Impact Assessment Study of EGF's CSR Support for Oxygen Plant Projects in Tamil Nadu, Uttarakhand, and Manipur

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Abbreviations

CSR - Corporate Social Responsibility
EGF - Eicher Group Foundation
EML - Eicher Motors Limited
FY - Fiscal Year
ICUs - Intensive Care Units
IRECS - Inclusiveness, Relevance, Efficiency and Effectiveness, Convergence, Service Delivery
LMICs - Low- and Middle-Income Countries
MT - Metric Tonnes
NABH - National Accreditation Board for Hospitals and Healthcare Providers
NGO - Non-Governmental Organisation
SDG - Sustainable Development Goal
SSA - Sub-Saharan Africa
VECV - VE Commercial Vehicles Limited
WHO - World Health Organization

Executive Summary

The report provides an impact assessment of the Eicher Group Foundation (EGF)'s financial support to 5 hospitals in Tamil Nadu, Uttarakhand, and Manipur during FY 2021-2022, specifically for the Oxygen Plant Project implemented by Ekam Foundation. This initiative aimed to establish an oxygen plant in selected hospitals bringing in a sustainable solution to the medical oxygen demand-supply problem that was exacerbated during COVID-19.

The assessment, conducted by Samhita Social Ventures, employed a qualitative research design, including in-depth interviews and secondary research, and evaluated the project's impact through the IRECS framework, focusing on inclusiveness, relevance, efficiency and effectiveness, convergence, and service delivery. Interviews were conducted via telephone with quartermaster staff and doctors from the concerned hospitals. Due to the absence of beneficiary data, patient interviews were not possible, and data was primarily obtained from secondary sources such as national media and research papers on COVID-19 health infrastructure.

The initiative responded to the critical need for a reliable medical oxygen supply, ensuring continuous availability for patient care during the pandemic's peak. Key findings indicated significant improvements in patient care catering to intensive care units and paediatric wards, reduced logistical challenges during the COVID-19 second wave in India when there was a higher waiting period for oxygen cylinders and enhanced preparedness for future health crises. The main challenges were that in small hospitals, the oxygen plant is not sustainable in the long term due to high operational expenses, although during COVID-19, the plant catered to around 50-100 patients daily. Some hospitals, such as the Raja Hospital in Thanjavur, also required direct pipelines from the oxygen plant to the respective wards. Upon evaluation, it is recommended to use oxygen concentrators in smaller hospitals to meet oxygen supply demands and strengthen the health infrastructure, such as the construction of pipelines or any other supporting infrastructure that could optimise the use of the oxygen plant. Also, the adequacy of oxygen supply must be coupled with training regarding appropriate oxygen use, adequate health care staffing, monitoring equipment, personal protective equipment, vaccination, and other essential initiatives to meaningfully address the existing inequities in healthcare provision.

1. Introduction

Eicher Motors Limited (EML) is the listed parent company of Royal Enfield, a renowned brand in middleweight motorcycles. Established in 1901, Royal Enfield holds the distinction of being the world's oldest continuously produced motorcycle brand. Eicher Motors defines its commitment to the community in a holistic sense, encompassing social, economic, and environmental spheres within which it operates and contributes[1]. The company implements its Corporate Social Responsibility (CSR) initiatives either independently or through the Eicher Group Foundation (EGF), a Section 8 Company jointly established by Eicher Motors Limited and its unlisted subsidiary VE Commercial Vehicles Limited (VECV). This collaborative effort aims to facilitate and oversee CSR projects undertaken by both entities, ensuring a strategic and impactful approach to social responsibility.[2]

The present report offers a comprehensive impact assessment of EGF's financial support to 5 hospitals in Tamil Nadu, Uttarakhand, and Manipur during FY 2021-2022, specifically for Oxygen Plant Project implemented by Ekam Foundation.

[1]Eicher:: Eicher Motors Limited:: About Us. (2016). https://eicher.in/about-us/heritage

[2] Annual Report on Corporate Social Responsibility (CSR) Activities for the financial year 2022-23. (2023). In STATUTORY REPORTS (pp. 178–179) [Report]. https://eicher.in/content/dam/eicher-motors/investor/corporate-governance/corporate-social-responsibility/CSR-Report-2022-23.pdf

2. About the Programme

2.1 About Implementation Partner – Ekam Foundation

Ekam Foundation is a leading non-governmental organisation (NGO) in India focused on improving healthcare. Founded by Dr. Sailakshmi Balijepally, Ekam works in partnership with government and private organisations to enhance healthcare access in rural communities. The foundation supports primary, secondary, and tertiary healthcare facilities, trains healthcare workers, and ensures the maintenance of medical equipment. With over 1 million lives impacted, Ekam continues to strive for the well-being of its target populations through comprehensive health programs.

2.2 Relevance of Oxygen Plants during COVID-19 pandemic

By the end of 2021, the World Health Organisation (WHO) had reported more than 6.2 million deaths worldwide due to COVID-19[3]. Even before the onset of COVID-19, lower respiratory tract infections or pneumonia remained the largest cause of death due to communicable diseases worldwide[4]. Given that some of these deaths were likely preventable with adequate oxygen therapy, there has been a longstanding but urgent need to assess and radically alter the mechanisms of Oxygen supply[5].

The COVID-19 pandemic markedly compounded the preexisting deficit of medical Oxygen in resource-limited settings. While needs have varied across epidemiological waves, the WHO estimated that approximately 15%–20% of patients with COVID-19 illness required supplemental Oxygen therapy[6]. Furthermore, a 10-country retrospective analysis in Africa in 2023 showed that, among COVID-19 patients in intensive care units, 50% of patients died without supplemental Oxygen[7]. Not accounting for treatment of other Oxygen-requiring conditions, the estimated daily need for Oxygen in the treatment of COVID-19 cases in Low- or Middle-Income Country (LMICs)

[3] Ross, M., & Wendel, S. K. (2023). Oxygen inequity in the COVID-19 pandemic and beyond. *Global Health Science and Practice*, *11*(1), e2200360. https://doi.org/10.9745/ghsp-d-22-00360

[4] Bender, R. G., Sirota, S. B., Swetschinski, L. R., Dominguez, R. V., Novotney, A., Wool, E. E., Ikuta, K. S., Vongpradith, A., Rogowski, E. L. B., Doxey, M., Troeger, C. E., Albertson, S. B., Ma, J., He, J., Maass, K. L., AFSimões, E., Abdoun, M., Aziz, J. M. A., Abdulah, D. M., . . . Kyu, H. H. (2024). Global, regional, and national incidence and mortality burden of non-COVID-19 lower respiratory infections and aetiologies, 1990–2021: a systematic analysis from the Global Burden of Disease Study 2021. *Lancet. Infectious Diseases/ the Lancet. Infectious Diseases*. https://doi.org/10.1016/s1473-3099(24)00176-2

[5] Ross, M., & Wendel, S. K. (2023). Oxygen inequity in the COVID-19 pandemic and beyond. *Global Health Science and Practice*, *11*(1), e2200360. https://doi.org/10.9745/ghsp-d-22-00360

[6] Ibid.

[7] Ibid.

at the end of 2021 remained at more than 1 million Oxygen cylinders per day[8]. Additionally, many LMICs in Sub-Saharan Africa (SSA) have also been disproportionately affected by inequity in access to vaccines and basic medical supplies (e.g., face masks)[9]. Given that vaccines lower the risk of virus progression and face masks, social distancing, and other measures slow virus spread, these additional inequities likely intensified the mismatch between Oxygen capacity and demand in these contexts.

In May 2021, India's health infrastructure was overwhelmed by the caseload resulting from the national second wave of the COVID-19 pandemic, with a lack of Oxygen, manpower, drugs, and hospital beds[10]. The most difficult challenge for the country was providing an adequate volume of medical Oxygen for the most severely ill patients who needed Oxygen support[11]. As of May 2021, Tamil Nadu had an installed capacity of around 400 tonnes of liquid Oxygen. The State was using 450 tonnes for medical purposes, and the demand was expected to increase due to the COVID-19 outbreak, with active cases crossing 1.25 lakh in April 2021[12]. The delay in releasing the agreed finalised medical Oxygen allocation plan put the State's Oxygen supply to hospitals in a difficult situation and forced ad-hoc management, which was not sustainable[13]. A permanent solution to meet the demand for Oxygen in hospitals was needed and setting up an Oxygen plant in hospitals was one such initiative.

2.3 About the Programme – Oxygen Plant Project

During the COVID-19 pandemic, India experienced the highest demand for Oxygen among low, lower-middle, and upper-middle-income countries, as reported by the PATH Oxygen Needs Tracker[14]. At the peak of infections in September 2020, with around 56,000 cases, Tamil Nadu required 260 metric tonnes (MT) of Oxygen daily[15]. By April 2021, with over 1 lakh active cases,

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[8] Ross, M., & Wendel, S. K. (2023). Oxygen inequity in the COVID-19 pandemic and beyond. *Global Health Science and Practice*, *11*(1), e2200360. https://doi.org/10.9745/ghsp-d-22-00360

[9] Ibid.

[10] *Strengthening Oxygen ecosystem for COVID-19 and beyond in India*. (n.d.). PATH. https://www.path.org/our-impact/resources/strengthening-Oxygen-ecosystem-for-COVID-19-and-beyond-in-india/

[11] Ibid.

[12] By Our Bureau. (2021, May 6). *Oxygen supply to hospitals in 'difficult situation': TN in Madras HC*. BusinessLine. https://www.thehindubusinessline.com/news/national/oxygen-supply-to-hospitals-in-difficult-situation-tn-in-madras-hc/article34501446.ece

[13] Ibid.

[14] Team, B. V. a. D. J. (2021, April 29). *Covid-19 in India: Cases, deaths and oxygen supply*. https://www.bbc.com/news/world-asia-india-56891016

[15] Verma, M., Mirza, M., Sahoo, S., Roy, S., Kakkar, R., & Singh, D. (2023). India's multi-sectoral response to oxygen surge demand during COVID-19 pandemic: A scoping review. *Indian Journal of Community Medicine/Indian Journal of Community Medicine*, *48*(1), 31. https://doi.org/10.4103/ijcm.ijcm_665_22

the daily Oxygen requirement had surged beyond 350 MT[16].

Ekam, in coordination with the Government Medical College Hospitals in Tamil Nadu dedicated to treating COVID-19 cases, understood that there is a requirement to set up an Oxygen Generation Plant. As a response to this situation, Ekam in partnership with EGF helped set up Oxygen Generation plants at 2 Government Medical College Hospitals in Tamil Nadu that are dedicated to treating COVID-19 cases and 3 army hospitals – one each in Tamil Nadu, Uttarakhand, and Manipur listed out in the table below:

State	District	Hospitals	Number of beds
Tamil Nadu	Chennai	Military Hospital	90 beds
Tamil Nadu	Thanjavur	Government Raja Mirasudar Hospital	55 beds (expanded currently to 500 beds)
Tamil Nadu	Tenkasi	Government Headquarters Hospital	80 beds
Uttarakhand	Almora	Military Hospital, Ranikhet	50 beds
Manipur	Imphal West	Assam Rifles Multispeciality Hospital	50 beds

Table 1 List of selected hospitals

[16] Ibid.

3. Research Methodology

In FY 2024-25, Samhita Social Ventures undertook a project evaluation of the Oxygen Plant Programme supported by EGF and implemented by Ekam Foundation in FY 2021-22, with the intention of assessing the initiative's outcomes.

3.1 Research Objectives and Framework

3.1.1 Objectives of the Study

i. Assess the impact and changes resulting from EGF-supported initiatives at 2 dedicated COVID-19 Government Medical College Hospitals in Tamil Nadu and 3 army hospitals – one each in Tamil Nadu, Uttarakhand, and Manipur;
ii. Identify key elements triggering project-induced changes;
iii. Determine evidence of improved patient services.

3.1.2 Analysis - IRECS Framework

IRECS is a tool that focuses on evaluating the performance of social development projects in terms of inclusiveness, relevance, effectiveness and efficiency, convergence, and service delivery. It helps gain a qualitative understanding of the impact created, stakeholder perception, extent of collaboration with other actors and sustenance of the change.

Parameter	Description	Indicators
Inclusiveness	• Extent to which communities equitably access benefits of assets created and services delivered • Role of different stakeholders in project design and implementation	• Increased accessibility for medical supply Oxygen
Relevance	• Whether the project is geared to respond to the needs of communities	• Need and operational efficiency
Efficiency and Effectiveness	• The extent to which project implementation meets the expectations of communities, • Extent of intended and unintended positive (benefits), socioeconomic, and cultural changes accrued for beneficiaries • How efficiently resources are utilised	• Improvement in patient care • Lack of sustainability of operational expenses

Parameter	Description	Indicators
Convergence	• Degree of convergence with government/other partners and linkages with concurrent government programmes in the field • Degree of stakeholder buy-in achieved	• Selection of hospitals
Service Delivery	• State of operations of programme outputs in terms of delivering intended services to beneficiaries	• Enhanced preparedness for future

Table 2 IRECS Framework and Indicators

3.1.3 Modes of Data Collection

Samhita conducted a qualitative study involving primary and secondary research. This involved the following:

1. Secondary Research

This stage included the review and analysis of literature consisting of research papers on Oxygen availability and capacity of states during COVID-19, and programme design to map the various stakeholders involved and create a research framework. The secondary research faced challenges due to the lack of beneficiaries' data, progress, or annual reports. The project reports were limited as this being an emergency initiative during COVID-19, the hospitals did not keep track of the number of patients treated through the intervention. However, interactions with the implementation partner and EGF project representatives helped identify and engage the appropriate stakeholders.

2. Primary Research

The details of the methods used for this study are as follows -

- **In-depth interviews / Key Informant Interviews:** In-depth interviews were conducted with quartermaster staff, and doctors from the government and army hospitals via telephone using a semi-structured questionnaire.
- **Written responses:** In certain army hospitals, due to strict protocols, written responses were sought for questions regarding the need felt, impact and sustainability of the Oxygen plant project.

3.1.4 Sampling

For the qualitative data collection, purposive sampling was followed to interact with programme stakeholders as per the sample sizes stated in the figure below.

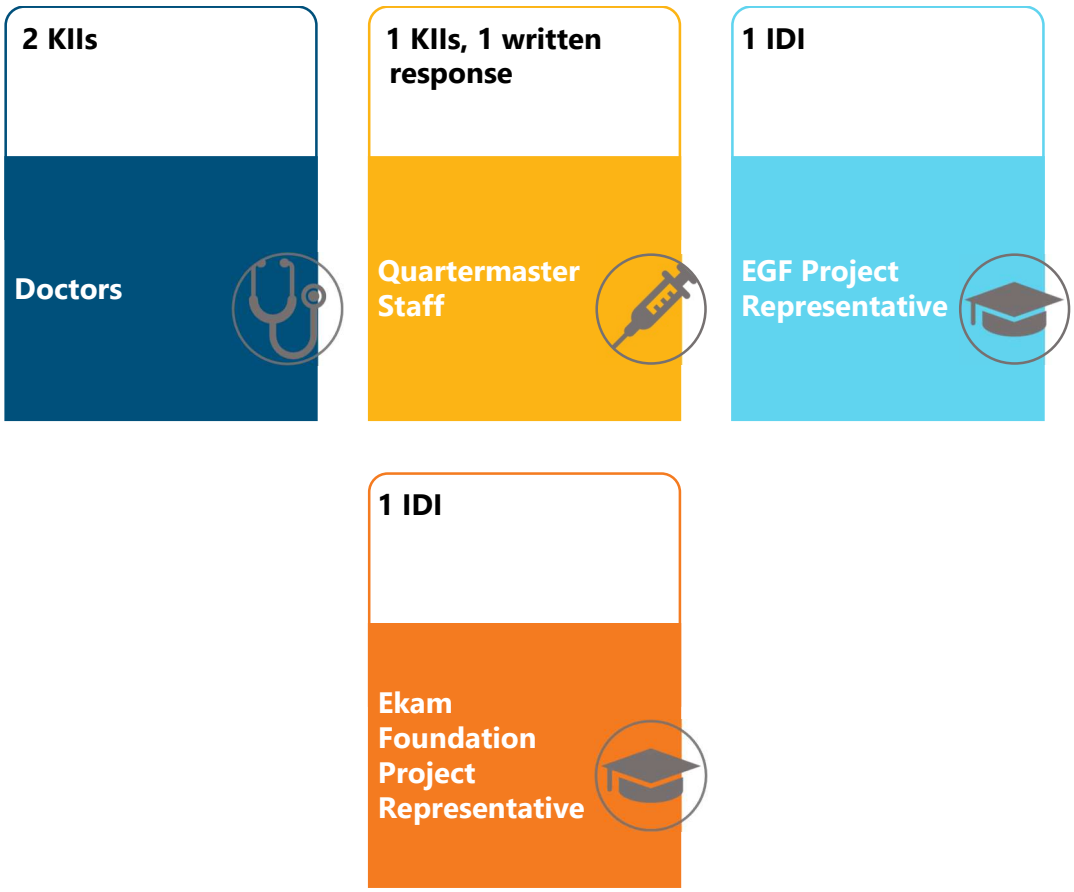

Figure 1 Stakeholders and modes of data collection

4. Key Findings

Parameters	2021-22 (Pre-Intervention)	2022-24 (Post-Intervention)
Inclusiveness indicators		
Increased accessibility for medical supply Oxygen	• Previously, hospitals provided Oxygen exclusively in intensive care units (ICUs). Consequently, the individuals, including children in paediatric wards, had to be transferred to ICUs to receive Oxygen. This was a problem during COVID-19 because there was a paucity of Oxygen beds	• Enough Oxygen supply to individuals in ICU and, in some hospitals, directly to paediatric wards
Relevance indicators		
Need-based programme design	• State's ad-hoc Oxygen supply such as Oxygen cylinders to hospitals during COVID-19 was limited not sustainable	• Setting up an Oxygen plant with EGF support in selected hospitals that met their Oxygen demands during COVID-19 and was a permanent solution to Oxygen paucity during COVID-19
Efficiency and Effectiveness indicators		
Improvement in patient care	• Traditionally Oxygen cylinders were used to meet the Oxygen demands of patients, posing logistical challenges and delays during the COVID-19 due to heavy Oxygen demand	• These plants provided a direct supply of Oxygen to the wards via pipelines, eliminating the need for cylinder refilling and transportation

		• During COVID-19, the oxygen plant supported approximately 50-100 patients daily per hospital • In certain hospitals such as the Chennai Army Hospital, it supplemented existing oxygen plants, while in others, it introduced new oxygen plant infrastructure
Lack of sustainability of operational expenses	• Not applicable	• Plant was beneficial during COVID-19 time distributing Oxygen directly towards or ICUs in selected hospitals but in some of the hospitals the Oxygen demand dropped after pandemic and now the operational expenses of the plant are higher than the demand for it.
Convergence indicators		
Selection of hospitals	• Not applicable	• The selection of hospitals for the initiative was strategic, targeting areas with minimal government and corporate funding to avoid duplication of resources and ensure impact. This included both army and government hospitals. They were funded by Eicher group to provide a permanent

		solution of Oxygen supply based on the patient footfall
Service delivery indicators		
Preparedness for future	• Hospital staff had to visit and stand in long queues in nearby factories to refill oxygen cylinders taking almost a day to complete the task	• The ability to produce Oxygen on-site eliminates the dependency on external suppliers, thus ensuring a continuous and timely supply of Oxygen during critical times

Table 3 Key Findings

5. Detailed Findings

5.1 Inclusiveness Indicator

5.1.1 Increased Accessibility for Medical Supply Oxygen

Previously, the selected hospitals provided oxygen exclusively in intensive care units (ICUs) with the help of oxygen cylinders, but it was not recommended by National Accreditation Board for Hospitals and Healthcare Providers (NABH) as a primary source of oxygen to ICUs specially during the pandemic[17]. Also**,** the individuals, including children in paediatric wards, had to be transferred to ICUs to receive oxygen. All critically ill patients without pre-existing lung disease need to receive supplementary Oxygen at sufficient concentration to maintain arterial Oxygen tension greater than 8 kilopascals or Oxygen saturation of at least 90%[18]. During the second COVID-19 wave in India from April 2021 to September 2021, this situation posed a significant challenge due to a shortage of hospital beds with oxygen support during peak periods. The shortage of such beds along with difficulty in accessing medical supply of oxygen in other wards was a crucial issue to address during the pandemic. With financial support from EGF, Ekam Foundation helped in establishing dedicated oxygen plants in these hospitals via which Oxygen was directly supplied to various wards through pipelines, ensuring comprehensive and inclusive care across the selected hospitals.

> **"During COVID-19, this plant was helping them a lot. Usually, it would be used in ICUs by critical patients only, whereas in COVID-19, 50-100 patients used it in 1 day.**
>
> **- Doctor, Thanjavur hospital**

[17] Government of Maharashtra. (2021). *Guidebook on Medical Oxygen Management System*. https://nrhm.maharashtra.gov.in/MH_Guidebook_Final.pdf

[18] Smith, G., & Nielsen, M. (1999). ABC of intensive care: Criteria for admission. BMJ. British Medical Journal, 318(7197), 1544–1547. https://doi.org/10.1136/bmj.318.7197.1544

5.2 Relevance Indicator

5.2.1 Need-based Programme Design

As of May 2021, Tamil Nadu had an installed capacity of around 400 tonnes of liquid Oxygen in its government hospitals[19]. The State was using 450 tonnes for medical purposes, and the demand was expected to increase due to the COVID-19 outbreak, with active cases crossing 1.25 lakh in April 2021[20].

> **"Cylinders had to be taken to the factory to refill and then brought back to the hospital, which was quite a hassle for us. This plant came to the rescue, significantly easing the process."**
>
> **- Hospital staff, Ranikhet hospital**

> **"As COVID-19 was not a situation to be segmented with respect to beneficiaries so our target group was general public."**
>
> **- Ekam Foundation Project Representative**

[19] Priyanka Thirumurthy, & Priyanka Thirumurthy. (2021, April 25). *How Tamil Nadu is managing oxygen supply and expanding storage*. The News Minute. https://www.thenewsminute.com/tamil-nadu/how-tamil-nadu-managing-oxygen-supply-and-expanding-storage-147764

[20] By Our Bureau. (2021, May 6). *Oxygen supply to hospitals in 'difficult situation': TN in Madras HC*. BusinessLine. https://www.thehindubusinessline.com/news/national/oxygen-supply-to-hospitals-in-difficult-situation-tn-in-madras-hc/article34501446.ece

> **"Prior to the intervention, we relied on oxygen cylinders, but the demand was so high that they were quickly depleted and had to be sent for refilling. Although we don't recall the exact numbers, it was significant. We used oxygen for all mobile beds and ICUs."**
>
> **- Quartermaster staff, Chennai army hospital**

Some oxygen plants in Tamil Nadu such Sterlite oxygen plant, produced 35 tonnes of liquid medical oxygen daily, but it could be obtained only in a week's time[21]. The overall bed occupancy rate in COVID-19 hospitals was 67.62 per cent in government facilities in Tamil Nadu and 71.22 per cent in private facilities[22]. The occupancy rate of oxygen and ICU beds was 95 per cent nearing saturation. It was at this time that EGF selected certain hospitals in the state that required Oxygen support and helped set up an Oxygen plant. The interactions with quartermaster staff and doctors at the Chennai, Thanjavur and Ranikhet hospitals revealed that these plants were very beneficial during COVID-19 since they were self-sustainable in Oxygen production and did not have to depend on the State's quota of Oxygen for hospitals.

5.3 Efficiency and Effectiveness Indicators

5.3.1 Improvement in Patient Care

Prior to the installation of the Oxygen plant, the hospitals faced challenges in managing Oxygen supply, particularly during the COVID-19 pandemic. Traditionally, Oxygen was primarily utilised by critical patients in Intensive Care Units (ICUs). However, during the pandemic, the demand for Oxygen surged dramatically, with 50-100 patients requiring Oxygen daily in each of the selected hospitals according to project representatives at Ekam Foundation. This increased demand highlighted the inadequacy of the existing system, where Oxygen cylinders had to be refilled at external factories and transported back to the hospital, causing considerable logistical challenges and delays.

[21] Ibid.

[22] Correspondent, S. (2021, April 15). *COVID-19 bed occupancy is less than 10% in Tamil Nadu, Health Secretary says*. The Hindu. https://www.thehindu.com/news/national/tamil-nadu/COVID-19-bed-occupancy-is-less-than-10-in-tamil-nadu-health-secretary-says/article34324274.ece

> **"We didn't have an adequate supply of Oxygen from the existing plants. This new additional plant was a life-saving instrument to us.**
>
> **- Quartermaster staff, Chennai hospital**

The installation of the Oxygen plants during the second wave of COVID-19, and their continued use through the third wave, marked a significant improvement in the hospital's Oxygen supply management. These plants provided a direct supply of Oxygen to the wards via pipelines, eliminating the need for cylinder refilling and transportation in Chennai and Ranikhet hospitals. This initiative reduced logistical challenges by 60%, according to a doctor in Ranikhet hospital and ensured a more reliable and timely supply of Oxygen to patients, and the continuous and dependable supply of Oxygen has improved the quality of care provided in Chennai army hospital by acting as a supplementary plant that fulfilled the oxygen need. In the Ranikhet hospital, this oxygen plant catered to critically ill patients in ICUs according to the doctors and quartermaster staff of these hospitals. The case was a little different in Thanjavur where there were no direct pipelines to wards, they had to manually fill the cylinders using these oxygen plants first as observed during interactions with doctors at Thanjavur hospital. This was not a convenient arrangement according to them.

Also, interviews with doctors at Chennai hospital revealed that adequate training regarding appropriate oxygen use, monitoring equipment, personal protective equipment, and other essential initiatives to meaningfully address the existing inequities across contexts during the pandemic was not provided for hospital staff coupled with this.

> **"We have no numbers or data maintained from that time due to the gravity of the situation, as everyone working was being affected."**
>
> **- Quartermaster staff, Chennai hospital**

> **"The Oxygen from this building is used via refilling the Oxygen cylinders as there is no setup of direct pipelines to the wards. We need the pipelines to be sent out to the emergency wards of paediatrics and newborn ICUs"**
>
> **- Doctor, Thanjavur hospital**

5.3.2 Lack of Sustainability of Operational Expenses of Oxygen Plant

Beyond pandemic scenarios, the installed Oxygen plants are currently being utilised to support ICUs and emergency medical situations in most hospitals such as Chennai, Ranikhet, and Thanjavur. This capability is vital for providing high-quality care to critically ill patients who require constant and reliable Oxygen supply. The direct pipeline system from the plants to the wards in most hospitals except Thanjavur ensures that Oxygen is readily available at all times, enhancing the hospitals' capacity to respond swiftly to medical emergencies.

In the long term, the plants installed at these hospitals provide a sustainable solution to meet the daily Oxygen needs of hospitals, reducing operational costs associated with purchasing and transporting Oxygen cylinders during the COVID-19 second wave in 2021. This cost-saving aspect allowed hospitals to allocate resources more effectively towards other critical areas of patient care. Additionally, having a robust Oxygen supply infrastructure in place strengthened the healthcare system, making it better prepared to face any future health crises and ensuring continuous support for both routine and emergency medical care.

The situation at Manipur Army Hospital was somewhat unique. The plant provided exceptional short-term benefits such as catering to COVID-19 patients' oxygen needs, but the long-term advantages were less significant unless a pandemic occurred. Written responses from the hospital revealed that the long-term benefits of the oxygen plant were directly proportional to the size of the hospital.

> **"The Oxygen plant was helpful during the pandemic but during normal times its utility is much less as the requirement for Oxygen has gone down. The operating cost of running an Oxygen plant is very high in a small hospital where the requirement is only ½ jumbo cylinders in a week."**
>
> **- Commandant, Manipur hospital**

5.4 Convergence Indicators

5.4.1 Selection of Hospitals

The selection of hospitals for the initiative was strategic, targeting areas with minimal government and corporate funding to avoid duplication of resources and ensure impactful initiative. The need for Oxygen plants was identified through a needs assessment for government hospitals and consultations with army officials, who highlighted the absence of such infrastructure in army hospitals. Initially, the plan was to support five hospitals in Tamil Nadu, but the focus shifted to include army hospitals following recommendations from government authorities. To provide a permanent solution to the Oxygen shortage, Eicher Group decided to fund the installation of Oxygen plants in five hospitals. This included two government hospitals in Tamil Nadu and three army hospitals spread across geographies such as Chennai, Manipur, and Ranikhet. In terms of caseload, Tamil Nadu ranked third, with total positive cases of approximately 4 lakh people as of June 2021[23].The situation was not different in Manipur where the state has recorded 82,955 positive cases and 1393 fatalities since the beginning of the second wave of the pandemic by August 2021[24]. Uttarakhand also became the fourth most affected state in India with 60 per lakh population cases in Uttarakhand[25].

[23] Impri. (2021, July 3). *An overview of the catastrophic second wave in Tamil Nadu - IMPRI Impact and Policy Research Institute*. IMPRI Impact and Policy Research Institute. https://www.impriindia.com/insights/event-rural-realities-tamil-nadu/

[24] *Daily cases, TPR rise as state sees four more deaths: 27th aug21 ~ E-Pao! Headlines*. (n.d.). https://e-pao.net/GP.asp?src=26..270821.aug21

[25] *Uttarakhand Corona Stats - Todays Uttarakhand Covid Cases with Latest Corona News*. (2024, February 22). https://www.euttaranchal.com/tourism/coronavirus-uttarakhand-updates.php

> **"We chose these hospitals because we aimed to target areas with less government and corporate funding, ensuring we avoided duplication of funds and provided a permanent solution."**
>
> **– Ekam Foundation Project Representative**

The project involved significant collaboration with government and army officials to ensure the effective selection and implementation of the Oxygen plants. The criteria for shortlisting government hospitals were based on treating a higher number of patients, while for army hospitals, the selection was influenced by geographic distribution and the critical need for Oxygen supply infrastructure. This initiative has proven to be highly successful, addressing the immediate Oxygen needs during the COVID-19 waves.

5.5 Service Delivery Indicators

5.5.1 Preparedness for Future

The installation of Oxygen plants in hospitals significantly enhanced preparedness for future pandemics. During the COVID-19 pandemic, the overwhelming demand for Oxygen exposed critical gaps in the healthcare infrastructure. By installing these plants, hospitals now had a reliable and self-sufficient source of Oxygen, ensuring they are better equipped to handle sudden surges in patient numbers. This preparedness is crucial for future pandemics or similar emergencies where the demand for medical Oxygen can spike unpredictably. The ability to produce Oxygen on-site eliminates the dependency on external suppliers, thus ensuring a continuous and timely supply of Oxygen during critical times such as respiratory pandemics.

> **"Our objective with this intervention was not just to combat the pandemic, but to provide a permanent solution to the Oxygen shortage in hospitals for the long term."**
>
> **– Ekam Foundation Project Representative**

6. Conclusion

The initiative, through strategic partnerships and a focus on sustainability, ensured continuous and reliable medical oxygen supply, significantly improving patient care and operational efficiency during the crisis. Key findings from the assessment indicate that the installation of oxygen plants addressed immediate and long-term oxygen supply challenges, reducing logistical burdens and enhancing hospitals' preparedness for future health crises.

This programme is also in alignment with the following Sustainable Development Goals (SDGs):

The installation of Oxygen plants in hospitals is directly related to Sustainable Development Goal 3 (SDG 3), which aims to ensure healthy lives and promote well-being for all at all ages. This initiative is crucial in improving healthcare outcomes, particularly benefiting patients in intensive care units (ICUs). During the COVID-19 pandemic, the demand for medical Oxygen surged dramatically, highlighting the essential role of a reliable Oxygen supply in managing severe respiratory conditions. By ensuring a steady and sufficient supply of medical Oxygen, hospitals are better equipped to provide critical care, thus reducing mortality rates. Moreover, the availability of in-house Oxygen generation reduces dependency on external suppliers, ensuring uninterrupted care during health crises.

The initiative is also linked to Sustainable Development Goal 10 (SDG 10), which aims to reduce inequality within and among countries. During the COVID-19 pandemic, the uneven distribution of medical resources, particularly oxygen, became evident, leading to health disparities. Hospitals faced severe shortages, leading to higher mortality rates and poorer health outcomes. By installing oxygen plants, these disparities were significantly reduced, ensuring that all hospitals, regardless of their location or economic status, have a reliable and adequate supply of medical oxygen. Consequently, this promotes inclusivity and fairness in healthcare, aligning with SDG 10's goal of reducing inequalities and ensuring that no one is left behind in times of health emergencies.

The initiative presented several challenges, including the need for robust infrastructure installation, such as pipeline systems for oxygen delivery. Existing hospital layouts may require significant modifications, adding to the complexity and cost. Accurate forecasting of future

oxygen needs is another major challenge, as highlighted by some hospitals during interactions. For smaller facilities, the cost of running the plant exceeded the post-pandemic demand for oxygen. Resource allocation decisions must carefully consider both current and projected needs. Addressing these challenges is essential for the successful and sustainable implementation of the proposed recommendations.

7. Recommendations

To enhance the effectiveness and sustainability of Oxygen plants in hospitals, a multipronged approach is essential. This includes improvements in infrastructure, training, and keeping the context in mind. The following recommendations outline the necessary steps for optimising the utilisation of Oxygen plants in hospitals:

7.1 Provision of supporting infrastructure and training

First and foremost, the provision of correct supporting infrastructure for Oxygen plant is essential[26]. This includes the installation of a robust pipeline system that connects the Oxygen plant directly to patient beds, especially in ICUs and paediatric wards. The pipeline system must be designed for efficient and safe Oxygen delivery, complemented by a centralised monitoring system to oversee Oxygen flow, pressure, and purity levels across the hospital. Adequacy of Oxygen supply through pipelines must also be coupled with training[27] regarding appropriate Oxygen use, adequate health care staffing, monitoring equipment, personal protective equipment, vaccination, and other essential initiatives to meaningfully address the existing inequities across contexts during the COVID-19 pandemic and beyond.

7.2 Use of portable and energy-efficient infrastructure for Oxygen

The sustainability issues, particularly in smaller hospitals, highlight the need for adaptable solutions such as the use of portable and energy-efficient oxygen concentrators find widespread use in various settings, from home care to clinical environments and they are particularly beneficial for individuals requiring continuous oxygen therapy and those with chronic respiratory conditions. With adjustable flow settings, concentrators can cater to a range of oxygen needs, making them versatile and adaptable to different patient requirements whereas Oxygen generators are engineered to produce larger quantities of oxygen, making them suitable for scenarios where the demand is higher. It is recommended that small hospitals such as Manipur Army Hospital could be supplied with oxygen concentrators instead of Oxygen plant. These steps are crucial for maintaining a high standard of care and readiness in the face of future health emergencies, ultimately fostering a more robust and equitable healthcare system. In conclusion, while selecting the type of support or infrastructure to be provided we need to keep in mind the context to ensure long-term sustainability.

[26] Enarson, Penny & La Vincente, Sophie & Gie, Robert & Maganga, Ellubey & Chokani, Codewell. (2008). Implementation of an oxygen concentrator system in district hospital paediatric wards throughout Malawi. Bulletin of the World Health Organisation. 86. 344-348. 10.1590/S0042-96862008000500011.
[27] Ibid.