and Kashmir

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Background: Haemovigilance is an important component of blood safety, it comprises surveillance procedures covering the whole transfusion chain from collection of blood (components) to follow-up of its recipients. It specially focusing on monitoring and preventing adverse events in blood donors and recipients. Tracking donor reactions and transfusion-transmissible infections (TTIs) helps improve the quality of donor care, promote donor retention, and strengthen the transfusion system's overall safety.

Objective: To determine the frequency and types of adverse donor reactions among blood donors at a tertiary care teaching hospital in Mirpur, Azad Jammu and Kashmir; To assess the prevalence and pattern of transfusion-transmissible infections (TTIs) among the donor population during the study period.

Methodology: In this cross-sectional study conducted at the Department of Pathology, DHQ Teaching Hospital, Mirpur, AJK from April 2025 to September 2025, A total of 5,670 healthy blood donors were included. Data were collected on donor demographics (age, gender, socioeconomic status, and regional distribution), donation volume, and haemovigilance outcomes. Donor reactions were classified as mild to moderate according to standard haemovigilance definitions. All donors were screened for Hepatitis B, Hepatitis C, HIV, syphilis, and malaria using CLIA assay.

Results: Among 5,670 donors, 5,619 (99.1%) were males and 51 (0.9%) were females. The mean donor age was 28 ± 6 years, distributed as follows: 18-25 years (46%), 26-35 years (38%), 36-45 years (12%), and above 45 years (4%). Most donors belonged to the middle socioeconomic class (68%), and 72% were residents of urban Mirpur Azad Jammu & Kashmir. The majority donated 450 ml (77%), while the rest donated 500 ml according to availability of blood bags. The overall adverse donor reaction rate was 2.8% (n = 160). All the reactions were mild to moderate in nature and no medical emergency or life-threatening situation appeared. The most frequent reactions included slow pulse and fall in BP (1.3%), had nausea (0.9%), needle-site pain and double pricked (0.6%), and some vomited which were (0.06%). Majority of adverse reactions (81%) occurred in donors donating 500 ml blood versus those donating 450 ml blood. The TTI positivity was observed in 1.9% (n = 108) of donors, including Hepatitis B (0.8%), Hepatitis C (0.7%), Syphilis (0.2%), HIV (0.1%), and malaria (0.1%).

Conclusion: The study confirms that blood donation is a safe procedure, with a low rate of mild to moderate adverse reactions. The prevalence of TTIs remains within acceptable limits but underscores the importance of strict donor screening and continuous haemovigilance. Strengthening donor education, pre-donation counseling, and systematic follow-up can further enhance donor safety and confidence.

OP-009: Plasma-Derived Medicinal Products: Ensuring Access Through Effective Fractionation Systems

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Summary: Plasma-derived medicinal products (PDMPs), including immunoglobulins, albumin, and clotting factors, are essential biological medicines used in immunology, hematology, and critical care. Their sustainable availability depends on the effectiveness, integration, and ethical governance of plasma collection and fractionation systems.

According to the World Health Organization (WHO) Global Framework for Blood Safety and Availability, every country should aim for national or regional self-sufficiency in blood and plasma components through coordinated systems based on voluntary, non-remunerated donation. However, practical implementation remains uneven.

High-income countries have established integrated blood systems ensuring full traceability from donor to patient. In these systems, plasma is either fractionated domestically or through international contract manufacturing and finished PDMPs are supplied back to the national health system-closing the safety and access loop.

Globally, around two-thirds of the world's source plasma for fractionation is collected in the United States from compensated donors, under strict GMP and regulatory oversight. In contrast, the European Union, guided by the principle of

voluntary non-remunerated donation, collects considerably less source plasma and imports about 40% of its PDMP needs from U.S. plasma.

The EU Regulation 2024/1860 on Substances of Human Origin (SOHO) reaffirmed that direct payment for blood or plasma is not permitted, yet it recognized the need for transparent and fair donor compensation mechanisms. This marks an important shift — acknowledging that donor motivation, time, and effort must be valued if plasma sufficiency is to be achieved. The donor remains the most fragile link in ensuring access, and this regulation offers a realistic path to strengthening that link ethically.

Different European models illustrate this diversity. Estonia exchanges collected plasma for finished PDMPs through contractual arrangements, ensuring product return. Lithuania, by contrast, sells surplus plasma to foreign fractionators without contractual return, generating donor dissatisfaction and revealing the absence of a national plasma strategy. These examples show that ethical principles alone cannot secure plasma availability without structural and motivational mechanisms.

Beyond Europe, Uzbekistan provides an illustrative case of pragmatic innovation. Its privately operated network of plasma centers functions under GMP standards, offering donors appropriate refreshments and regulated compensation. These centers use integrated donor management and traceability systems and are preparing for national plasma fractionation to produce domestic immunoglobulins and albumin under European quality principles. Uzbekistan's experience demonstrates that well-regulated private sector participation can effectively support national plasma sufficiency.

Conclusion: Plasma safety is ensured through validated GMP systems and traceability frameworks as defined by WHO and countries regulation. Plasma access, however, depends on coherent national strategies that protect and motivate donors, establish fair compensation mechanisms, and integrate private or public-sector resources effectively. Sustainable access to PDMPs is not determined by wealth-it is defined by policy, ethics, and respect for the donor.

OP-010: Mapping the Silent Carrier: A Spatial Analysis of Thalassemia Minor Trait Across Sindh Province, Pakistan

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Background: Thalassemia minor, though clinically silent, serves as a critical reservoir for the transmission of Thalassemia major, a severe hereditary blood disorder. National or provincial prevalence data often mask regional disparities, limiting the effectiveness of targeted prevention strategies.

Objective: To map the spatial distribution of Thalassemia minor carriers across Sindh province and generate evidence for region-specific public health interventions.

Methodology: A cross-sectional descriptive study was conducted using a multi-stage stratified sampling approach for a period of nine months (January to September 2025). Participants were individuals attending NADRA (National Database & Registration Authority) offices for new or renewed Computerized National Identity Cards (CNIC) activity in northern Sindh (Sukkur, Khairpur, Ghotki), central Sindh (Hyderabad, Shaheed Benazirabad, Mirpurkhas, Tharparkar), and southern Sindh (Karachi).

After informed consent, participants were counselled and screened at newly established Thalassemia Screening Desks in selected NADRA offices, including the Regional NADRA Centers at Sukkur (northern Sindh), Shaheed Benazirabad (central Sindh), and Karachi (southern Sindh). The screening was performed at the NADRA centers at Awami Markaz, Korangi, and Safoora, situated in district South, Korangi and East respectively.

Procedure of Thalassemia screening followed international guidelines. A complete blood count (CBC) was performed for initial evaluation, and individuals with atypical findings underwent high-performance liquid chromatography (HPLC) for confirmation of either Iron deficiency anemia or thalassemia minor. An HbA2 level ≥ 3.5% was considered diagnostic. A total of 7,231 participants

were screened, of which 3,455 were filtered for further evaluation. Out of these 1,436 came out as carriers of thalassemia minor. Wherein Chi-square tests were applied to assess demographic and regional prevalence differences.

Results: Out of total 7,231 consented clients screened for thalassemia minor, 3,455 (47.8%) were identified as anemic on CBC, with further confirmatory test on HLPC done, 1,436 (19.8%) out of 7,231 were found positive as thalassemia trait.

Thalassemia trait was detected in all regions, with significant inter-district variation ($p < 0.05$). The highest prevalence was observed in northern Sindh (9.57%), followed by southern Sindh (5.43%) and central Sindh (5.03%). The elevated prevalence in northern districts correlated with sociocultural factors, particularly the high frequency of consanguineous marriages and limited public awareness.

Participants' age ranged from 7 to 45 years, with the majority in the 10-19 years age group. Screening outcomes demonstrated no significant gender difference, with males and females nearly equally represented among both suspected and confirmed cases.

Conclusion: The distribution of thalassemia minor in Sindh is uneven, with northern districts carrying the main burden. Regionally tailored interventions are urgently required, including community and healthcare provider capacity building, premarital and family screening programmes, integration of testing into existing infrastructures, culturally sensitive counselling, and enforceable provincial screening policies.

Implications: Spatial risk mapping of silent carriers provides actionable evidence for policymakers, guiding efficient allocation of resources and reducing the incidence of Thalassemia major through targeted, and evidence-based strategies.

Table 1: Prevalence of Beta-Thalassemia Trait Across Sindh

Region	Districts Included	Sample Size (n)	Number of Carriers	Prevalence (%)	p-value
Northern Sindh	Sukkur, Khairpur, Ghotki	710	68	9.57%	<0.05
Central Sindh	SBA, Mirpurkhas, Umerkot, Tharparkar	4392	1312	5.03%	<0.05
Southern Sindh	Karachi, Hyderabad	2129	56	5.43%	<0.05

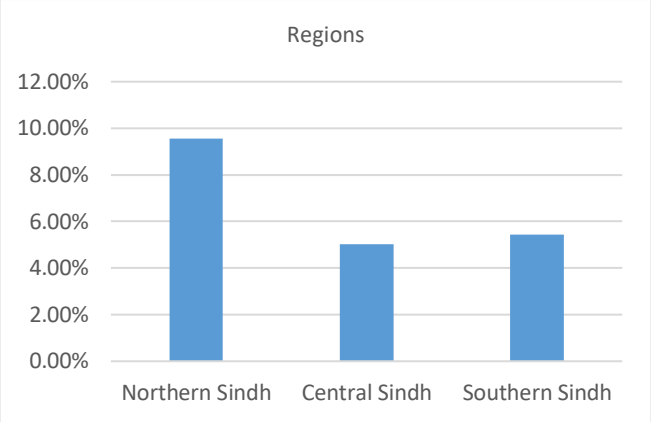

Figure 1: Comparative Prevalence of Thalassemia Minor by Region

OP-011: Transfusion-Transmissible Infections: Screening, Surveillance, and Prevention

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Background: Transfusion-transmissible infections (TTIs) remain a global challenge, threatening the safety of blood supply despite decades of progress in screening and surveillance. Historical tragedies such as HIV and hepatitis C transmission through contaminated blood products in the 1970s-1980s, continue to influence blood safety policies worldwide. The events with outbreaks, underscore the dynamic nature of emerging pathogens.

Objective: This presentation aims to provide a comprehensive review of TTIs, with emphasis on the evolution of screening methods, global surveillance efforts, and the transformative impact of nucleic acid testing (NAT).

Methodology: Drawing on historical case studies, hemovigilance data, and recent advances in molecular diagnostics, the session explores both established and emerging approaches to minimize TTI risk. NAT modalities—including minipool versus individual-donation testing—are critically compared. Emerging technologies such as digital PCR, CRISPR-based assays, and next-generation sequencing are highlighted for their potential to reshape future screening paradigms.

Results: NAT has significantly shortened diagnostic window periods and reduced residual risk for HIV, HBV, and HCV in countries where implemented.

Hemovigilance reports demonstrate declining TTI incidence post-NAT adoption, though disparities persist between high-income and resource-limited regions. Pathogen reduction technologies and strengthened surveillance networks further complement screening, offering additional layers of protection against both known and emerging threats.

Conclusion: The trajectory of blood safety reflects a continual interplay between emerging pathogens, diagnostic innovation, and public health policy. To achieve equitable safety standards globally, wider access to NAT, integration of emerging molecular technologies, and robust hemovigilance frameworks are essential. These strategies collectively advance the goal of a safer, sustainable, and universally trusted blood supply.

OP-012: Thalidomide-Induced Cerebral Ischemic Event in a Child with Transfusion-Dependent Thalassemia: A Rare but Reversible Neurological Complication

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Background: Thalidomide, a potent immunomodulatory and anti-angiogenic agent, has shown promise in reducing transfusion requirements in patients with transfusion-dependent thalassemia (TDT). However, data regarding its safety in the pediatric population remain limited. We report a rare case of acute ischemic stroke in a child receiving thalidomide for TDT, emphasizing the need for vigilance and prompt management.

Case Presentation

A 4-year-old male with transfusion-dependent β-thalassemia was initiated on thalidomide therapy as a disease-modifying agent. After one month of treatment, the patient developed sudden onset weakness and complete paralysis of the left upper and lower limbs. MRI of the brain revealed ischemic infarction with ex-vacuo dilatation of both ventricles. Thalidomide was immediately discontinued, and the patient was started on oral steroids and low-dose aspirin (Ascard 75 mg). Remarkably, within weeks, the child demonstrated progressive neurological recovery, regaining muscle power and normal motor function. Follow-up MRI with MRA revealed persistent ischemic changes in the left frontal white matter, along with narrowing of bilateral internal carotid arteries and replacement of the circle of Willis with multiple tiny collateral vessels, consistent with secondary moyamoya-like vasculopathy.

Methodology: This case highlights a possible thalidomide-induced cerebral vasculopathy leading to ischemic infarction in a pediatric thalassemia patient. The anti-angiogenic effects of thalidomide may precipitate endothelial dysfunction and vascular narrowing, especially in patients with pre-existing oxidative and inflammatory stress related to chronic transfusion therapy. Prompt discontinuation of the drug and initiation of anti-inflammatory and antiplatelet therapy led to complete clinical recovery, although radiologic vascular changes persisted.

Results: The present study included 297 patients with hypochromic, microcytic anemia for beta thalassemia trait (BTT) and iron deficiency anemia (IDA). HPLC detected 141 patients with BTT, while 156 were diagnosed with IDA. The average age of Patients with BTT was 14.5 years, whereas the average age of IDA patients was 20.6 years.

The Mentzer index correctly identified patients at 64.6%, followed by MCI and SI at 63.2%, 62.2%, and 55.2%, respectively.

Conclusion: Thalidomide, though effective in reducing transfusion burden in TDT, can rarely cause severe cerebrovascular complications. Early recognition, drug withdrawal, and aggressive management can result in favorable neurological outcomes. This case underscores the importance of baseline and follow-up neuroimaging in children receiving thalidomide and raises awareness about its potential to induce moyamoya-like vasculopathy.

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OP-013: From Genes to Parasites: Incidental Malaria Detection during Thalassemia Screening in Resource-Limited Settings

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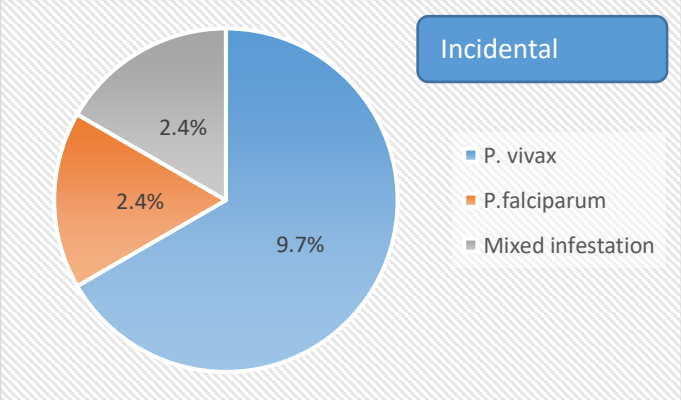
Background: Pakistan is a resource-constrained country and lies within a malaria-endemic zone. Mosquito-born parasitic disease remains prevalent throughout the year especially in Karachi region due to moderate climate. Incidental malarial parasites detection and reporting during hemoglobinopathy screening by HPLC or any other reason for peripheral smear examination is a noteworthy occurrence in the realm of diagnostic medicine. Although unintended, such findings carry important clinical implications. Malaria can mimic or exacerbate anemia leading to inappropriate screening for hemoglobinopathies and if not reported timely may result in unnecessary financial burden as well as increased morbidity and mortality. It is therefore imperative to perform peripheral smear examination with added intent to detect malarial parasite in all samples received for hemoglobinopathies

Objective: To determine the frequency and clinical significance of incidental malarial parasite detection in peripheral blood smears examined for hemoglobinopathies

Methodology: This cross-sectional, retrospective study included 124 patient samples screened for Hemoglobin disorders from November 2022 to January 2023, following the heavy monsoon season. Ethical approvals were taken. Complete Blood Counts were performed using automated analyzers. Peripheral blood smears were prepared, stained with Leishman stain and reviewed for morphological features and presence of malarial parasites. Hemoglobinopathy screening was performed using high performance liquid chromatography (HPLC, Biorad Variant) with appropriate positive controls. Abnormal hemoglobin peaks were documented and an Hb A2 value ≥ 3.9% was considered diagnostic for Beta thalassemia trait

Results: Among 124 patients included in the study, 45 were male and 79 females with a mean age of 17.5 ± 15.0 years. The mean hemoglobin level was 8.0±2.7 g/dl. Incidental malaria parasites were detected in 18 patients (14.5%). Of these, 12 cases (9.7%) were *Plasmodium vivax*, 3 cases (2.4%) were *Plasmodium falciparum*, and 3 cases (2.4%) showed mixed infestation (*P. vivax* + *P. falciparum*). Coexistence of malaria and thalassemia minor was observed in 4 cases (3.2%), including 3 cases (2.4%) with β-thalassemia trait - Plasmodium vivax and 1 case (0.8%) with HbD trait – Plasmodium falciparum. As anticipated, 15 out of 18 malaria-positive cases were originated from socioeconomically underprivileged areas of Karachi (Hub)

Conclusion: The incidental detection of malarial parasites highlights the continued significance of peripheral blood smear examination, particularly in malaria-endemic regions. Finding incidental falciparum during hemoglobinopathy screening can be crucial as this parasite is responsible for severe, life-threatening malaria. Individuals with hemoglobinopathies may have some protection against severe malaria because of the altered Hb interference with the growth of parasite in red blood cells. This genetic protection is partial and not absolute, and people with hemoglobinopathies can still contract malaria



OP-014: From Wastage to Efficiency: Resource Management in Blood Banking at Muhammadi Blood Bank, Jacobabad

Sammar Fatima[1], Dure Naz Jamal[2]
[1]Laboratory Manager & Project Coordinator, Muhammadi Welfare Foundation, Karachi, Pakistan; [2]Secretary, Sindh Blood Transfusion Authority, Karachi, Pakistan

Background: Transfusion-transmissible infections (TTIs) including Hepatitis B, Hepatitis C, and HIV continue to pose a major threat to blood safety in Pakistan, particularly within rural and interior regions. The Jacobabad branch of Muhammadi Blood Bank, established in December 2021, initially performed donor testing directly on Cobas-ECLIA. Although this method ensured accuracy, it led to substantial wastage of blood bags, reagents, manpower, and transport resources due to the high rate of post-donation reactive results. To overcome these losses and enhance operational efficiency, the center introduced pre-donor ICT screening as an initial filter before confirmatory ECLIA testing.

Objectives: To evaluate the impact of ICT-based pre-donor screening in minimizing wastage and improving resource utilization in a region with a high prevalence of TTIs.

Methodology: A retrospective comparative analysis was conducted across two operational phases. - Phase 1 (December 2021 – April 2022): Direct Cobas-ECLIA testing on 847 donors. - Phase 2 (May 2022 – September 2025): ICT pre-screening using Abbott kits (sensitivity/specificity ~99.99%) followed by ECLIA confirmation, involving 16,607 donors. During donor selection, an additional sample was drawn for ICT screening of HBsAg, HCV, and HIV, along with the CBC. Donors who tested reactive through ICT were deferred and recalled for confirmation, while non-reactive donors proceeded for ECLIA analysis.

Results: In Phase 1 (n = 847), 693 donors were non-reactive (81.8%), while 102 (12.0%) tested reactive for HCV, 33 (3.9%) for HBsAg, and 6 (0.7%) for HIV. In Phase 2 (n = 16,607), non-reactive donors increased to 14,473 (87.1%), with lower reactivity for HCV (1,048; 6.3%), HBsAg (266; 1.6%), and HIV (50; 0.3%). The introduction of ICT pre-screening significantly reduced wastage of consumables and manpower hours while improving donor selection and overall blood safety.

Table 1. Comparison of reactivity before and after ICT pre-screening

Marker	Phase 1 (Dec 2021–Apr 2022)	Phase 2 (May 2022–Sep 2025)
Non-Reactive	693 (81.8%)	14,473 (87.1%)
HBsAg	33 (3.9%)	266 (1.6%)
HCV	102 (12.0%)	1,048 (6.3%)
HIV	6 (0.7%)	50 (0.3%)

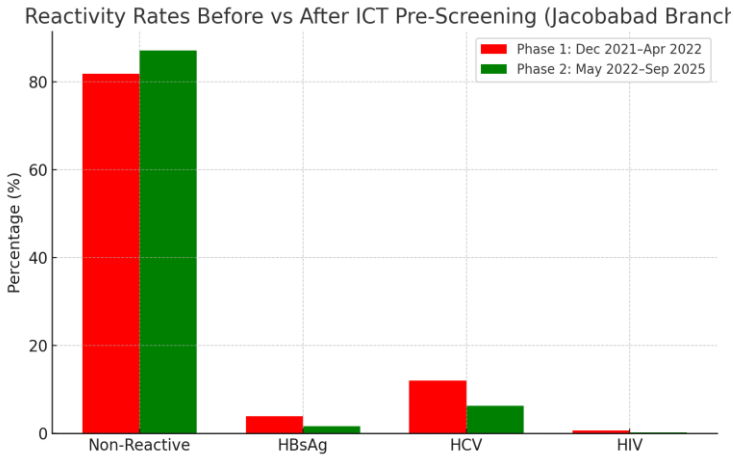


Figure 1. Reactivity rates before and after ICT pre-screening at Jacobabad Branch (Bar Graph)

Conclusion: Introducing ICT-based pre-donor screening before confirmatory ECLIA testing considerably improved efficiency and resource management in a high-TTI prevalence setting. This two-tiered approach reduced wastage of blood bags and reagents, conserved manpower, and maintained diagnostic accuracy. The model can serve as a sustainable strategy for blood banks in resource-limited, high-burden regions.

OP-015: Silent Carrier or Simple Deficiency? How the Matos & Carvalho Index Advances Thalassemia Prevention

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Background: Distinguishing between iron deficiency anemia (IDA) and thalassemia trait is a longstanding diagnostic challenge, especially in high-prevalence regions where both conditions

frequently overlap. Misclassification can delay appropriate intervention, mask silent carriers, and hinder thalassemia prevention efforts. The Matos & Carvalho Index (MCI)—a lesser-known but highly promising discriminant formula—offers new potential in resolving this diagnostic gray zone.

Objectives: This study aimed to assess the value of the Matos and Carvalho index (MCI) in detecting Beta thalassemia traits from patients with microcytic, hypochromic anemia.

Methodology: This retrospective study was conducted in CHK Central Laboratory Dr Ruth KM Pfau Civil Hospital, Karachi, Pakistan from 1st July to 31st December 2023. All newly diagnosed cases of iron deficiency and Beta Thalassemia trait were included. 297 patients with an age range of 1–60 years were evaluated. We calculated 4 discrimination indices in all patients with hemoglobin (Hb) values of <10 g/dL. The patient groups were evaluated according to red blood count; the Mentzer index (MI); the Srivastava index (SI) and the Matos and Carvalho index (MCI). In this study complete blood counts for red cell indices were processed on a Hematology analyzer (XN-1000), HPLC was done on Arkray HA-8108T and serum ferritin was done on a chemistry analyzer (COBAS 501).

Results: The present study included 297 patients with hypochromic, microcytic anemia for beta thalassemia trait (BTT) and iron deficiency anemia (IDA). HPLC detected 141 patients with BTT, while 156 were diagnosed with IDA. The average age of Patients with BTT was 14.5 years, whereas the average age of IDA patients was 20.6 years.

The Mentzer index correctly identified patients at 64.6%, followed by MCI and SI at 63.2%, 62.2%, and 55.2%, respectively.

Conclusion: Silent carriers are often missed—but they don't have to be. The Matos & Carvalho Index offers an easy and accessible way to enhance thalassemia detection by the simple test of CBC at the frontline. It can help medical personnel detect thalassemia carriers when used strategically, enabling earlier intervention and more effective prevention. However, the absence of red cell indices and methods that possess 100% specificity, efficacy, and sensitivity hinders the differentiation of BTT from other hypochromic microcytic anemias.

OP-016: Strengthening Safe Blood Transfusion Services in Resource Limited Settings: The Experience of Regional Blood Centre Quetta, Balochistan, Pakistan

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Quetta Regional Blood Centre, Balochistan, Pakistan

Background: Ensuring universal access to safe blood is a global public health goal endorsed by the World Health Organization (WHO). In Pakistan, fragmented blood banking systems historically compromised transfusion safety, especially in underdeveloped regions like Balochistan. In 2008, the Government of Pakistan, with support from the Federal Republic of Germany through KfW Bank, initiated the Blood Transfusion System Reform Project, leading to the establishment of the Regional Blood Centre (RBC) Quetta a cornerstone in modernizing blood transfusion practices in the Heart of province.

Objective: To evaluate the operational performance, infection screening outcomes, and challenges of RBC Quetta in promoting safe and sustainable blood transfusion services across Quetta.

Methodology: A retrospective analysis of operational data from January to December 2024 was conducted. Donor characteristics, component production, and transfusion transmissible infection (TTI) screening were analyzed. Testing for HIV, HCV, HBsAg, syphilis (VDRL), and malaria was performed using Chemiluminescent Immunoassay (CLIA) technology, following national and WHO guidelines.

Results: A total of 24,127 donors were screened, with 651 (3.6%) testing positive for TTIs: HIV (0.24%), HCV (0.92%), HBsAg (1.99%), VDRL (0.33%), and malaria (0.12%). Of all donors, 2.8% were voluntary and 97.2% were family donors. The Centre produced 18,522 units each of red cells, platelets, and plasma,

ensuring a 24/7 supply to four Hospital Based Blood Banks and four tertiary care hospitals, including Trauma Centre Quetta.

Discussion: The experience of RBC Quetta demonstrates that even in low resource environments, structured national programs and international partnerships can markedly improve transfusion safety. The low TTI prevalence reflects effective screening and adherence to WHO recommended quality assurance protocols (WHO, 2020; ISBT, 2021). However, dependence on family donors and infrastructural constraints such as unstable electricity and limited NAT testing remain challenges, similar to trends reported in other South Asian regions (Ahmed et al., *Asian J Transfus Sci*, 2022). Continued investment in voluntary donor recruitment, staff capacity building, and technological upgrades is essential for sustaining these gains and aligning global transfusion safety targets.

Conclusion: RBC Quetta exemplifies a successful model of blood system strengthening under challenging conditions. Its commitment to quality, transparency, and continuous improvement has significantly advanced transfusion safety across Balochistan. Scaling this model to other underserved regions will further support Pakistan's progress toward WHO's goal of 100% voluntary, non-remunerated blood donation.

OP-017: Serial Serum Ferritin Levels for Monitoring Response to Iron Chelation Therapy in Patients of Beta Thalassaemia Major Prospective Cohort Study

Malik Zeb Khan

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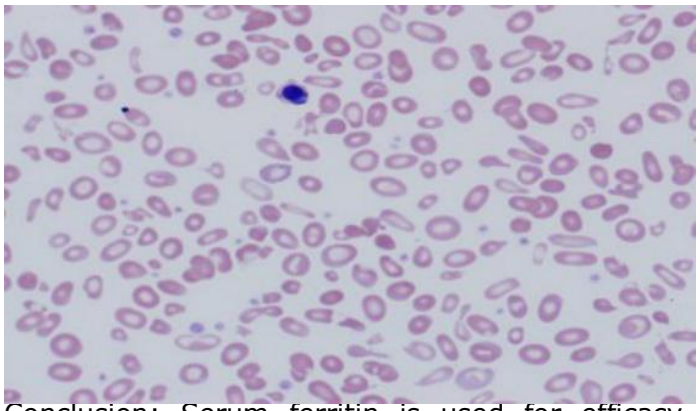
Background: In Beta Thalassaemia Major repeated blood transfusion, ineffective erythropoiesis and increased gastrointestinal iron absorption led to iron overload in the body. The management of the iron overload in these patients requires the administration of iron chelators continuously and evaluation of serum Ferritin levels at regular intervals.

Objective: The aim of the study is to analyze serum Ferritin level among Beta Thalassaemia Major patients and to see the effect of iron chelation therapy in transfusion dependent thalassemic patients.

Methodology: A prospective cohort study conducted Seven months from January to July 2023 at Hematology Day Care Centre HMC Peshawar, Pakistan A total of 50 thalassaemia major patients were selected and their blood samples were evaluated for serum Ferritin assays by ECLIA special immunoassay analyzer.3ml of venous blood was collected in a BD disposable syringe which was then transferred to serum vacutainer for estimation of serum Ferritin levels. Serum ferritin assays were done on Day 0, then after 3 months and then after another 3 months of iron chelation therapy.

Results: The mean pre-iron chelation therapy with desferoxamine and Deferasirox (Asunra) of serum ferritin was 3465.97 ng/ml ± std 2120.097 ng/ml and mean serum ferritin levels after 3 months and 6 months iron chelation was 2984.96 ng/ml ± std 1979.837 ng/ml and 2455.44 ng/ml ± std 1816.722 ng/ml respectively. A highly significant difference ($P < 0.01$) was observed between the two i.e., 0 day and 3 months serum ferritin levels. Similarly, highly significant difference ($P < 0.01$) was also seen at 3 months and 6 months intervals.



Conclusion: Serum ferritin is used for efficacy monitoring of iron chelation therapy and is a suitable method for ascertaining the iron metabolism situation. Determination of ferritin at the beginning of therapy provides a representative measure of the body iron reserves. Single or sporadic measurement of serum ferritin alone is a poor indicator of iron burden in the transfusion dependents patients like beta thalassaemia major. Nevertheless, serial studies in individuals' patients usually give an indication of whether the iron burden in that patients is static, increasing or decreasing. In addition, the maintenance of serum ferritin levels below 2.500µg/L is associated with improved survival free of cardiac disease in patients with thalassemia.

OP-018: Utilization of Mentzer Index to Discriminate Between Beta Thalassemia minor and Anemia of Iron Deficiency, Followed by HPLC

Huma Riaz
Associate Professor/Consultant Haematologist, Hayatabad Medical Complex, Peshawar, Pakistan

Objective: To evaluate the sensitivity and specificity of Mentzer index in differentiating beta thalassemia minor from anemia of Iron deficiency.

Methodology: A cross-sectional study conducted in Hematology unit of Hayatabad Medical Complex Sampling was done non-consecutively. A total of 860 cases with value of Hemoglobin less than 11 Gm/DL were counted. In all the selected cases full blood count were checked and Mentzer Index mean corpuscular volume [MCV] per RBCs count)was calculated. Value of <13 suggests the diagnosis of β Thalassemia minor/trait while more than 13 value is more indicative of Iron deficiency anemia (IDA). Confirmation of diagnoses was made by hemoglobin study using HPLC. Values for specificity and sensitivity for Mentzer Index were calculated for the two differentials of microcytic hypochromic anemia presenting with microcytosis and hypochromia.

Results: Mean hemoglobin level of patients was 9.01±1.85. Minimum and maximum hemoglobin value was 2.90 and 11 g/dl. Mean RCB count was 4.66±4.59 minimum and maximum RCB count was 1.07 and 136. Mean MCV value was 63.89±9.01. Minimum and maximum MCV value was 39.40 and 92.10 respectively. Men Mentzer index was 15.70±7.68. Minimum and maximum Mentzer index value was 7.80 and 10.7 respectively. Based on Mentzer index criteria 489(56.86%) patients had iron deficiency anemia and 371(43.14%) patients had higher suspicion of beta thalassemia

Conclusion: It was concluded that for differentiation among Beta thalassemia minor and anemia of iron deficiency, Mentzer Index can be beneficial to discriminate with a high sensitivity as well as specificity percentage and thus through a cost-effective way, only suspected cases of beta thalassemia trait/minor can be further confirmed by Hb Electrophoreses.

OP-019: Arefed Levels & Ferritin Assessment in Karachi, Pakistan

Warqa Khalid
Kashif Iqbal Thalassaemia Care Centre, Karachi, Pakistan

Background: Iron chelation therapy is essential for Thalassemia management, with film-coated and dispersible tablets being the two primary formulations prescribed. The choice and dosage of these tablets are determined by clinical factors such as age, height, weight, and concurrent treatments. Despite medical supervision, recent observations indicate growing non-compliance among pediatric patients, particularly due to the inconvenience associated with dispersible tablets. Many children report difficulty adhering to the required waiting time before meals, resulting in skipped doses or improper administration. This study investigates the compliance challenges faced by young Thalassemia patients, evaluates the impact of tablet type on their quality of life, and analyzes the comparative effects of film-coated and dispersible formulations on treatment adherence and overall well-being.

Objectives: To conduct a prospective observational study on the effects of film-coated vs dispersible tablets on Patients' Iron Levels and Quality of Life Over Three Months

Methodology: Groups: Two groups of patients were made; group A and group B. Group A, which will hereby be referred to as group Film-coated, consisted of 30 patients that only recently began the use of AREFED 360 mg or 180 mg film coated tablets as per their doctor's prescription.

On the other hand, Group B, which will hereby be referred to as group Dispersible, consisted of patients which too very recently began the intake of AREFED 500 mg or 250 mg dispersible tablets as per their doctor's prescription. This task was accomplished on August 1st, 2025. In that, the groups were made by August 1st, 2025, and that marked the initiation of the study/research. All their necessary and case study-relevant data is attached with case study.

Consent: The immediate aftermath of the groups being made was to design an assent and consent form. Assent forms were for minors while consent forms were for their parents. Patients that weren't minors also filled out a consent form. These forms were meant to ensure that every patient selected for the research or case study is willing to be a part of it and cooperate with the ones in charge of the

study.This way the case study was entirely consensual. The consent forms are attached with the case study in the appendix.

Data Collection: As a result of successful consents and cooperation, the patients' ferritin levels were acquired. These ferritin levels will hereby be known as "Ferritin month 1" and "Ferritin month 3". These reports marked the data that was collected from the participating patients over the span of 3 months. Further quality of life was rated from 1-5 by each patient depending on how well they feel the medicine has worked for them. Yes or no symbolizes whether they had compliance issues or not.

Questionnaire: A questionnaire was designed to ensure whether the patients were taking the medicine as per the guidelines. The questionnaire covers compliance, adherence and other relevant information regarding the medicinal intake. The questionnaire is attached in the abstract's appendix.

Manual: A medicine instruction manual was designed after the questionnaires were filled. The manual had instructions of how the medicine should be properly consumed. This was done to make sure that regardless of how proper a patient's compliance is, they still have the proper instructions and guidelines to gain maximum benefits from the medicine. The manual is attached in the appendix.

Duration: The duration of this research was 3 months. In that, the research came to a conclusion on October 31st, 2025.

Primary Outcome: The primary outcome of this research is to observe the difference in the changes of ferritin levels of both the patients intaking dispersible and the ones intaking film-coated tablets.

Secondary Outcome: The secondary outcome is to note the improvements in the patients' quality of life, energy, physical activity, and side effects.

Results: The data demonstrates a notable difference in the efficacy of film-coated and dispersible iron chelation tablets on patients' ferritin levels. Among children administered film-coated tablets, the mean ferritin level decreased substantially from 5524.1 µg/L before treatment to 3656.933 µg/L after three months of therapy, indicating a marked improvement in iron reduction. In contrast, patients using dispersible tablets exhibited an increase in mean ferritin levels, rising from 4056.5 µg/L to 4892.193 µg/L over the same period. This upward trend suggests lower therapeutic efficiency or potential issues with adherence in the dispersible tablet group, otherwise known as compliance issues. Compliance patterns and quality-of-life outcomes further emphasize the superior practicality of film-coated tablets over dispersible formulations in pediatric Thalassemia patients. Among the thirty children receiving film-coated tablets, only five reported adherence difficulties, primarily due to the tablet's size and swallowing discomfort. Conversely, in the dispersible tablet group, ten out of thirty participants experienced compliance issues, largely related to hunger and time management challenges, as the medication requires a waiting period before food consumption. These findings suggest that film-coated tablets are generally more acceptable and convenient for pediatric use, despite minor swallowing concerns. The difference in reported quality-of-life scores; averaging 4 for film-coated users compared to 3 for dispersible users; further supports this conclusion. The higher quality-of-life rating among film-coated tablet users may be attributed to greater dosing convenience, improved adherence, and fewer lifestyle disruptions.

Conclusion: Collectively, the compliance and quality-of-life data reinforce the earlier evidence from ferritin level outcomes, indicating that film-coated tablets not only achieve better therapeutic efficacy but also enhance patient well-being and treatment continuity.

OP-020: Silent Carrier or Simple Deficiency? How the Matos & Carvalho Index Advances Thalassemia Prevention

Noorulain Fareed[1], Saba Aman[2], Muhammad Younus Jamal[3], Maliha Sumbul[1]

[1]Department of Haematology, National Institute of Cardiovascular Diseases, Karachi, Pakistan; [2]CHK Central Lab, Dr Ruth KM Pfau Hospital, Karachi, Pakistan; [3]Department of Pathology, Jinnah Medical and Dental College, Karachi, Pakistan

Background: Distinguishing between iron deficiency anemia (IDA) and thalassemia trait is a longstanding diagnostic challenge, especially in

high-prevalence regions where both conditions frequently overlap. Misclassification can delay appropriate intervention, mask silent carriers, and hinder thalassemia prevention efforts. The Matos & Carvalho Index (MCI)—a lesser-known but highly promising discriminant formula—offers new potential in resolving this diagnostic gray zone.

Objectives: This study aimed to assess the value of the Matos and Carvalho index (MCI) in detecting Beta thalassemia traits from patients with microcytic, hypochromic anemia.

Methodology: This retrospective study was conducted in CHK Central Laboratory Dr Ruth KM Pfau Civil Hospital, Karachi, Pakistan from 1st July to 31st December 2023. All newly diagnosed cases of iron deficiency and Beta Thalassemia trait were included. 297 patients with an age range of 1–60 years were evaluated. We calculated 4 discrimination indices in all patients with hemoglobin (Hb) values of <10 g/dL. The patient groups were evaluated according to red blood count; the Mentzer index (MI); the Srivastava index (SI) and the Matos and Carvalho index (MCI). In this study complete blood counts for red cell indices were processed on a Hematology analyzer (XN-1000), HPLC was done on Arkray HA-8108T and serum ferritin was done on a chemistry analyzer (COBAS 501).

Results: The present study included 297 patients with hypochromic, microcytic anemia for beta thalassemia trait (BTT) and iron deficiency anemia (IDA). HPLC detected 141 patients with BTT, while 156 were diagnosed with IDA. The average age of Patients with BTT was 14.5 years, whereas the average age of IDA patients was 20.6 years. The Mentzer index correctly identified patients at 64.6%, followed by MCI and SI at 63.2%, 62.2%, and 55.2%, respectively.

Conclusion: Silent carriers are often missed—but they don't have to be. The Matos & Carvalho Index offers an easy and accessible way to enhance thalassemia detection by the simple test of CBC at the frontline. It can help medical personnel detect thalassemia carriers when used strategically, enabling earlier intervention and more effective prevention. However, the absence of red cell indices and methods that possess 100% specificity, efficacy, and sensitivity hinders the differentiation of BTT from other hypochromic microcytic anemias.

OP-021: Thalassaemia Prevention through Compulsory Testing: Challenges and Solutions

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Background: Thalassemia, a preventable genetic blood disorder, affects approximately 5% of Pakistan's population, posing a severe public health burden. Despite existing legislation, its prevalence persists, disproportionately impacting underprivileged communities. This situation is exacerbated by Pakistan's limited healthcare expenditure (1.2% of GDP), low literacy rate (59.13%), and significant resource constraints compared to nations like Italy and Iran with successful control programs.

Objective:

1. Analyze existing thalassemia testing models
2. Evaluate the current thalassemia situation in Pakistan
3. Recommend a feasible, uniform testing bill for all provincial assemblies
4. Utilize the BBMT platform to drive this initiative.

Current Situation and Challenges: While screening legislation exists, implementation is inconsistent and ineffective. Core challenges include ambiguous testing mandates, no enforcement mechanisms, and inadequate regulatory oversight. Cultural and religious barriers are significant: female carriers face marriage rejection, while prenatal diagnosis and termination options encounter moral and religious objections, hindering acceptance. Pakistan's challenges are magnified by resource scarcity, overpopulation, pervasive unawareness, and low governmental priority compared to countries with lower prevalence but stronger health systems.

International Models and Local Insights: Comparative analysis offers valuable lessons: the UK's universal prenatal screening, Turkey's targeted approach in high-prevalence regions, and WHO's extended family screening. Crucially, local data reveals a 30% carrier rate among families with known thalassemia cases, strongly supporting a targeted screening strategy focused on high-risk groups

Parameters	Italy	Iran	Pakistan
Per capita Income	43,788 $	4388 $	1568 $
Literacy	98%	80%	59.13%
Health Spending	9% of GDP	4.2% of GDP	1.2 % of GDP
Population	61M	70 M	250 M
Thalassemia	12%	4%	5%

Proposed Framework and Remedial Measures: The recommended framework prioritizes feasibility and cultural sensitivity: Premarital screening targeting males from known thalassemia families ("index families"); mandatory couple registration if the male tests positive; prenatal testing only if the husband is a carrier; Chorionic Villus Sampling (CVS) with counseling if both partners are carriers; and offering Termination of Pregnancy (TOP) if the fetus is diagnosed with thalassemia major. Success hinges on robust supporting measures: nationwide public education campaigns, active NGO involvement, strengthening the Pakistan Thalassemia Federation, guaranteed confidentiality, securing religious endorsement, enhancing genetic counseling services, establishing a national thalassemia registry, and allocating dedicated government resources.

Conclusion: Effectively preventing thalassemia in Pakistan demands a comprehensive, multi-pronged strategy that directly addresses legislative ambiguities, deep-seated cultural and religious sensitivities, and critical resource limitations. The proposed culturally sensitive framework, combining targeted screening with robust implementation mechanisms and multi-stakeholder collaboration (government, healthcare providers, religious leaders, NGOs, and communities), offers a viable pathway. Success requires unwavering political commitment, adequate resource allocation, and leveraging platforms like BBMT to drive uniform policy adoption and execution nationwide, transforming thalassemia from a persistent burden into a preventable condition.

OP-022: Mapping the Burden of Transfusion- Transmissible Infections Across Sindh: Insights from 224,000 Blood Donors at Muhammadi Blood Bank (2019–2025)

Maeesa Sajeel, Sammar Fatima
Muhammadi Welfare Foundation, Karachi, Sindh, Pakistan

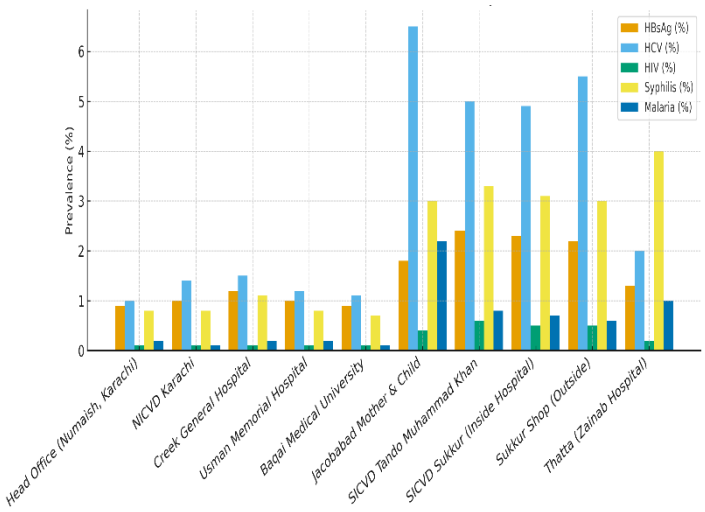
Background: Safe blood transfusion remains vital in Pakistan's healthcare system, particularly for patients with thalassemia, maternal complications, oncology needs, and trauma cases [1]. Despite ongoing improvements in screening, transfusion-transmissible infections (TTIs) continue to threaten patient safety [2]. Hepatitis C virus (HCV) and hepatitis B virus (HBV) are the primary contributors, with additional risks from syphilis, HIV, and Malaria. The Muhammadi Blood Bank, operated by Muhammadi Hematology Oncology Services and Welfare Foundation, runs multiple centers across Sindh. This study evaluates six years of donor screening data to estimate the prevalence of TTI and support safer transfusion practices

Objective: To determine the prevalence of major transfusion-transmissible infections among blood donors screened at Muhammadi Blood Bank branches from 2019 to 2025 and to identify high-burden regions requiring targeted interventions.

Methodology: A retrospective descriptive study was conducted using donor screening data from January 2019 to September 2025. A total of 223,997 voluntary and replacement donors from ten branches affiliated with tertiary and public hospitals across Sindh were included. HBsAg, Anti-HCV, and HIV p24 Ag with Anti-HIV 1 & 2 screening were performed using Electrochemiluminescence immunoassay (ECLIA) on the Cobas E411 Analyzer, Roche Diagnostics. Syphilis testing used ICT kits confirmed by ECLIA, and malaria testing combined ICT with microscopy. Descriptive statistics were used to calculate center-wise and overall prevalence.

Results: Among 223,997 donors, 94.6% tested non-reactive for all markers. The prevalence of infections was as follows:

Infection	Positive Cases (n)	Prevalence (%)
Hepatitis C	5,334	2.40
Hepatitis B	3,805	1.71
Syphilis	3,049	1.37
HIV infection	392	0.18
Malaria	648	0.29



Prevalence of Transfusion-Transmissible Infections by Center (2019–2025)

Conclusion: HCV emerged as the most prevalent transfusion-transmissible infection across all centers, surpassing HBV. Regional variation underscores the need for targeted interventions and the integration of NGO-generated data into national surveillance systems. Strengthening donor selection, expanding public education on TTI prevention, ensuring hepatitis B vaccination, and linking reactive donors to government treatment programs are essential. In high-prevalence areas such as Jacobabad and Sukkur, introducing rapid pre-donation screening may improve transfusion safety.

OP-023: Improving Blood Transfusion Safety through Quality Indicators: A Hemovigilance Approach at PIMS, Islamabad

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Background: Blood transfusion is life-saving and an integral part of the healthcare system. According to the IHN definition, hemovigilance is a set of surveillance procedures covering the whole transfusion chain, from donation and processing of blood and its components to their provision, transfusion to patients, and follow-up. TQIs provide quantifiable parameters that serve as basic tools for assessing the quality of transfusion processes and identifying areas needing improvement. Many developing countries, including Pakistan, are still in the evolving phases of establishing structured hemovigilance systems. As a tertiary care hospital, PIMS deals with a large number of blood transfusions on a daily basis. Implementing a systematic hemovigilance program at such a facility demands effective tools for monitoring and evaluation

Objective: The objective of the study is to assess the role and effectiveness of transfusion quality indicators in implementing and improving a hemovigilance system at PIMS Blood Bank, a tertiary care setup.

Methodology: A retrospective observational study was conducted at the PIMS Blood Bank from January 2024 to October 2025, assessing 59,202 whole blood and 1,140 apheresis donations. All blood donations and transfusions during the study period were included. Data were retrieved from computerized donor records, hemovigilance reports, adverse transfusion reaction forms, component preparation, and wastage logs. A predesigned and structured data collection sheet was developed to record all relevant Transfusion Quality Indicators (TQIs). National guidelines for quality control in transfusion were reviewed to design the proformas. Approval from the Institutional Review Board (IRB) of PIMS was obtained. Statistical analysis was done by SPSS version 20.

Results: During the study period, a total of 59,202 whole blood donations and 1,140 apheresis donations were recorded. 491 donor reactions reported, accounting for a reaction rate of 0.82%, with the majority of being mild vasovagal reactions. Among the recipients, adverse transfusion reactions were noticed in 653 (1.10%) cases of Red Cell Concentrates (RCC), 302 (0.52%) cases of Fresh Frozen Plasma (FFP) transfusions, and 164 (0.31%) cases of platelets. Febrile Non-Haemolytic Transfusion Reaction (FNHTR) were the most frequent, comprising of 49.86% of the cases, followed by allergic reactions at 32.97%.

From 59,202 donations, 55,702 components were prepared and 3,171 components (5.7%) were wasted. The most leading cause of wastage, seen in 63.67% of the cases, was reactivity for transfusion-transmitted infections (TTIs). Out of 126,958 blood request forms and samples, errors were duly noted, with incomplete request forms being the most common concern, occurring in 72% of the cases.

Conclusion: Transfusion quality indicators proved to be effective tools in the identification of areas demanding quality improvement in blood transfusion services. The overall donor and recipient reaction rates remained within the acceptable limit; however, significant lapses were noted regarding documentation and filling of request forms. TTIs continued to lead as the major cause of wastage of the components. Inclusion of TQIs in routine monitoring significantly strengthens the basis for a sustainable hemovigilance system at PIMS Blood Bank, promoting a culture of safety, accountability, and continuous quality improvement.

OP-024: Blood Transfusion-related Acute Adverse Reactions: A Single Centre Haemovigilance Initiative from Islamabad

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Background: This study was conducted to analyze the magnitude of adverse acute transfusion reactions in terms of contributing factors among in-patients receiving blood or blood components, and to determine the crossmatch to transfusion (C/T) ratio, transfusion probability (%T), and transfusion index (TI) of red cell concentrates.

Methodology: This study was conducted from August to October 2024, at Dr. Akbar Niazi Teaching Hospital (ANTH), Islamabad. The daily transfusion utilization of ANTH is an average of 15 units. A total of 527 red cell transfused patients were followed in this study. Socio-demographic and clinical data were collected from the HMIS. Baseline measurement and 24-hour periodic vital signs monitoring were conducted after each transfusion. In case of ATR, 4 mL of venous blood was drawn for CBC, blood grouping, direct antihuman globulin test (DAT), and crossmatching. Further, the following three indices were calculated for each patient separately, i.e. C/T ratio, transfusion probability, and transfusion index. Data were entered into and analyzed using Statistical Package for Social Science software (SPSS) version 26.0. A P value ≤ .05 was considered to indicate statistical significance.

Results: A total of 527 participants were included in this study, with more than half (56%) of them being females. The age of the participants ranged from 3 days to 88 years, and the median age of transfused patients was 34 years. The blood groups B positive (52.18%) and O positive (20.87%) were the most common ones. Acute transfusion reactions were observed in 0.38% of patients (2/527) and both were febrile non-haemolytic transfusion reactions. CT ratio was 1.69, TI 0.59, and %T 59.01.

Conclusion: The overall results of our analysis showed proper utilization of blood components at ANTH. Starting a hemovigilance system of monitoring, collecting, and evaluating data on adverse effects of blood transfusion locally and nationally will decrease the occurrence of acute transfusion reactions.

OP-025: Blood Transfusion-related Acute Adverse Reactions: A Single Centre Haemovigilance Initiative from Islamabad

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Introduction A blood transfusion is a routine medical procedure in which donated blood is provided to recipient after necessary steps such as compatibility testing and donor screening for blood- borne viruses, bacteria and parasite. The balance between demand and supply is increasing

significantly. The completion of blood request form is equally important for the successful blood transfusion, haemovigilance and traceability of adverse events. The judicious use of blood products can be calculated by compatibility testing and transfusion (C: T) ratio, transfusion probability and transfusion index (TI) thus in developing countries the use of blood products is not always judicious. These practices are resultant suboptimum utilization of blood products. In a study conducted in Islamabad revealed that only 12.7% BRF were found completely filled.

Methodology: This was a prospective study carried out in a Department of Pathology and Transfusion Medicine from June 2023 to November 2023. Total 3213 patients were entertained during the study period. The data were entered in SPSS version 20.0 (IBM SPSS Statistics for Windows, IBM Corp., Armonk, NY, USA) and analysed for completeness, legibility, and blood component utilization through calculation of key indicators including C:T ratio, transfusion probability (%T), and TI.

Results: Out of the 3213 request forms reviewed, only 01% forms were filled. The overall C: T value, transfusion probability %T, and transfusion index (TI) were 1.5, 64.8% and 0.6 respectively.

Conclusion: This study highlights significant gaps in the completion of Blood requisition form, only 01% forms are completely filled. There is a variation seen in blood transfusion practice among different hospital departments. Similar study is suggested at larger scale to assess the real scenario of C:T ratio, transfusion probability (TP) and transfusion index (TI). To improve blood management Hospital transfusion committee should take a bold step to encounter this problem.

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Disclosure

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