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Public Private Partnership Challenges in Healthcare Infrastructure in India

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Abstract
Healthcare and education are pivotal to a nation's growth and competitiveness. India faces a critical healthcare infrastructure deficit, requiring 2.4 million hospital beds to meet WHO standards and 1.6 million to achieve the National Health Policy 2017 target by 2025. With non-communicable diseases projected to cause 60% of deaths by 2030, strengthening healthcare infrastructure in tier 2 and tier 3 cities is essential. Despite Public-Private Partnerships (PPPs) driving progress in other sectors, their presence in healthcare remains minimal, accounting for only 0.90% of all PPP projects in India.
This dissertation examines the role of PPPs in addressing India's healthcare infrastructure challenges. It explores PPP models, financial frameworks, key challenges, and stakeholder roles through case studies and surveys. The study identifies disparities in healthcare access and evaluates PPP models, including Infrastructure-based, Discrete Clinical Service, and Integrated Models, alongside financial mechanisms like Special Purpose Vehicles (SPVs) and Viability Gap Funding (VGF). While PPPs offer transformative potential, their adoption is limited. The research recommends policy enhancements, rural healthcare prioritization, and robust monitoring systems to ensure equitable and effective implementation.

Keywords. Public-Private Partnership, Healthcare Infrastructure, Indian Healthcare System

1. INTRODUCTION

Health is one of the most important indicators of quality of human life. It is a basic need, along with food, shelter, education, and a precondition for productivity and development. It is well established that there is a positive relationship between the health status of people and the economic development of the country. India's healthcare system consists of a complex mix of public and private providers, long with a significant presence of NGOs and charitable trusts. The government aims to provide free healthcare services across the nation, but the system struggles with issues such as underfunding, inadequate resources, and disparate quality. (India health system review, WHO.2024)
Currently, public healthcare facilities account for a valuable component of the overall system, yet they remain heavily reliant on community participation and seem to lack the reach in rural areas, where healthcare needs are the greatest. The private healthcare sector plays a dominant role in India's healthcare system, providing a substantial portion of healthcare services. However, due to the high cost of care and

the concentration of facilities in urban areas, the private sector remains largely inaccessible to economically weaker populations and those in rural regions. This disparity highlights a significant gap in access to affordable healthcare, particularly for marginalized and underserved communities. NGOs and charitable trusts are vital players in India's healthcare landscape, offering services to those underserved by both public and private sectors. They engage in numerous health initiatives targeting maternal health, child development, sanitation, and disease prevention (Samar Hafeez. 2024)

Ultimately, India's healthcare infrastructure requires a holistic approach that integrates both public and private sectors to address existing gaps. Public-Private Partnerships (PPPs) can play a pivotal role in improving healthcare delivery by leveraging shared resources, expertise, and technology. (weforum.org)

This is particularly crucial in tier-2 & 3 and rural areas, where access to healthcare services remains significantly limited. The successful implementation of collaborative frameworks is essential for overcoming healthcare challenges and establishing a scalable, sustainable healthcare system.

2. Literature Review

A partnership is "a relationship based upon agreements, reflecting mutual responsibilities in furtherance of shared interests. (www.pwc.com/global-health)

Public-Private Partnership (PPP) is a fixed-term contract between a public and a private entity to provide public assets or services. In this arrangement, the private entity handles the investment and/or management, and users may or may not need to pay a fee. The contract clearly defines how risks are shared between the two parties and the private entity is required to meet specific, pre-set performance standards. (DEA Ministry of Finance India)

Public-private partnerships (PPPs) in healthcare represent a collaborative framework to leverage the strengths of both sectors in addressing healthcare needs, improving service delivery, and developing infrastructure. [www.orfonline.org]

This model involves long-term agreements between public sector entities and private sector partners, aiming to share risks and resources while ensuring accountability and performance-linked payment mechanisms (Matthew Eldridge, Charles Cadwell). According to WHO standards, a minimum of 3 beds per 1000 people is required (World Health Organization, WHO). To meet WHO standards, a country should have at least 3 hospital beds per 1,000 people. Currently, India falls short of this benchmark, with only 1.3 beds per 1,000 people across both public and private healthcare facilities. This creates a significant deficit of 1.7 beds per 1,000 people. To address this shortfall and adequately meet the growing healthcare needs of the population, India requires an additional 2.4 million hospital beds (The Economic Times, November 23, 2023). According to a list of the Department of Economic Affairs, India, there are only 16 projects out of 1,883 Public-Private Partnership (PPP) projects are related to healthcare. (pppinindia.gov.in)

In India, the role of the PPP model to develop healthcare infrastructure is very low as compared to other Infrastructure projects. While we have the Potential of PPP model to bridge the gap in healthcare infrastructure and improve the operational services of healthcare projects in India.

The PPP India database reports a total of 1,883 Public-Private Partnership (PPP) projects across various development stages: Pre-construction, Construction, and Operation & Maintenance. These projects span multiple sectors, including Transportation, Energy, Water & Sanitation, Communication, and Social & Commercial Infrastructure.

Notably, the Social & Commercial Infrastructure sector accounts for a smaller share of PPP projects

compared to other sectors, representing only 10.24% of the total projects. Within this category, the healthcare sub-sector is significantly underrepresented, making up just 0.74% of all PPP projects. This indicates a relatively lower focus on healthcare infrastructure development through PPPs.

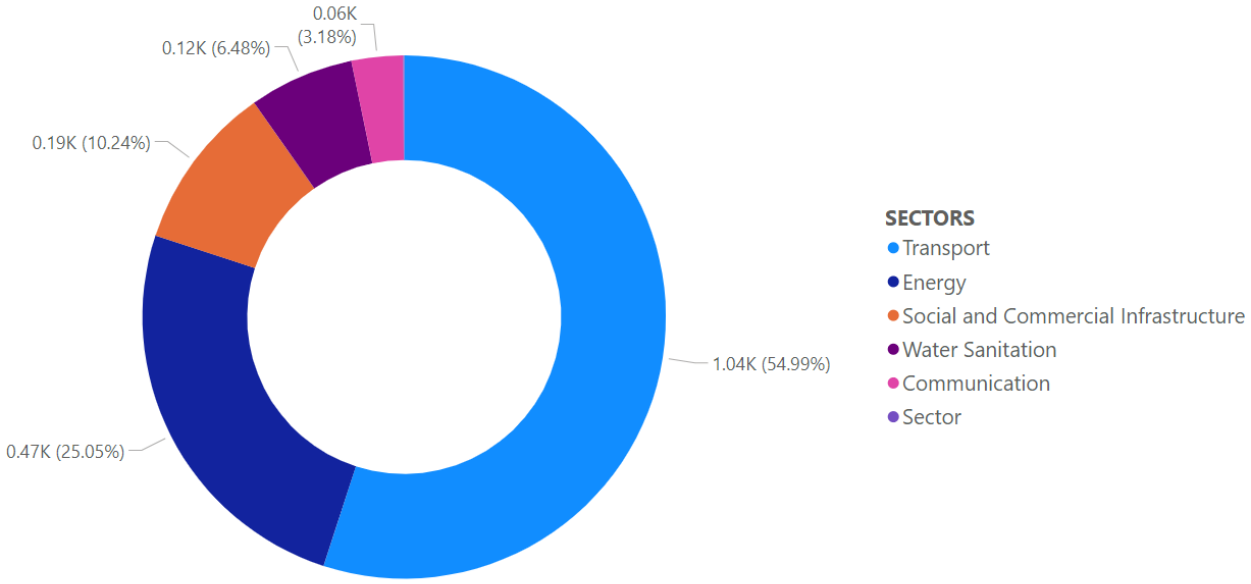

Figure 1, Statics of ongoing ppp projects & sector in India

2.1 Types of PPP Contracts

The World Bank classifies various Public-Private Partnership (PPP) delivery models into the following families:

Service Contract: A service contract is a system wherein the administration delegates specific and restrictive tasks to the private sector. These tasks may include facility maintenance or security services. The administration retains overall responsibility, while the private sector assumes management responsibility for employees. The service contract format encompasses agreements for single or multiple services with a private sector entity (outsourcing). The contract duration typically spans 1 to 2 years (Varga, 2020).

Management Contract: A management contract is a system in which the administration entrusts the management (O&M, etc.) of an entire facility, owned by the administration, to a private sector entity. The private sector does not assume financial risks such as financing, and the administrative entity provides the private sector with funds for operation or investment. The private sector consistently acts on behalf of the administration, which maintains ultimate responsibility for the public services provided by the trustee. In this instance, the contract duration typically ranges from 3 to 5 years (Pratap & Chakrabarti, 2017).

Lease Contract (Property Rental Contract): A lease contract is a system wherein the administration leases an institution to a private sector entity for a fixed period to facilitate the private sector's operation and maintenance (O&M) of a public facility. The administration recoups investments by collecting rental fees from the private sector over an extended period. The private sector conducts O&M of the facilities. When additional investment or facility renewal becomes necessary, the administration bears these expenses. The contract duration in this case typically ranges from 8 to 15 years (Zhang et al., 2017).

Full Divestiture Contract: Full divestiture, also referred to as privatization, occurs when all or substantially all of a government's interests in a utility asset or sector are transferred to the private sector. A divested or

privatized utility or public service is distinguishable from a private commercial enterprise in that the government generally retains some indirect form of control or regulatory mechanism over the privatized utility, typically through a license granted to the entity to deliver the service to the public (Nwangwu, 2016).

Concession Contract (Business Right Contract): A concession contract is a system wherein the administration entrusts the management of public works to a private sector entity that has acquired a business license (managerial right), and this contract is termed a business right contract. The private sector entity, having acquired a business license, conducts business management, including O&M of facilities and investment for business expansion. Although the facilities remain publicly owned, management is entrusted to the business license holder for the duration of the contract. The facilities are transferred back to the administration from the private sector upon completion of the contract duration. In this instance, the duration typically extends for 25 to 30 years to facilitate investment recovery (Utaria, 2019).

Research and innovation in project delivery models have resulted in various approaches to finding the best fit for infrastructure projects. These methods typically integrate functions like Finance (F), Design (D), Build (B), Operate (O), Lease (L), Own (O), Maintain (M), and Transfer (T). Based on these functions, types of projects, and the capacity of the public and private parties, different models define the roles and responsibilities of stakeholders (Koala, 2020).

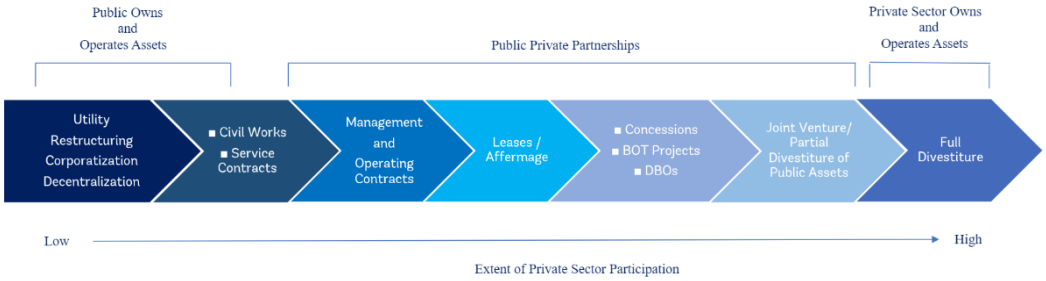

Figure 2, The extent of public and private participation (https://ppp.worldbank.org)

	Service Contracts	Management Contracts	Lease Contracts	Concession Contracts	Full Divestiture
Scope	Multiple contracts for a variety of specific tasks, such as operation, maintenance, billing, etc.	Manage entire scope of operations, including maintenance and customer service	Responsibility to manage revenue generation, operations, maintenance, and capital investment	Responsibility for all operations and maintenance, plus investment in infrastructure	Complete transfer of ownership and operational responsibilities from public to private sector.
Asset Ownership	Public	Public	Public	Public/Private	Private
O&M Responsibility	Public/Private	Public/Private	Public	Private	Private

Capital Investment	Public	Public	Private	Private	Private
Overall Level of Risk	Minimal	Low	Moderate	High	High
Compensation Terms	Fee for service, possibly with performance incentives	Usually paid as a fixed daily or monthly rate	Portion of tariff revenues	All or part of tariff revenues	Direct payments for asset sale
Special Features	Competition	Improve operational and commercial performance; may include performance incentives	More operational and commercial responsibility with private party	Private sector investment with long-term service guarantees	Privatization of assets; long-term commitment; often significant regulatory oversight to prevent monopolies.
Problems and Challenges	Contractors may have limited flexibility, given terms are short	Contracts often lack sufficient incentives for improvement	Revenue-sharing may create conflicts over cost-sharing	High investment risk due to long duration	Regulatory oversight is needed to prevent monopolistic behavior; consumer protection is essential for fair pricing; public opposition and political risks are significant.

Table 1 models Summary of Key Features of the Basic Forms of Public-Private Partnership (PPP), source ADB

2.2 Public-private partnership in Indian Healthcare Infrastructure:

From a philosophical standpoint, the primary aim of executing healthcare projects through public-private partnerships (PPP) is to ensure that vulnerable populations, particularly those who are economically disadvantaged or below the poverty line (BPL Patients), have access to modern medical services. To accomplish this goal, the government, acting as the Implementing Agency, plans to establish or upgrade hospitals across various regions of the country. These initiatives may involve constructing new hospital buildings and supporting infrastructure, installing medical equipment, and potentially offering clinical

services, ancillary medical support, and facility management services (such as cleaning, maintenance, and food service) for both inpatients and outpatients. (Department of Economic Affairs, pppIndia.gov.in)

Three facility-based PPP models are used globally to enhance healthcare infrastructure, aiming to improve service quality and expand healthcare access for the public. These models are tailored to leverage private sector expertise and investment, each with unique structures and responsibilities to meet specific healthcare needs.

Healthcare Public-Private Partnerships (PPPs) provide innovative solutions to infrastructure and service delivery challenges. Three primary models exist: the Infrastructure-Based Model, the Discrete Clinical Services Model, and the Integrated PPP Model.

The Infrastructure-Based Model involves private sector participation in designing, constructing, financing, and maintaining healthcare facilities. It allows the public sector to focus on clinical services while private entities handle non-clinical operations such as facility management and support services. Frameworks like Design-Build-Finance-Maintain (DBFM) and Private Finance Initiatives (PFIs) help ensure efficient infrastructure development under public oversight. The model is ideal for projects requiring significant capital investment without transferring core medical service management to the private sector.

The Discrete Clinical Services Model focuses on outsourcing specific healthcare services, such as diagnostic imaging and laboratory testing, to private partners while the public sector retains facility ownership and oversight. These services operate under Operation and Management (O&M) contracts, enabling public healthcare institutions to enhance specialized care without significant infrastructure investments. This approach improves service accessibility and efficiency, reducing patient waiting times and ensuring quality care.

The Integrated PPP Model encompasses end-to-end management by private entities, covering infrastructure development, operations, and clinical service provision. Examples include the Design-Build-Operate-Deliver (DBOD) model and Public-Private Integrated Partnerships (PPIPs). This model is best suited for large-scale projects requiring comprehensive service integration and private-sector investment. However, strong regulatory oversight is crucial to maintaining public health standards, affordability, and accessibility.

By strategically deploying these PPP models, governments can enhance healthcare infrastructure, improve service efficiency, and expand access to quality healthcare services while maintaining appropriate public sector oversight.

PPP Model Type	Infrastructure-based Model	Discrete Clinical Services Model	Integrated PPP Model
PPP Model Components	Infrastructure + financing + nonclinical services + clinical support services (as relevant)	Clinical services	Infrastructure + financing + nonclinical services + clinical and clinical support services
Private Partner Responsibilities	Design, build, finance, and maintain facilities. May include delivery of nonclinical services (e.g., laundry, cafeteria). Advanced projects may	Deliver discrete clinical services (e.g., clinical support services, specialty care services).	Design, build, finance, operate facilities, and deliver nonclinical and clinical services.

	include clinical support services (e.g., lab, radiology).		
Common PPP Model Names	Design Build Finance Maintain (DBFM), Design Build Finance Maintain Operate (DBFMO), Design Build Operate Transfer (DBOT), Private Finance Initiative (PFI), Infrastructure PPP, Accommodation model	Operation and management (O&M) contracts	Design Build Operate Deliver (DBOD), Clinical services PPP, Integrated PPP, Public Private Integrated Partnership (PPIP), Alzira model
Healthcare Delivery Impact	Lower	Medium	High

Table 2 Summary of the three most common PPP models in healthcare

3. Case Studies

To evaluate the contract structure of various Public-Private Partnership (PPP) models and their associated challenges, three case studies were identified. Data for this analysis was collected from the PPP India portal, official websites of relevant projects, and the World Bank report on Jay Prabha Medanta Hospital. These case studies provide valuable insights into the implementation, operational efficiencies, and obstacles encountered in healthcare PPP projects.

3.1 Case Study 1: Hemodialysis Unit at Zonal Hospital, Dharamshala, Himachal Pradesh

Rahi Care Dharamshala Pvt. Ltd. operates a dialysis unit within a government hospital under a Build-Operate-Transfer (BOT) model, enabling private sector expertise in healthcare while preserving public ownership post-concession. This approach supports government efforts to deliver accessible healthcare, particularly for free patients, by minimizing upfront investment and leveraging private efficiency.

The revenue model is based on user charges, with the government reimbursing costs for free patients verified by the state health cell. This hybrid financing ensures treatment access for both paying and non-paying patients while managing financial risk. However, maintaining service quality and equity is challenging, requiring oversight to ensure free patients receive care equal to that of paying patients. Financial sustainability hinges on timely reimbursements—within 21 days—to maintain cash flow and avoid financial strain. Additionally, operational responsibilities for staffing, particularly in rural areas, add complexity, requiring adequate recruitment and training to ensure consistent care.

Table 3 Case Study 1, Hemodialysis Unit Dharamshala, HP

Project Name	Hemodialysis Unit at Zonal Hospital, Dharamshala, Himachal Pradesh
Public Parties	- The Governor of the State of Himachal Pradesh, acting through the Special Secretary, Health, Govt. of Himachal Pradesh

	- Mission Director, National Rural Health Mission (MD, NRHM), HP State Health and Family Welfare Society (Confirming Party or SH&FWS)
Private Party	M/s Rahi Care Dharamshala Private Limited, Chandigarh
PPP Model	BOT (Build-Operate-Transfer)
Concession Period	7 years (10.02.2014 to 09.02.2021)
Performance Security	₹5,00,000 (Rupees Five Lakhs only)

3.2 Case Study 2: Sport Injury Centre at Safdarjung Hospital New Delhi

The Sport Injury Centre at Safdarjung Hospital operates under a Build-Operate-Transfer (BOT) model, partnering with Mahajan Imaging Centre and P. Bhasin Path Lab to offer diagnostic and pathology services. This setup harnesses private sector efficiency within a public facility, ensuring affordable, accessible healthcare while retaining public ownership.

The revenue model relies on user charges aligned with CGHS (Central Government Health Scheme) rates, making services affordable. Additionally, public financing support includes rent-free space and essential utilities provided by the hospital, reducing private partners' operational costs. This hybrid structure enables public resources to support private services cost-effectively. Maintaining service quality and equity at CGHS rates poses challenges in delivering high-quality diagnostics to all patients affordably, necessitating ongoing quality control. Financial oversight is handled by a hospital account officer who monitors revenue distribution daily, enhancing transparency. However, delays in distribution may impact the private partners' cash flow. Lastly, operational responsibilities for advanced equipment, staffing, and maintenance add to the private partners' costs, creating financial pressures due to CGHS rate constraints amid rising operational expenses and demand for advanced diagnostics.

Table 4 Case Study 2, Sport Injury Centre Safdarjung Hospital New Delhi

Project Name	Sport Injury Centre, Safdarjung Hospital, New Delhi
Public Parties	- HSCC
	- Ministry of Health and Family Welfare
Private Parties	- Mahajan Imaging Centre (Owner: Dr. Harsh Mahajan)
	- P. Bhasin Path Lab (Owner: Dr. Vishnu Bhasin)
PPP Model	BOT (Build-Operate-Transfer)
Concession Period	- Mahajan Imaging Centre: 10 Years
	- P. Bhasin Path Lab: 5 Years
Construction Period	30 Months
Capacity/Size	G+7 floors + 2 Basements, 35 Beds
Facilities Available	- Diagnostic (Radiological & Imaging) and Pathology Lab (on PPP)
	- Emergency services, Physiotherapy, Psychological Counselling, 3 OTs
Shareholding Pattern	- Mahajan Imaging Centre: 74% & Govt. Body: 26%
	- P. Bhasin Path Lab: 68.5% & Govt. Body: 31.5%

3.3 Case Study 3: Jay Prabha Medanta Super Specialty Hospital, Patna

The Jay Prabha Medanta Hospital project runs in a Design-Build-Finance-Operate-Transfer (DBFOT) model, leveraging private sector efficiency to develop and run a healthcare facility on government land. This approach ensures affordable care, with 25% of beds reserved for Below Poverty Line (BPL) patients,

making it suitable for delivering accessible services in public-private partnerships. The project's **financing structure** includes a private investment of INR 600 crore by Medanta, an annual concession fee to the Government of Bihar (increasing by 6.5% annually), and a 1% revenue share after commissioning. This setup provides the government with revenue while allowing operational flexibility for the private partner.

Service quality and equity remain essential to ensure that beds at CGHS rates maintain high standards of care. Financial oversight is critical for transparent revenue-sharing, minimizing risks of financial disputes. Operational responsibilities include managing escalating costs and meeting project milestones while adhering to CGHS rate requirements, which adds pressure to maintain service quality.

Table 5 Case study 3 Jay Prabha Medanta Super Specialty Hospital, Patna

Project Name	Jay Prabha Medanta Super Specialty Hospital, Patna
Public Parties	Government of Bihar
	Health Department, Government of Bihar
Advisory Body	International Finance Corporation IFC (World Bank Group)
Interested Bidders	• Medanta (offered the highest annual concession fee for the first year) • Apollo • Asian Institute of Medical Sciences • Global Healthcare Systems Private Limited • Narayan Hrudayala • Abengoa from Spain
Tender Awarded to	Medanta
PPP Model	Design, Build, Finance, Operate, and Transfer (DBFOT)
Concession Period	33 Years
GoB Provided	7-acre Existing Gov. Hospital land to Medanta
Construction Period	30 Months
Medanta Investment	600 Cr.
Concession Signed	2015
Commercial Operation Date	2021
Hospital Capacity	500 beds
Shareholding Pattern	
Annual concession fee by the Concessionaire to GoB.	Annual Concession fee (will increase at 6.5% every year)
	1% of the annual revenue
Public Benefits	25% of the operationalized beds (Regulated Beds) will be capped at Central Government Health Scheme (CGHS) rates

4. Questionnaire Survey:

Based on the literature review and case studies, a questionnaire survey was designed and administered to validate the identified challenges and gather insights from key stakeholders involved in PPP-based healthcare projects, spanning from project initiation to the operational stage. Data collection was primarily

conducted at the Sport Injury Centre, Safdarjung Hospital, New Delhi (Case Study 2), as it was the most feasible site for me. As per the time constraints, primary data could not be gathered from the other two case studies. To ensure comprehensive input, I visited many times to the Sport Injury Centre to engage with the targeted audience, including healthcare staff, managers, and patients. Some respondents completed the survey online upon request, while others responded on hard copies which I brought. Additionally, to include the perspective of procurement and tendering professionals, I visited HSCC Limited (Hospital Services Consultancy Corporation Limited) in Noida. This approach enabled the collection of diverse responses to support the study's objectives effectively.

5. Research Methodology

This research adopts an exploratory and mixed-method approach to investigate the Public-Private Partnership (PPP) models in healthcare infrastructure, with a particular focus on identifying key challenges and analyzing financing structures.

The critical review method is employed to evaluate existing research and develop new hypotheses or models. Unlike systematic reviews, which often provide quantitative answers, critical reviews focus on qualitative analysis, examining prior research and competing theories to build a foundation for conceptual development.(Hyett, N.; Kenny, A & all 2014)

This study employed a two-phase research methodology to identify and validate the challenges associated with PPP-based healthcare projects, focusing on key stages from project initiation to operations. In the first phase, an extensive literature review and analysis of case studies were conducted to identify potential challenges and categorize them into relevant themes. These themes served as the foundation for developing a structured questionnaire to gather insights from stakeholders.

The second phase involved the administration of the questionnaire survey to validate the identified challenges. Data collection was primarily conducted at the Sport Injury Centre, Safdarjung Hospital, New Delhi (Case Study 2), selected for its feasibility within the given time constraints. To ensure diverse and comprehensive input, the targeted audience included healthcare staff, managers, and patients at the Sport Injury Centre, with responses collected through both online submissions and hard copies. Additionally, to incorporate the perspective of procurement and tendering professionals, data was gathered from HSCC Limited (Hospital Services Consultancy Corporation Limited) in Noida. This multi-faceted approach ensured a balanced representation of viewpoints, enhancing the validity and relevance of the study's findings.

The collected data was analyzed using a mixed-method approach to comprehensively validate the identified challenges in PPP-based healthcare projects. Quantitative data from the survey responses were organized and statistically evaluated using descriptive statistics, including percentages and frequencies, to determine the significance and prevalence of each identified challenge.

For qualitative insights, open-ended responses and observations were thematically analyzed to capture detailed perspectives and enhance the context of the quantitative findings. This dual approach facilitated a nuanced understanding of the challenges across project stages, enabling the formulation of robust conclusions and actionable recommendations for improving the implementation and operation of PPP-based healthcare infrastructure projects in India.

6. Results and Discussions

A comparative analysis of all case studies is done to highlight the key findings, financial structures, and

operational challenges associated with each case study. It shows the diverse applications of PPP models and financial structure for a healthcare infrastructure that can vary as per the project and healthcare service (clinical or non-clinical services) typology. The financial structure and VGF allocation are contingent upon the designated healthcare services for BPL patients, their proportion of healthcare services, and the prevailing CGHS rates.

Table 6 Case Studies Comparative Analysis

	Aspect	Case Study 1: Rahi Care Dharamshala Pvt. Ltd. (Dialysis Unit)	Case Study 2: Sport Injury Centre (Diagnostic Services)	Case Study 3: Jay Prabha Medanta Hospital (Full Facility)
PPP Model & Scope	PPP Model Used	Build-Operate-Transfer (BOT)	BOT	Design-Build-Finance-Operate-Transfer (DBFOT)
	Scope of Services	Dialysis services for patients, including free treatments for verified patients	Diagnostic and pathology services, especially affordable care at CGHS rates	Full hospital services with special provisions for Below Poverty Line (BPL) patients
	Suitability of PPP Model	Effective for specific healthcare services (e.g., dialysis) where private expertise is required	Allows the public hospital to provide specialized diagnostics without direct investment	Suitable for large-scale hospital development, leveraging private efficiency and resources
Financial Structure	Revenue Model	User charges applied by private operator for paid patients; reimbursement for free treatments	Revenue generated from user charges based on CGHS rates for referred patients	Private investment with concession fees and revenue share with government, aligned with annual increases
	Public Financing Element	Reimbursement by government for free patients; hybrid model ensuring both paid and free treatments	Hospital provides rent-free space and essential utilities to reduce operational costs for private partners	Concession fees to the government, annual increase in fees, plus 1% revenue share
Challenges	Service Quality and Equity	Challenge in maintaining equal quality for paid and free patients, requiring strong oversight	Continuous monitoring needed to ensure quality, especially for CGHS-rate patients	Ensuring high-quality services for CGHS-rate patients
	Financial Sustainability	Relies on timely government reimbursements;	Financial impact if revenue distribution is delayed	Emphasis on transparent revenue

		financial risk if reimbursements are delayed		sharing to avoid financial disputes
	Operational Responsibilities	Challenges in maintaining clinical staff, especially in rural areas	Private partners manage equipment, staffing, and maintenance, with financial constraints on operations	Operational responsibilities include managing rising costs while adhering to project milestones

6.1 Questionnaire Survey Analysis

The survey findings provide valuable insights into the challenges and barriers encountered in implementing Public-Private Partnership (PPP) models in healthcare. These challenges have been categorized into project phases, regulatory concerns, financial constraints, operational difficulties, and their impact on healthcare service delivery.

Survey respondents identified several systemic challenges that hinder the successful implementation of PPP projects. A lack of clear policy frameworks was highlighted by 46.2% of respondents as a critical factor causing delays and inefficiencies. Similarly, approval delays, also cited by 46.2%, led to disruptions in project timelines and increased costs. Difficulty in stakeholder coordination was emphasized by 30.8% of respondents, underlining the complexities of aligning diverse entities. Additionally, 34.6% noted issues in equitable risk-sharing between public and private stakeholders, further complicating the implementation of these projects.

Challenges were also categorized based on different project stages. During the initiation and planning phase, 31.4% of respondents reported complexities in defining project goals and developing a structured framework. Financing issues, including funding constraints and challenges in structuring agreements, were cited by another 31.4%. In the construction phase, 21.6% faced delays, quality control issues, and coordination difficulties. Meanwhile, 13.7% of respondents struggled with maintaining efficient healthcare services during the operational phase.

Regulatory challenges also posed significant obstacles, with contract management and enforcement identified by 49% of respondents as the most pressing issue. Delays in obtaining environmental clearances were cited by 19.6%, while legal disputes and land acquisition difficulties were reported by 15.7% and 13.7% of respondents, respectively. Financial challenges were another major concern, with 50% of respondents highlighting high operational costs, while 44.2% reported difficulties in securing long-term financing. Delayed payments from the public sector (38.5%) and unclear revenue-sharing mechanisms (23.1%) further complicated financial sustainability.

Operational difficulties were particularly prominent, as maintaining service quality emerged as the most significant issue for 53.8% of respondents. Additionally, 44.2% cited challenges in maintaining medical equipment, while 42.3% reported delays in the procurement of supplies. Staffing and human resource issues were also highlighted by 26.9% of respondents as a critical concern. The impact on healthcare service delivery in PPP hospitals was evident, with high treatment costs being a concern for 35.3% of respondents, long waiting times affecting 25.5%, poor service quality cited by 23.5%, and lack of transparency in billing raised by 15.7%.

Key issues affecting daily operations included poor coordination between public and private management,

identified by 63.5% of respondents as a major challenge. Inadequate staffing (25%), outdated medical equipment (23.1%), and limited access to training and professional development (23.1%) were also cited as barriers to effective service delivery. Furthermore, barriers to successful public-private collaboration included conflicting interests and priorities (49.1%), lack of clear communication channels (45.3%), differences in organizational culture and values (28.3%), and insufficient performance incentives (22.6%). These findings underscore the multifaceted challenges that affect PPP healthcare projects. Addressing these barriers through clear policy frameworks, improved coordination, better financial structures, and enhanced operational efficiency can significantly enhance the effectiveness of PPPs in healthcare service delivery.

7. Conclusions

Healthcare and education are fundamental pillars of a nation's growth and development, directly impacting economic progress and global competitiveness. Despite its significance, India's healthcare infrastructure faces considerable deficiencies, including a shortage of 2.4 million hospital beds to meet WHO standards and 1.6 million beds to achieve the National Health Policy (NHP) 2017 target of two beds per 1,000 population by 2025. Additionally, the rising burden of non-communicable diseases (NCDs) is expected to contribute to 60% of deaths in India by 2030 (WHO, 2024; Ministry of Health and Family Welfare, 2017). To bridge these gaps, India must prioritize healthcare expansion, particularly in tier-2 and tier-3 cities, to enhance secondary and tertiary healthcare services.

Public-Private Partnerships (PPPs) offer a viable solution to India's healthcare infrastructure challenges, yet they account for only 0.90% of total PPP projects. Various PPP models, such as Build-Operate-Transfer (BOT) and Design-Build-Finance-Operate-Transfer (DBFOT), have been employed to introduce specialized healthcare services. While the DBFOT model facilitates greenfield projects without significant upfront government investment, maintaining oversight during the operational phase is essential. Active government participation on project boards can ensure accountability in decision-making, revenue allocation, and patient satisfaction (Virani & Ramesh, 2019; La Forgia, 2020).

Despite their potential, PPP-based healthcare initiatives encounter several challenges. A survey analysis revealed that unclear policy frameworks (46.2%), risk allocation issues (34.6%), and difficulties in planning and initiation (31.4%) hinder effective project execution. Financial constraints also pose a challenge, with 31.4% of respondents highlighting funding-related concerns. Furthermore, operational inefficiencies—such as high costs (50%), lack of long-term financing (44.2%), and poor public-private coordination (63.5%)—negatively impact project sustainability. Staffing shortages (26.9%), cultural disparities (28.3%), and billing transparency concerns (15.7%) further limit the effectiveness of PPPs in delivering quality healthcare services (Rodrigues, 2023; Das & Guha, 2024).

To enhance the success of PPP healthcare projects, the government must address policy clarity, operational efficiency, and financing mechanisms. Proactive monitoring of operational performance, financial transactions, and revenue-sharing agreements is crucial to fostering transparency and accountability. Strengthening governance frameworks and ensuring consistent stakeholder collaboration will significantly improve healthcare service delivery, ultimately contributing to India's overall development (Hafeez, 2024; Economic Times, 2023).

Future studies can focus on developing mitigation strategies to address the challenges faced by Public-Private Partnerships (PPPs) in India's healthcare infrastructure. Emphasis should be placed on enhancing the policy framework and establishing robust monitoring systems that prioritize the needs and perspectives

of the end users (targeted population). By aligning PPP initiatives to ensure equitable access, quality, and affordability, future research can contribute to optimising the deployment of PPPs in the healthcare sector, enabling them to deliver holistic and positive impacts across all dimensions of healthcare delivery.

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