Brief Report: Setting up a Department

Pioneering Clinical Hematology and Bone Marrow Transplant Services in Central Travancore, Kerala: A Transformative Journey

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Keywords: Hematology, BMT, India, Kerala

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Abstract:
Although India possesses highly skilled medical professionals and cutting-edge medical facilities comparable to global standards, these resources are frequently concentrated in major cities, rendering them inaccessible to the economically & geographically disadvantaged. We delve into the challenges, triumphs, and transformative impact of bringing advanced haematology and BMT services to a Tier-3 city. The journey involves innovative adaptation, strategic planning, multidisciplinary collaboration, and a commitment to raising the standard of care.

Introduction:
Bridging the Healthcare Gap

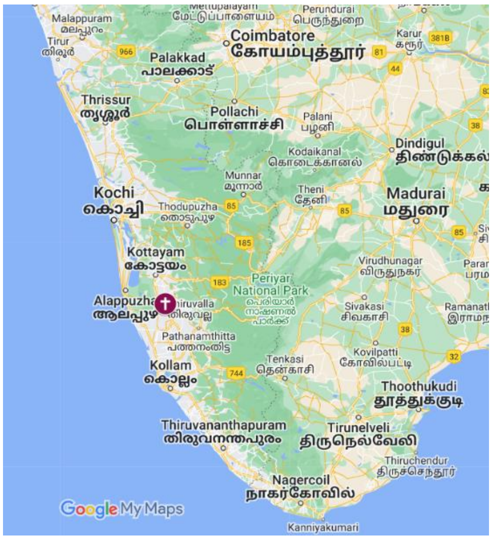
The challenges associated with establishing and delivering reliable clinical and laboratory haematology services in resource-constrained environments are widely acknowledged, and potential solutions have been proposed.(1) Despite the advancements in healthcare in India, unique challenges persist. There is a widespread recognition that patients in India encounter significant issues related to underdiagnosed and underreporting, resulting in a substantial portion of patients not receiving standard-of-care therapy.(2) While India boasts highly skilled medical professionals and state-of-the-art medical facilities meeting global standards, these resources are predominantly concentrated in major cities, creating barriers for the economically and geographically disadvantaged.(3, 4) Given that a significant proportion of patients in non-urban areas lack access to specialised healthcare, it becomes imperative to develop healthcare infrastructure in tier II and tier III cities in India, ensuring equitable access to quality healthcare for all, regardless of their location or economic status.(5)

We discuss the challenges and the transformative impact of establishing an advanced haematology and bone marrow transplant service at Believers Church Medical College Hospital in Thiruvalla, located in the Central Travancore region of Kerala, India.

Assessing the Need

Though there exist gaps; Kerala is home to an excellent health care service, repeatedly performing well on the national health indicators.(6, 7) However the availability of

Blood & Marrow Units (BMT) and specialized haematology services is limited. The Believers Church Medical College Hospital, situated in the town of Thiruvalla within Central Travancore, between Thiruvananthapuram and Kochi, serves as an essential facility to address this gap, of a focused haematology unit in this region (Map 1).(8)



Map1 -: Location of Believers Church Medical College Hospital (depicted as a cross in red)

In order to bridge this gap, initiatives were launched to identify individuals who were dedicated and willing to foster a service from its inception to fruition. The hospital leadership actively collaborated with various stakeholders, pinpointing a core team consisting of clinical, laboratory, and immunohematology specialists to spearhead the project.

Strategic Planning & Out-patient Initiation

The next step involved establishing the services. We began by initiating outpatient services with the scaffold of existing laboratory and blood bank services in the hospital. We established a shared care model with medical oncology services that were pre-existing in the institute utilising the available day care services and patient referral base. While financial considerations were significant, perhaps even more crucial was the establishment of professional relationships grounded in shared principles and vision, fostering consensus, and building a patient referral network. We explored this at multiple levels.

a. **Face-to-face Meetings**: Through active participation in gatherings such as meetings of the Indian Medical Association (IMA), physicians clubs, speciality-focused academic groups, Continuing Medical Education sessions, and organising quiz activities for medical students and postgraduates, we engaged with colleagues and professionals from diverse specialities and institutes.

b. **Webinars**: Given the substantial impact of COVID on physical meetings, we adapted our approach to include telemedicine-based health camps, community webinars, and awareness campaigns through broadcast media to effectively disseminate information.

c. **Personal Communications**: Leveraging the existing referral network of the parent institute, we utilised telephone calls and emails to inform stakeholders about the need and availability of services, emphasising improved care and coordination.(9)

d. **Awareness Programs for In-Hospital Staff**: Recognising a gap in awareness among in-hospital staff regarding haematology services, we organised weekly awareness modules for all staff members, from security personnel to physicians in other departments. Communication methods and content were adjusted based on the demographics of each group. Additionally, awareness days and months were acknowledged to sensitise the staff about diseases and treatment options.

e. **Outreach Program for Haemophilia**: Implemented a dedicated outreach program focussing on raising awareness and providing information about haemophilia, collaborating with the district intervention centre.

f. **Community Integration and Awareness**: Despite challenges posed by COVID and lockdown measures, active efforts were made to engage with the community through webinars involving adjacent churches, clergy, community webinars, newsletters, and print media. Recognising that informed patients can better understand their physicians, these initiatives aimed to enhance community awareness about medical conditions and treatment processes (10).

Infrastructure Development:

The next phase involved stepping up our services to include a bone marrow and cellular therapy unit, advanced laboratory diagnostics and apheresis services. The integration of cutting-edge diagnostic technologies, specialised laboratories, and a dedicated BMT unit formed a critical part of this phase. An estimate of the costs is included in Table 1.

a. Blood & Marrow Unit: Recognising that BMT units in developing regions benefit from dedicated HEPA-filtered rooms,(4, 5) we encountered additional challenges during the COVID pandemic, particularly in acquiring construction materials and labour amid lockdown restrictions. Although an area adjacent to the hospital was initially designated for transplant services as part of a cancer care expansion project, this plan could not be implemented due to financial constraints exacerbated by COVID. To address this, we reconfigured an area within the hospital, making necessary modifications to align with our objectives. Despite transport and labour disruptions during the lockdown, discussions with nearby hospitals led to the identification of BMT-grade materials from a facility that had procured materials and labour for their operation room expansion but was hesitant to invest further. This collaboration provided the necessary materials to complete our initiative.

b. **Laboratory Diagnostics**: During this period, we welcomed skilled colleagues with advanced training in diagnostic haematology, who concurrently elevated diagnostic capabilities by acquiring new technology pertinent to both malignant and benign haematology.

c. **Apheresis**: As an integral part of the transplant service, we collaborated with the industry to devise a financing model for the apheresis machine. This model allowed for an extended repayment period, enabling us to strengthen our infrastructure.

d. **Blood product support**: Due to COVID-19, there was a significant decrease in donor numbers.(11) To address this challenge, we relied on registered voluntary donors and utilised a WhatsApp group to

Table 1: Approximated expenses in setting up infrastructure for the new Haematology & BMT service		
S.No	**Purpose**	**Amount (₹)**
1	Building Addition	9,56,704
2	Television	72,201
3	UV Filter & Disinfection cabin	62,000
4	Vertical blinds and Curtains	18,400
5	Air Conditioner	1,15,739
6	Electrical & Plumbing	1,50,000
7	Syringe Pump & Infusion Pump	2,52,000
8	Crash Cart & Defibrillator	1,45,000
9	Beds & Furniture	2,00,000
10	Construction Cost of area converted to BMT (including HEPA filters)	20,00,000
11	Conversion of specialty single rooms	12,00,000
12	Apheresis Machine	26,88,000
	Total	**78,60,044**

communicate with donors during the lockdown. As restrictions eased, we increased donor camps by collaborating with local leaders. Additionally, we provided single-donor platelets using the newly procured apheresis machine which were divided into four bags to meet the patients' demand for products. We further established a Memorandum of Understanding (MOU) with a facility within 10km from our centre for blood product irradiation with daily transportation managed by our team. In case of shortages, we secured an MOU with the nearest government medical college as a contingency plan.

Core Care Team:

This entailed assembling a team of skilled and specialised professionals dedicated to delivering comprehensive and coordinated care for patients with blood disorders. We acknowledged that the excellence of our medical services hinged primarily on the knowledge and technical skills of our healthcare providers' team.(10)

a. **Physicians**: We successfully engaged professionals willing to dedicate their time to the care of patients with blood disorders. Their training encompassed knowledge training, reviewing literature and reporting our experiences.(12)

b. **Haematology & BMT nurses**: This group, integral to healthcare, plays a pivotal role in patient care, administering treatments, monitoring side effects, and providing education and support throughout the treatment process. We conducted training and professional development modules, and in addition to on-site training, a few nurses underwent training at the high-volume centre at CMC Vellore to shape their perspective, skills, and expertise.

c. **Specialist/Physician extenders**: We also provided extended training to some nurses, undergraduate doctors, and advanced clinical pharmacists, focussing on the specific diseases seen in our service. This included training them in relevant diagnostics and identifying warning signs for prompt remedial action, rather than functioning as generalists.

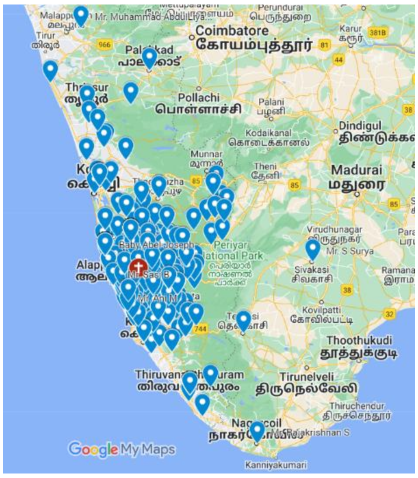
In addition to establishing the core team and infrastructure, efforts were also directed towards building a multidisciplinary team. This involved strengthening both paediatric and adult critical care services and collaborating with experts within and outside the institute.

Outsourced services: As an emerging centre and new service, we rely on outsourcing certain services to enhance our haematology care. One such service is flow cytometer including CD34 enumeration, conducted in collaboration with a centre that offers same-day reporting, facilitating prompt treatment decisions. This partnership also includes sample processing on holidays to support our new service. For apheresis services, we have on-site engineer support during stem cell collection and other cytapheresis as part of our equipment provider arrangement. Additionally, we have a cryopreservation arrangement for stem cells at an offsite centre. Previously, we used off-site labs for drug monitoring, but we now conduct monitoring in-house for immunosuppression during transplants. We've also outsourced molecular tests including next-generation sequencing through a special arrangement with an off-site lab, providing this service to our patients at reduced rates. These outsourced services are crucial in ensuring efficient and effective haematology care, providing us with the expertise and resources needed to deliver high-quality services.

Patient-Focused Regional Approach: Adjusting to the shifting demographics in Central Travancore, notably with a substantial elderly population, required careful considerations. We acknowledged that a majority of our patients were elderly, necessitating customisation of standard treatment plans to accommodate their unique needs and capacities. Recognising the challenges these patients encountered in communicating their progress with next of kin, many of whom were residing outside the country, we implemented telemedicine and remote discussions. This initiative helped facilitate family involvement and enable their participation in the care of their loved ones.

Clinical Impact

Despite the challenging path, in our opinion, patients in the region have benefitted (Map 2).



Map2 – Patient location to our service (Our centre as a cross in red, patient location in blue

Our service includes advanced diagnostics and specialised care for adults and children with haematologic malignancies, including chemotherapy, immunotherapy and bone marrow transplant.(13, 14) We also focus on diagnosis and treatment for thrombophilia, deep vein thrombosis, and coagulation disorders like hemophilia. With support from the community and referring physicians, individuals who might have otherwise resigned to fate or been compelled to travel long distances for treatment can now access nearby care for blood diseases.

FIG 1 : OUTPATIENT VISITS PER YEAR

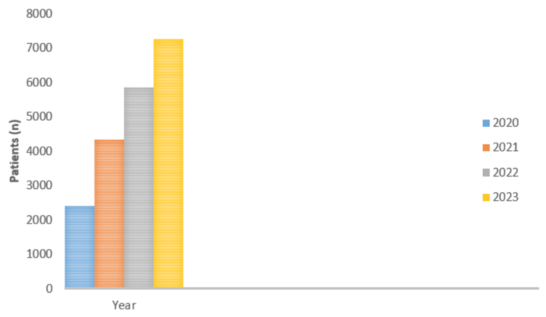
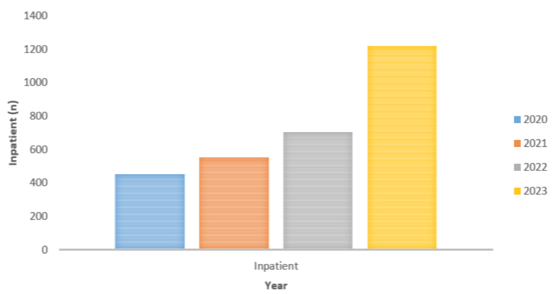


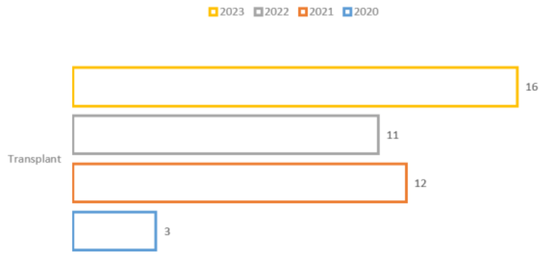
Figure 1 shows the temporal trend of our outpatient services during this period. During this timeframe, our inpatient services were repurposed. To enhance infection control, we implemented structured single rooms and wards for patients requiring care and comfort for blood-related diseases. Patients requiring admission as shown in Figure 2,

FIG.2:IN-PATIENT ADMISSIONS



included those with malignant diseases (Lymphoma, Myeloma & Leukaemia), as well as conditions related to thrombosis (DVT) and bleeding (haemophilia). Our Bone Marrow Transplant (BMT) services extend treatment to adults and children. Figure 3

FIG. 3: BONE MARROW TRANSPLANTS



BMT utilisation as shown in figure 3 at our centre, included 26 autologous transplants, 16 allogeneic transplants, 10 paediatric transplants, 4 matched unrelated donors and one haploidentical transplant. Among our initial paediatric patients was the son of a daily wage worker, whose bone marrow transplant was crowd-funded, enabling him to lead a normal life now. Two siblings affected by aplastic anaemia also now have a new lease of normal life.

Future Directions:

Our goal is to enhance healthcare standards in our region by providing comprehensive services such as bone marrow transplants and laboratory diagnostics. Collaborating with institutes, we are pursuing efforts to bring innovative therapies like Chimeric Antigen Receptor Therapy (CAR-T) to local patients. Our research efforts are focused on addressing region-specific health issues through well-structured research initiatives. As part of this commitment, core team members are undergoing training in clinical research skills through workshops, both domestically and internationally.(15) In our future plans, we are committed to expanding our impact in haematology research by partnering and contributing to registries such as the Haematology Cancer Consortium (HCC), Indian Society for Blood & Marrow Transplant (ISBMT), and Indian Myeloma Group (IMAGE).(16-18) These collaborations will enable us to access a wealth of data, enhance our research methodologies, and contribute valuable insights to the field.(19) Additionally, we aim to collaborate on developmental and research grants that focus on emerging areas of interest, such as the gut microbiome in hematology. The gut microbiome plays a crucial role in immune regulation and could have significant implications for haematologic disorders and therapies.(20) By exploring this area, we hope to uncover novel treatment strategies and improve outcomes for patients. We recognize the significance of enhancing knowledge and skill and welcome additional members to join the team and contribute to expanding access to health care for more patients in the region.

Conclusion: A Model for Tier-3 Healthcare Excellence

We did face multiple challenges during the establishment phase, which were compounded by lockdown & COVID-19. Overcoming challenges required a multifaceted approach involving strategic planning, community engagement, infrastructure development, and the formation of a skilled core care team. These efforts have significantly contributed to filling the gap in specialised haematology services in the region.

In conclusion, we hope our experience, though not novel, could serve as a blueprint/model for colleagues and healthcare professionals, policymakers, and stakeholders in their efforts to bring specialised haematology and BMT services to underserved regions, ultimately contributing to a more inclusive and comprehensive healthcare system.

Acknowledgements: We thank his holiness, The Metropolitan Moran Mor Athanasius Yohan I, for the conceptualisation and spearheading of this project, Rev Fr Sijo Pandapallil, and Rev Dr. Daniel Johnson for their critical inputs and guidance. We also value the work of Ms. Rosy Marcel, Deepa J, Mini Sarah Thomas, Ms. Ponnamma Thomas, and Ms. Sudha Mathew. Special thanks to our physician assistants, junior doctors, our wonderful nurses and patients for helping set up this project.

Funding Source: Nil

Conflict of Interest: None

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