



Bangladesh Oxygen Summit 2025 **proceedings**

National Roadmap to Safe, Affordable
and Reliable Medical Oxygen for All



“

Oxygen delayed
is life denied.”

- Person who survived COVID-19, Kenya

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Proceedings

Bangladesh Oxygen Summit 2025

National Roadmap to Safe, Affordable and
Reliable Medical Oxygen for All

7 October 2025 | InterContinental Dhaka

Organised by:
icddr,b

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**The LANCET Global Health Commission on Medical Oxygen Security
Every Breath Counts Coalition**



Foreword



Professor Dr Md. Sayedur Rahman

Honourable Special Assistant (State Minister)
Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh

The Bangladesh Oxygen Summit 2025 convened as a major national forum, bringing together policymakers, researchers, clinicians, and development partners to address a critical component of the health system. The scale of this summit, underscored the depth of research and dialogue, clearly reflected its policy importance and highlighted our national commitment to ensuring equitable and uninterrupted access to medical oxygen.

It was necessary to examine persistent gaps in the production, regulation, distribution, and equitable access to medical oxygen, which directly affect patient outcomes. I expect this proceeding to provide a clear evidence base to inform policy decisions and implementation planning, and to support coordinated actions that ensure the availability of safe, reliable, and affordable oxygen across all levels of health care in Bangladesh.



Foreword

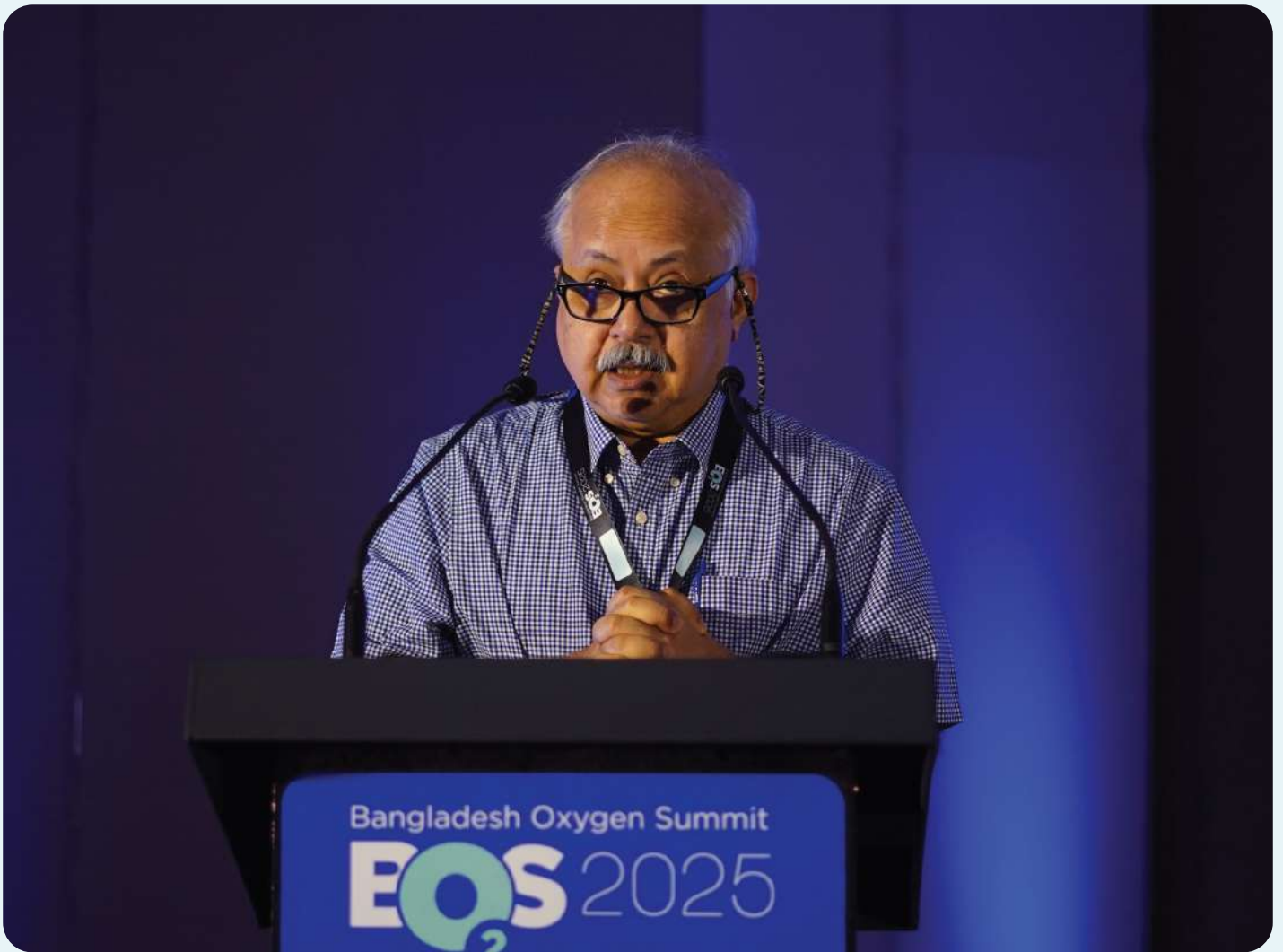


Dr Tahmeed Ahmed
Executive Director, icddr,b

I am delighted to see the proceeding of the Bangladesh Oxygen Summit 2025, which captured the depth and breadth of discussions on ensuring safe, reliable, and affordable medical oxygen for all. This summit reaffirmed a crucial message that is, “Oxygen delayed is life denied”. While oxygen is often invisible in daily life, its importance becomes starkly clear in moments of critical need.

This summit has highlighted both progress

and persistent gaps in medical oxygen security. Expanding pulse oximetry, oxygen systems, and integrated monitoring remain critical. I commend the presenters, participants, and organizers for their insightful contributions. This proceeding will serve as a valuable resource, guiding policies, research, and innovations to strengthen Bangladesh’s oxygen ecosystem and to save lives.



Foreword

Dr Shams El Arifeen

Senior Scientist (Emeritus), icddr,b
Commissioner, The Lancet Global Health Commission on Medical Oxygen Security

The Bangladesh Oxygen Summit 2025 marks an important step to improve medical oxygen systems in Bangladesh and globally. This proceeding captures the insights, analyses, and recommendations that emerged from the Summit's deliberations, spanning governance, supply systems, data monitoring, innovation, and clinical practice. The discussions from the summit reaffirm that ensuring oxygen

security is not only a technical goal but a strategic imperative for safeguarding lives and ensuring preparedness for future health emergencies.

I hope that the knowledge shared through this proceeding will inspire continued collaboration, investment, and policy action toward building a sustainable, equitable, and data-driven oxygen ecosystem for Bangladesh and beyond.

Acronyms

ADB	Asian Development Bank
AD	Assistant Director
AI	Artificial Intelligence
AIIB	Asian Infrastructure Investment Bank
ASU	Air Separation Unit
BERC	Bangladesh Energy Regulatory Commission
BME	Biomedical Engineering
BMU	Bangladesh Medical University
BO2S	Bangladesh Oxygen Summit
BUET	Bangladesh University of Engineering and Technology
CPAP	Continuous Positive Airway Pressure
DGDA	Directorate General of Drug Administration
DGHS	Directorate General of Health Services
DGME	Directorate General of Medical Education
DoH	Department of Health
ECRI	Emergency Care and Research Institute
EQA	External Quality Assurance
GC	Gas Chromatography
GAC	Global Affairs Canada
GHP	Global Health Partnership
GoB	Government of Bangladesh
GMP	Good Manufacturing Practice
HIC	High-Income Country
HRD	Human Resource Development
HRH	Human Resources for Health
ICU	Intensive Care Unit
icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
ISO	International Organization for Standardization
JICA	Japan International Cooperation Agency

KPI	Key Performance Indicator
LMIC	Low- and Middle-Income Country
LMO	Liquid Medical Oxygen
MCHD	Maternal and Child Health Division
MGPS	Medical Gas Pipeline System
MoHFW	Ministry of Health and Family Welfare
NEMEMW&TC	National Electro Medical Equipment Maintenance Workshop and Training Center
NGO	Non-Governmental Organization
NOC	No Objection Certificate
NTP	National Tuberculosis Programme
O&M	Operation and Maintenance
OT	Operating Theatre
PHC	Primary Health Care
PPE	Personal Protective Equipment
PPR	Pandemic Preparedness and Response
PSA	Pressure Swing Adsorption
QC	Quality Control
QMS	Quality Management System
SDG	Sustainable Development Goal
SOP	Standard Operating Procedure
TCO	Total Cost of Ownership
TNA	Training Needs Assessment
UN	United Nations
UNOPS	United Nations Office for Project Services
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VIE	Vacuum Insulated Evaporator
VSA	Vacuum Swing Adsorption
WB	World Bank
WHO	World Health Organization

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Executive Summary



380+ Summit Participants

60+ Organisations

60+ Policymakers



4 Scientific Sessions

17 Scientific Oral Presentations

7 Innovation Presentations

15 Poster Presentations

1 Round Table Discussion



25+ Media Houses

45+ Journalists

30+ Media Coverage

Access to medical oxygen is a cornerstone of modern healthcare, yet ensuring its reliable availability remains a critical challenge. The COVID-19 pandemic exposed the inequities in access to medical oxygen and emphasised its critical role as a lifesaving therapy for people of all ages, both within the country and worldwide. Evidence indicates that the acute medical and surgical need for oxygen is increasing, while a significant gap in oxygen coverage persists. In this context, greater investment in strengthening oxygen systems holds the potential to save millions of lives and ensure stronger preparedness for future pandemics.

In response to the global oxygen challenges, the Lancet Global Health Commission on Medical Oxygen Security was established in September 2022 to address critical gaps by quantifying global oxygen needs, improving access, evaluating delivery solutions, exploring sustainable financing options, and identifying research priorities. In May 2023, this global momentum was reinforced when the 76th World Health Assembly adopted the resolution on

“Increasing Access to Medical Oxygen”, giving countries a strong political mandate to prioritise oxygen within their health systems. The Commission’s final report, published in February 2025, provides governments with a practical roadmap to achieve sustainable oxygen security and reduce preventable deaths. icddr,b has been actively engaged in this initiative through its representation as co-chair of the commission, executive committee member, and contributions from a commissioner.

To act on this, on 7 October 2025, icddr,b organised the Bangladesh Oxygen Summit 2025: National Roadmap to Safe, Affordable and Reliable Medical Oxygen for All (BO2S2025) as one of the hosting institutes to showcase the current status of Bangladesh in terms of oxygen demand, availability, regulation and investment, innovations, education and research. The event presented global evidence, key recommendations, and research priorities using the Lancet Global Health Commission Report on Medical Oxygen Security alongside Bangladesh-specific findings.

In a board category, BO2S2025 brought together policymakers, regulators, prescribers, producers, beneficiaries, civil society, innovators, development partners, academicians, and youth for a comprehensive dialogue on the security of medical oxygen, through four distinct Scientific Sessions:

Medical Oxygen Need and Hypoxemia, with presentations and discussion covering the global evidence on oxygen demand, and the Bangladesh perspective on acute medical, surgical and long-term oxygen need under session one;

Medical Oxygen Delivery System and Oxygen Access, with discussion and evidence covering the global landscape on oxygen supply, and the Bangladesh perspective on oxygen access, delivery and distribution system under session two;

Medical Oxygen Production, Regulations and Investments, with global and national evidence; Medical Oxygen Research, Innovation and Education, with selective showcasing of existing oxygen innovations and research in the country covering both session three and four.

The summit was graced by the presence of Professor Dr Md. Sayedur Rahman, Honourable Special Assistant (State Minister), Ministry of Health and Family Welfare, as the chief guest.

The event brought together senior officials from key government institutions, including the Ministry of Health and Family Welfare (MoHFW), the Directorate General of Health Services (DGHS), the Directorate General of Medical Education (DGME), and the Directorate General of Drug Administration (DGDA). The summit also witnessed the active participation of eminent representatives from leading academic and research institutions, notably Bangladesh Medical University (BMU), icddr,b, the University of Dhaka, Bangladesh University of Engineering and Technology (BUET), American International University–Bangladesh (AIUB), and Daffodil International University.

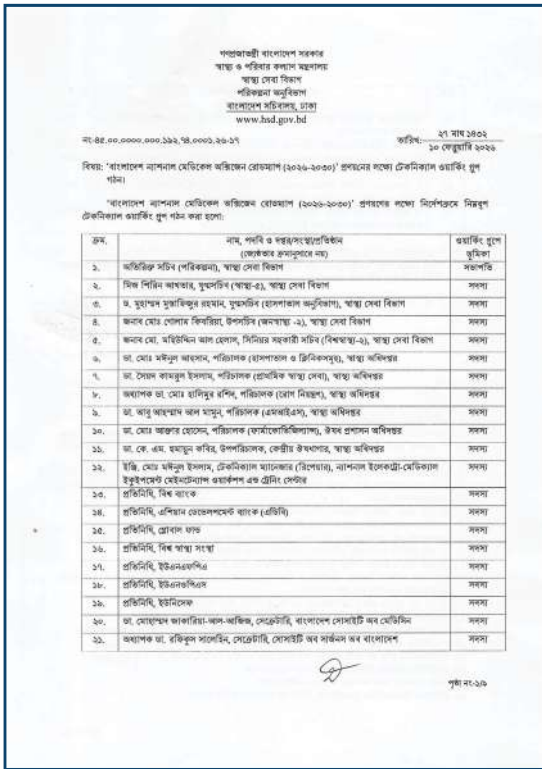
In addition, the occasion was attended by development partners and international agencies, including the World Bank, the Asian Development Bank (ADB), UNICEF Bangladesh, and United Nations Office for Project Services (UNOPS) Bangladesh.

BO2S2025's success yielded with three landmark outcomes:

The declaration to include medical oxygen in Bangladesh's National Essential Medicine list;

The formation of the Bangladesh Oxygen Network, which is a collaborative platform for professionals dedicated to ensuring medical oxygen security for all;

The development of a National Roadmap for Medical Oxygen, aligned with WHO Oxygen Resolution and the Sustainable Development Goals.



On 10 February 2026, the Government of the People’s Republic of Bangladesh, through the Ministry of Health and Family Welfare, Health Services Division, Planning Sub-division, Bangladesh Secretariat, Dhaka, officially issued the formal establishment of a Technical Working Group (TWG) tasked with developing the “Bangladesh National Medical Oxygen Roadmap (2026–2030)”. This national-level initiative aims to create a structured, evidence-based, and sustainable framework for strengthening Bangladesh’s medical oxygen ecosystem over the next five years and is marked as one of the major successes of the Bangladesh Oxygen Summit 2025.

Access Annex A for the full letter.

The scope of the Technical Working Group includes developing effective guidelines to ensure availability, quality control, and sustainable management of medical oxygen across all levels of the health system. Additionally, the group has the authority to co-opt members as needed to strengthen its expertise and capacity. The committee brings together a diverse range of stakeholders, including representatives relevant divisions of health ministry, major international financial institutions such as the World Bank and the Asian Development Bank (ADB), as well as key global health partners like the Global Fund, the World Health Organization (WHO), the United Nations Population Fund (UNFPA), the United Nations Office for Project Services (UNOPS), and UNICEF.

National expertise is also well represented through professional bodies and academic institutions, including the Bangladesh Society of Medicine, the Society of Surgeons of Bangladesh, the Obstetrical and Gynecological Society of Bangladesh, the Bangladesh Medical Research Council, and the Bangladesh University of Engineering and Technology (BUET). Dr Shams El Arifeen, Senior Scientist (Emeritus), icddr,b and Commissioner, Lancet Global Health Commission on Medical Oxygen Security and Dr Ahmed Ehsanur Rahman, Scientist, icddr,b and Member, Executive Committee, Lancet Global Health Commission on Medical Oxygen Security, are two of the selected members at the TWG.

“A few days ago, we met with the UN. The purpose was to make non-functional PSA plants operational and to discuss establishing a national oxygen network. ... Oxygen is a medicine, it is a life-saving drug, and it must be recognized as such. It is an essential medicine. We, from the government, are looking to update the existing essential medicines list, and oxygen must be included in it.”

“We have a policy decision to develop a National Medical Oxygen Road Map aligned with the WHO Resolution 76.3, integrate DHIS2 into the national oxygen reporting system, and ensure both technical and financial sustainability.... We also have a plan to publish the annual “oxygen brief” based on DHIS2 data.”

- **Professor Dr Md. Sayedur Rahman**, Honourable Special Assistant (State Minister), Ministry of Health and Family Welfare at the BO2S2025

- **Dr Md Mohiuddin Al Helal**, Senior Assistant Secretary & Program Manager, Policy and Program Monitoring, Ministry of Health and Family Welfare at the BO2S2025

Feb
2026



SPEAKING THROUGH ACTIONS

The Technical Working Group (TWG) tasked with developing the “Bangladesh National Medical Oxygen Roadmap (2026–2030)” was developed by the Government of the People’s Republic of Bangladesh.

Oct
2025



SPEAKING THROUGH ACTIONS

Bangladesh marches for a national roadmap to safe, affordable and reliable medical oxygen for all

Feb
2025

THE LANCET
Global Health

GENERATING EVIDENCE

The prevalence of hypoxaemia in paediatric and adult patients in health-care facilities in low-income and middle-income countries: a systematic review and meta-analysis

Hamish R Graham, **Esrat Jahan**, Rami Subhi, **Farhia Azrin**, Jaclyn R Maher, Jasmine L Miller, **Ahmed Ehsanur Rahman**

Reducing global inequities in medical oxygen access: the Lancet Global Health Commission of medical oxygen security Published

Hamish R Graham, Carina King, **Ahmed Ehsanur Rahman**, Freddy Eric Kitutu, Leith Greenslade, Masooma Aqeel, Tim Baker, Lucio Flavio de Magalhães Brito, Prof Harry Campbell, Karen Czischke, Prof Mike English, Prof Adegoke G Falade, Prof Patricia J Garcia, Mireia Gil, Prof Stephen M Graham, Prof Amy Z Gray, Stephen R C Howie, Prof Niranjana Kissoon, Ramanan Laxminarayan, Inês Li Lin, Michael S Lipnick, Dianne B Lowe, David Lowrance, Eric D McCollum, Tisungane Mvalo, Jacquie Oliwa, Prof Stefan Swartling Peterson, Rediet Shimeles Workneh, Prof Heather J Zar, **Prof Shams El Arifeen**, Prof Freddie Ssenooba

May
2023



SPEAKING THROUGH ACTIONS

WHO passed a resolution on "Access to Medical Oxygen" with support from 194 member states and formed the Global Alliance for Oxygen (GO2AL)

Sep
2022

THE LANCET
Global Health
Commission

ENGAGING THROUGH DIALOGUE

Lancet Global Health Commission on Medical Oxygen Security announced

- 6 Executive Committee members with a **first-ever member from Bangladesh**
- 20 Commissioners, with a **member from Bangladesh**
- 40 Advisors, with a **first-ever member from Bangladesh**

Apr
2022



EVIDENCE SHARING

The Lancet Journal on Oxygen Security presented at Every Breath Counts

Mar
2022

THE LANCET
Global Health

GENERATING EVIDENCE

Prevalence of Hypoxaemia in Pneumonia in LMICs published in the Lancet Global Health Journal

Ahmed Ehsanur Rahman, **Aniqa Tasnim Hossain**, Harish Nair, Mohammad Jobayer Chisti, David Dockrell, **Shams El Arifeen**, Harry Campbell



Welcome Address

Dr Shams El Arifeen

Senior Scientist (Emeritus), icddr,b

Commissioner, Lancet Global Health Commission on Medical Oxygen Security

The summit opened with a warm welcome from Dr Shams El Arifeen, acknowledging their collective commitment to advancing oxygen security in Bangladesh and globally. In his address, Dr Arifeen reflected on the origins of this journey on 23 September 2022, with the formation of the Lancet Global Health Commission on Medical Oxygen Security. The Secretariat of the Commission, hosted by icddr,b in partnership with the Makerere University, Uganda; University of Melbourne and Murdoch Children's Research Institute, Melbourne, with support from the Every Breath Counts Coalition, is marked a historic milestone as the first global health commission led by Bangladesh. Behind the Commission's creation, he credited one of the significant studies on hypoxemia by Dr Ahmed Ehsanur Rahman

during his PhD. Later recognized internationally, Dr Rahman's work inspired the proposal that led to the Commission's establishment. Dr Arifeen also emphasized the Commission's mission to ensure safe, affordable, and reliable medical oxygen for everyone. Outlining the day's agenda, Dr Arifeen mentioned that the Summit covers four thematic areas, including Bangladesh's oxygen need, demand and supply, global perspectives on oxygen security, regulation and investment, and innovations in education and technology. He concluded his address by calling for collective action from policymakers, health professionals, innovators, and development partners to translate knowledge into sustainable solutions.

“Let us work together to build a truly resilient and equitable oxygen system for the future of this country.”



Leith Greenslade

Coordinator, Every Breath Counts Coalition

Member, Executive Committee, Lancet Global Health Commission on Medical Oxygen Security

Leith Greenslade, Executive Committee member of the Lancet Global Health Commission on Medical Oxygen Security, delivered a video message at the inauguration of the BO2S2025. She began her address with a note of appreciation and a sense of urgency about the global need for medical oxygen. She congratulated the colleagues at icddr,b for their leadership in hosting the summit. She recalled the devastating early months of the COVID-19 pandemic in 2020, when infections spread rapidly across countries and health systems struggled to cope. At that time, there was neither a vaccine nor a cure. What patients needed most was medical oxygen. However, many hospitals either lacked oxygen supplies or could not meet the overwhelming demand. Images of hospital signs declaring “No more hospital admissions” and “No oxygen supply.”

By the end of the pandemic, more than seven

million people had died from COVID-19. Studies suggested that as many as half of those deaths might have occurred without access to medical oxygen. Outraged by the lack of preparedness for what the WHO describes as an essential medicine with no substitute, coalition members called for a thorough investigation into the oxygen crisis. In mid-2022, they approached the Lancet Global Health, and the Commission was announced later that year. Greenslade mentioned that the Commission’s goal was to document global oxygen needs, identify the number of patients who do not receive it, and estimate the cost of ensuring universal access. She concluded by echoing a powerful reflection from an icddr,b physician:

“If the oxygen had not been there, it would have been very simple - my father would have died. Oxygen security should be available every time, everywhere, in every hospital.”

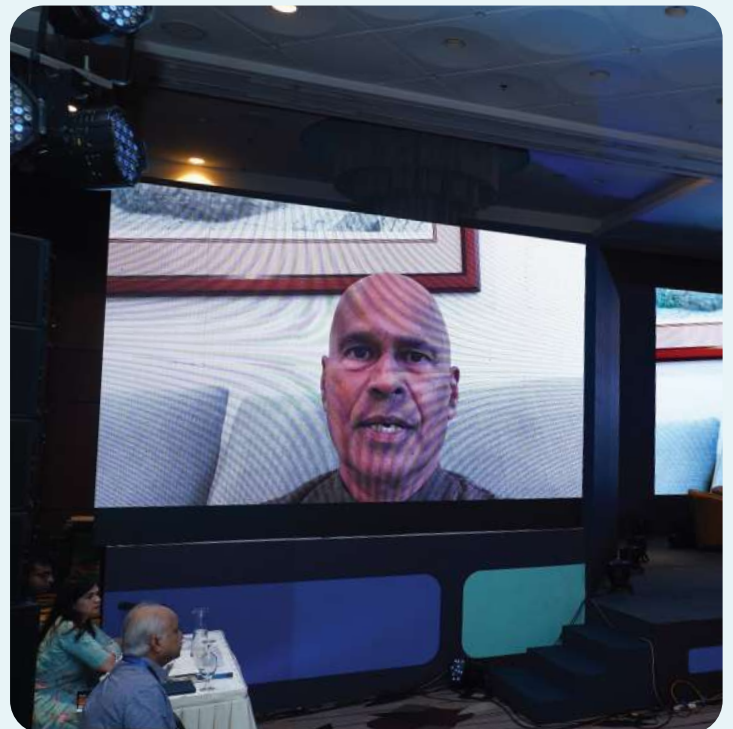
On the occasion of the Bangladesh Oxygen Summit 2025, colleagues, partners, and global health leaders from around the world shared their warm wishes and messages of support. Their words reflect a shared commitment to strengthening medical oxygen systems and ensuring equitable access to life-saving oxygen for all.

“

I would like to congratulate my colleagues in Bangladesh for the Bangladesh Oxygen Summit 2025. I wish you every success and look forward to your continued cooperation in this venture and to seeing you sometime. Have a wonderful event.”

Niranjan Kissoon

President, Global Sepsis Alliance
Professor, Department of Pediatrics and Emergency Medicine, BC Children’s Hospital and UBC Global Child Health, University of British Columbia, Vancouver, Canada
Commissioner, Lancet Global Health Commission on Medical Oxygen Security



“

I want to wish you the best of luck for the Bangladesh Oxygen Summit that you're hosting today, and my apologies for not being able to attend in person. I look forward to hearing all the stories and outcomes that will come from this wonderful event. Thank you so much. I wish you every success and look forward to your continued cooperation in this venture and to seeing you sometime. Have a wonderful event.”

Dr. Karina King

Associate Professor, Global Health, Karolinska Institute, Stockholm, Sweden
Member, Executive Committee, Lancet Global Health Commission on Medical Oxygen Security

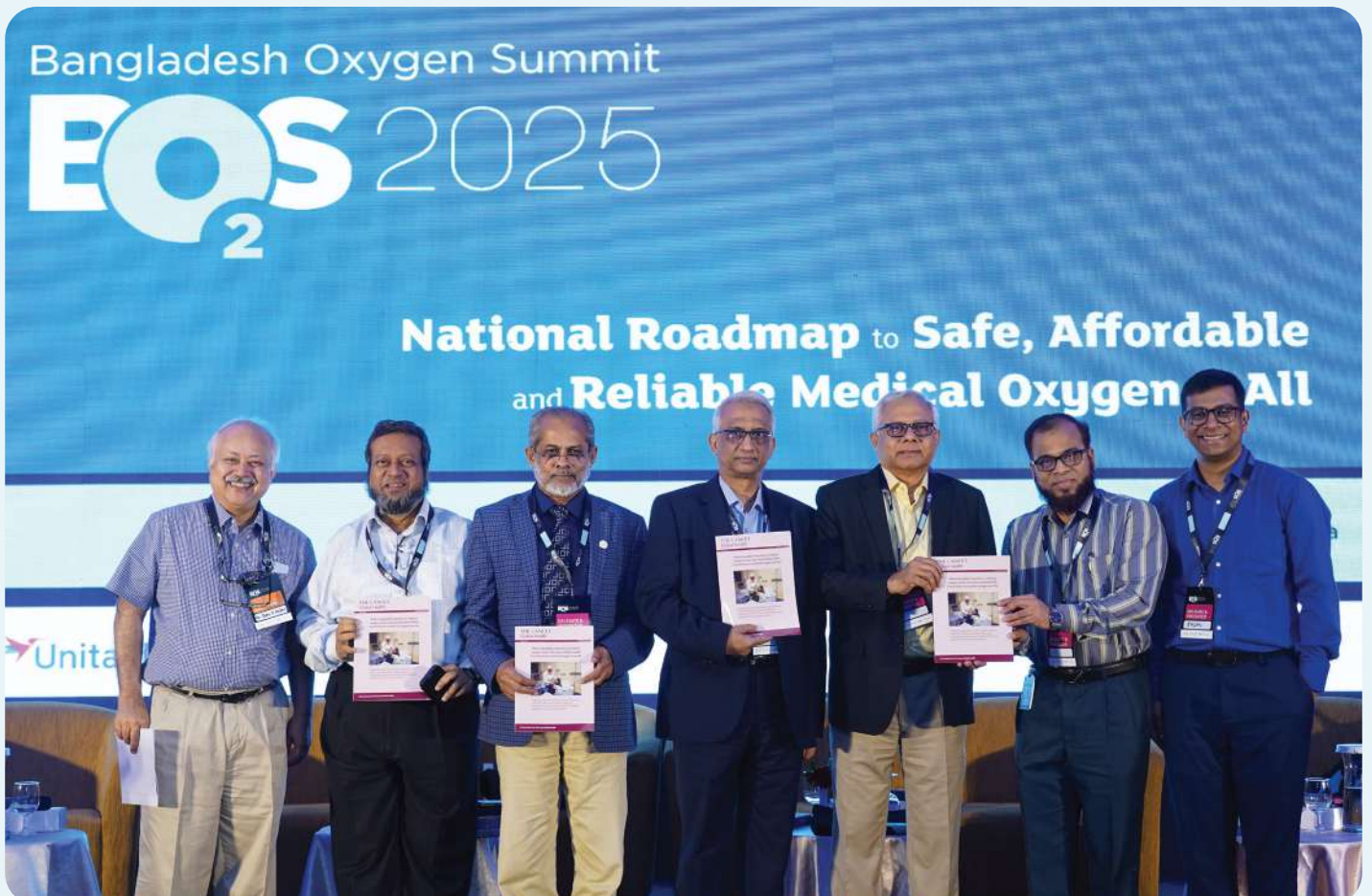




Session One

Oxygen Need:

Who Needs Oxygen,
How Many People, and
How Much Oxygen



The opening session provided a comprehensive overview of global and national perspectives on medical oxygen need and demand, grounded in evidence from the Lancet Global Health Commission on Medical Oxygen Security. The discussion covered acute, surgical, and chronic oxygen needs and examined Bangladesh's situation in the broader global context.

Moderator:

Dr Shams El Arifeen

Senior Scientist (Emeritus), icddr,b;
Commissioner, Lancet Global Health Commission on
Medical Oxygen Security

Chair:

Dr Tahmeed Ahmed

Executive Director, icddr,b

Presenters & Discussants:

Dr Ahmed Ehsanur Rahman

Scientist, icddr,b;
Member, Executive Committee, Lancet Global Health Commission on
Medical Oxygen Security

Professor Dr Abid Hossain Mollah

Professor of Paediatrics;
Member, National Technical Working Committee on
Integrated Management of Childhood Illness

Dr Mohammad Zakaria Al Aziz

Associate Professor of Medicine;
Member Secretary, Bangladesh Society of Medicine

Professor Dr Rafique Salehin

Professor of Surgery;
Secretary General, Society of Surgeons of Bangladesh

Dr Kazi Saifuddin Bennoor

Senior Consultant of Respiratory Medicine;
Joint Secretary, Bangladesh Lung Foundation

Speakers' affiliations are as stated at the time of their presentations.

Oxygen Need

Global Perspective

Dr Ahmed Ehsanur Rahman

Scientist, icddr,b;
Member, Executive Committee,
Lancet Global Health Commission
on Medical Oxygen Security



The session was opened by Dr Ahmed Ehsanur Rahman by placing oxygen within the very foundation of human survival, next only to food and water. While a person may survive weeks without food and days without water, life ceases within minutes without oxygen. He highlighted how the lack of clean air already claims over seven million lives annually, underscoring oxygen's centrality to life and health.

Focusing on medical oxygen, Dr Rahman explained that oxygen becomes a therapeutic necessity when blood oxygen saturation SpO_2 drops below the safe threshold. An oxygen saturation below 90% is strongly associated with increased mortality.

Evidence also indicates that moderate hypoxaemia (SpO_2 90–94%) carries a significantly higher risk of adverse outcomes compared with normal oxygen saturation levels.

Dr Rahman categorized oxygen needs into three major clinical domains: Acute medical conditions such as pneumonia, COVID-19, bronchiolitis, sepsis, or acute asthma attacks, Surgical conditions including before, during, and after anesthesia; and Chronic conditions including COPD, pulmonary fibrosis, and lung cancer, among others.

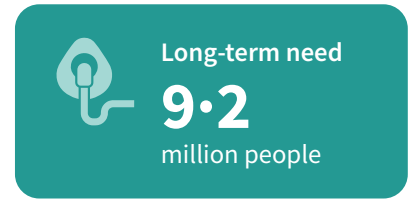
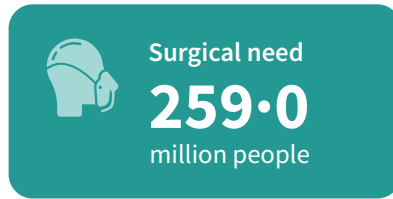
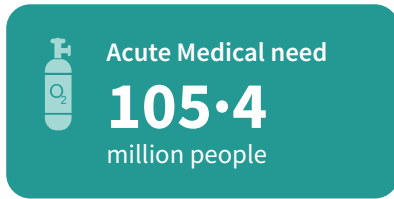
Drawing on extensive global evidence compiled by the Lancet Global Health Commission on Medical Oxygen Security, Dr Rahman presented a systematic estimation of global oxygen need and demand. Using datasets from the Global Burden of Disease studies (2010-2021), expert consultations,

and systematic reviews of more than 9,000 scientific abstracts and 200 peer-reviewed articles, the Lancet Global Health Commission on Medical Oxygen Security estimated, approximately 370 million people worldwide require medical oxygen annually in non-pandemic settings, with substantial additional demand observed during the COVID-19 surge. Breaking this down, more than 105.4 million people require oxygen for acute medical conditions annually; 259 million for oxygen related to surgeries; and 9.2 million for long-term oxygen therapy (primarily for COPD).

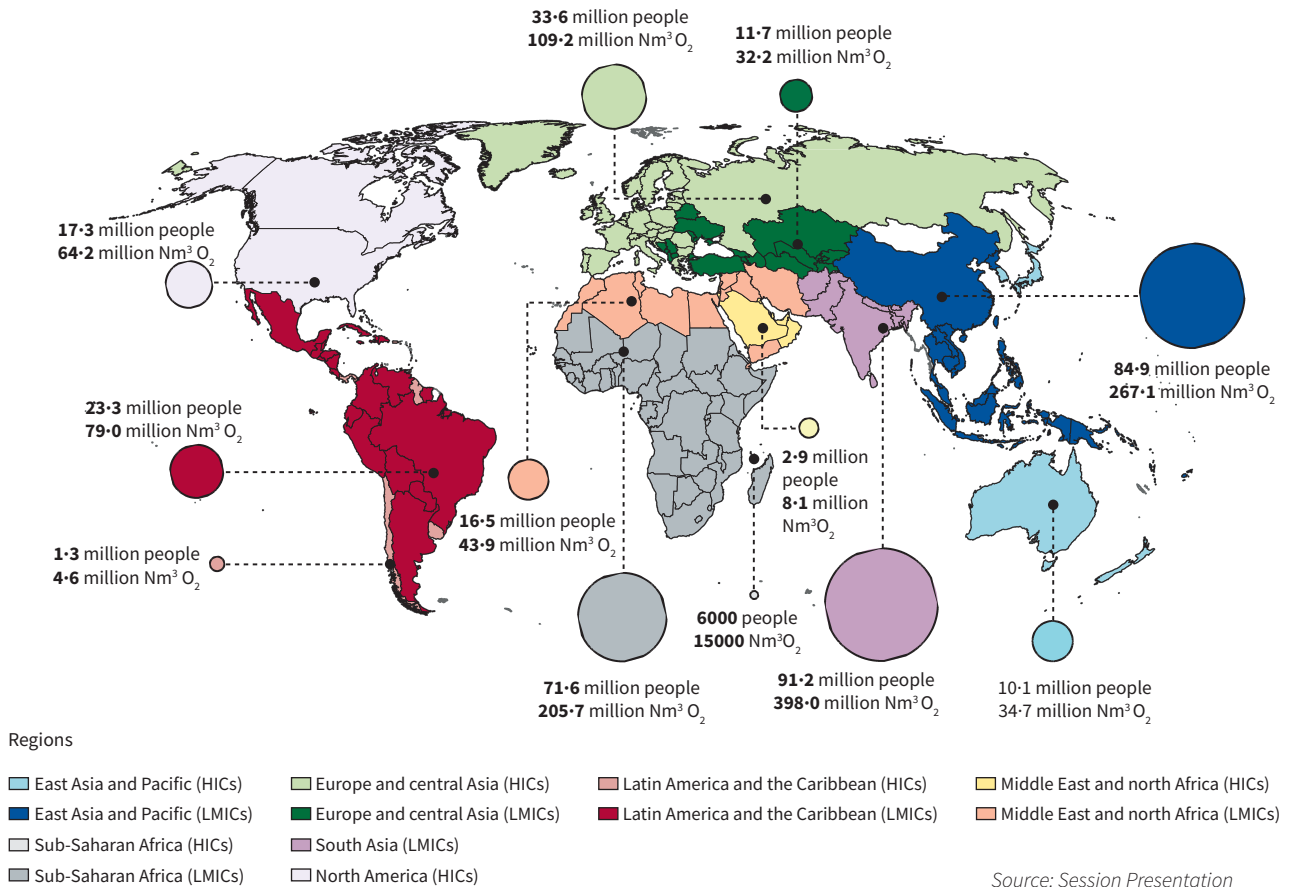
Evidence indicate South and Southeast Asia hold the highest global oxygen burden, followed by East Asia and Sub-Saharan Africa. While acute oxygen needs have remained relatively stable, requirements for surgical and long-term oxygen therapy are steadily rising. Dr Rahman emphasized that failing to meet these oxygen needs directly translates into preventable deaths. Hypoxemia increases the risk of death up to fivefold across various age and disease groups. Comparing oxygen need with malaria incidence (376 million vs. 250 million annually), he noted the severe disparity in global investment where malaria receives billions in funding, and medical oxygen remains an under-discussed and underfunded lifesaving therapy.

“It is our moral duty to ensure that every person who needs oxygen receives it.”

Global Medical Oxygen Need in a Year



Oxygen Need among People during Acute Medical Condition (in a year)



Key Recommendations

- Develop national and regional oxygen need assessment frameworks using standardized global methodologies to guide policy and investment.
- Prioritize oxygen system strengthening within health system resilience and emergency preparedness strategies.
- Increase investment in oxygen production, storage, and delivery infrastructure, especially in South and Southeast Asia.
- Promote routine monitoring of hypoxemia in clinical settings through pulse oximetry and clinical training.
- Advocate for global recognition and financing of medical oxygen as an essential medicine, comparable to major global health priorities like malaria and tuberculosis.

Acute Medical Need for Children

Bangladesh Perspective

Dr Abid Hossain Mollah

Professor of Paediatrics;
Member, National Technical Working
Committee on Integrated Management of
Childhood Illness



Emphasizing hypoxemia as one of the strongest predictors of mortality in children, Professor Dr Abid Hossain Mollah presented the critical issue of medical oxygen needs among children with acute illnesses in Bangladesh. Prof. Mollah underscored that timely and adequate oxygen therapy is often the difference between life and death for hypoxemic patients.

Drawing upon national and hospital-based studies, he highlighted the high burden of respiratory illness among Bangladeshi children. A multi-hospital study covering 43 facilities across different tiers of the health system found that 67% of children admitted had respiratory illnesses. Among them, lower respiratory tract infections dominated, with bronchiolitis, pneumonia, and asthma as the leading causes.

Evidence from a multi-centre randomized controlled trial revealed that 27% of children with bronchiolitis presented with hypoxemia, while nearly 47% of those with WHO-defined severe pneumonia were hypoxemic. Alarming, data from icddr,b showed that children with pneumonia and hypoxemia had an eightfold higher risk of death compared to those without hypoxemia - reinforcing why pneumonia remains the leading cause of under-five mortality in Bangladesh.

Turning to neonates, Prof. Mollah cited a study showing that 60% of newborns admitted with acute neonatal illness required oxygen therapy. These conditions included neonatal sepsis, perinatal

asphyxia, transient tachypnea of the newborn, respiratory distress syndrome, meconium aspiration syndrome, and pneumonia. Oxygen was administered through nasal cannula, Continuous Positive Airway Pressure (CPAP), and mechanical ventilation, depending on severity.

He also drew attention to non-respiratory causes of hypoxemia among children, including sepsis, shock, and other systemic illnesses, noting that the need for oxygen extends beyond respiratory diseases.

Summarizing the findings, he identified pneumonia as the top cause of hypoxemia-associated acute illness among children, followed by bronchiolitis and neonatal conditions. He emphasized, many of these deaths are preventable through early detection by pulse oximetry and prompt oxygen administration. The national data estimate that approximately 0.4 million under-five children require oxygen therapy annually, translating to an estimated 1.8 million normal cubic meters of oxygen need each year. To meet this immense need, Prof. Mollah called for scaling up the clinical capacity of healthcare workers to detect hypoxemia accurately using pulse oximetry, alongside ensuring a reliable and uninterrupted supply of medical oxygen at all health system levels.

“To save these children, we must act quickly – detect hypoxemia early, correct it effectively, and ensure that oxygen is never out of reach.”

Acute Medical Oxygen Need in a Year : Estimating Number And Volume Required (Under-5 Children)



Global

19.8

Million children needed Oxygen

88.3

Million Nm³
Volume of Oxygen Needed



LMIC

18.8

Million children needed Oxygen

84.1

Million Nm³
Volume of Oxygen Needed



South Asia

6.4

Million children needed Oxygen

29.2

Million Nm³
Volume of Oxygen Needed



Bangladesh

0.4

Million children needed Oxygen

1.8

Million Nm³
Volume of Oxygen Needed

Source: Session Presentation

Key Recommendations

- Expand pulse oximetry coverage across all child and neonatal care facilities for early detection of hypoxemia.
- Strengthen clinical capacity of healthcare providers to assess and manage oxygen needs accurately and promptly.
- Integrate oxygen therapy protocols into national child health and IMCI guidelines for uniform clinical practice.
- Prioritize investment in pediatric oxygen infrastructure, including CPAP, concentrators, and monitoring systems, particularly at sub-district hospitals.

Acute Medical Need for Adults

Bangladesh Perspective

Dr Mohammad Zakaria Al Aziz

Associate Professor of Medicine
Member Secretary,
Bangladesh Society of Medicine



With reiterating the essential nature of oxygen, describing it as a life-saving essential medicine, Dr Mohammad Zakaria Al Aziz presented a comprehensive overview of the acute medical oxygen needs among adult patients in Bangladesh. Citing global and national data, Dr Aziz noted that hypoxemia is not merely a symptom but a powerful predictor of mortality. According to a Lancet Global Health systematic review (2025), adult patients with respiratory illnesses who develop hypoxemia are 5.4 times more likely to die compared to those without it. For non-respiratory illnesses, the risk is 1.9 times higher.

He outlined the major acute medical conditions associated with hypoxemia in Low-and Middle-Income Countries (LMICs), including lower respiratory infections, acute asthma, acute exacerbations of COPD, trauma, meningitis, encephalitis, sepsis, and cardiovascular diseases. The Global Burden of Disease 2021 study showed that lower respiratory infections and injuries are the leading causes of hypoxemia, together accounting for the majority of acute medical oxygen needs globally.

Among hospitalized adults in LMICs, the prevalence of hypoxemia was reported as 38% among trauma

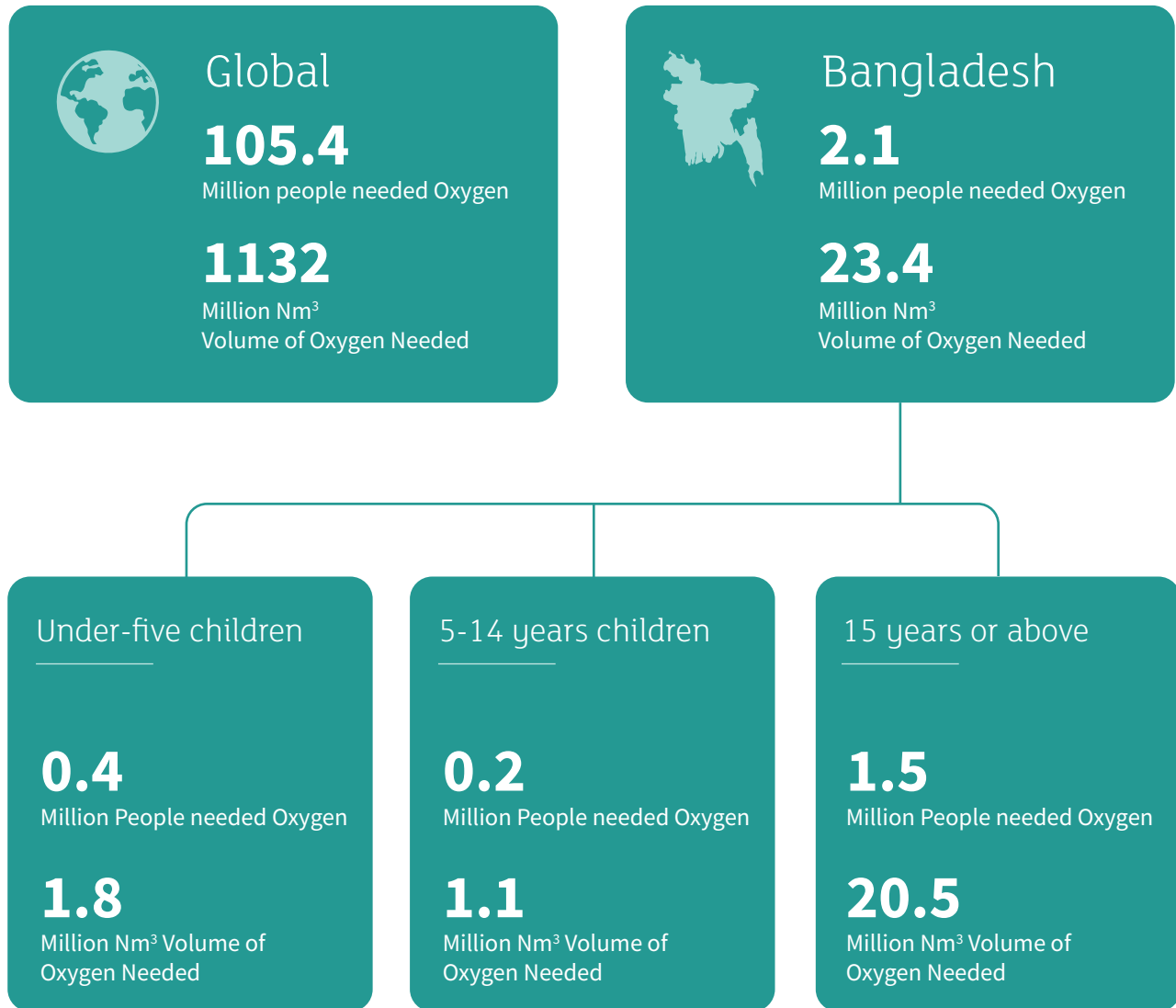
patients, 20% in lower respiratory infections, and 17% in acute asthma. Even in outpatient settings, a notable percentage of patients presented with hypoxemia, including 16% in respiratory infections, 16% in HIV-related complications, and 8% in trauma cases, indicating that the need for oxygen extends beyond critical care units.

In Bangladesh, an estimated 2.1 million adults require oxygen annually, equivalent to 23.4 million normal cubic meters of oxygen. The largest contributors to this demand are lower respiratory infections (0.76 million patients), followed by cardiovascular diseases (0.45 million), trauma, sepsis, and diarrheal illnesses.

Dr Aziz emphasized that addressing hypoxemia is crucial not only for acute respiratory illnesses but also for systemic and non-communicable diseases. He called for evidence-based national guidelines and a coordinated strategy led by professional societies and the government to ensure oxygen availability in all hospitals, including district and sub-district facilities.

“Together we can ensure oxygen for every patient, in every hospital, across Bangladesh.”

Acute Medical Oxygen Need: Estimating Number and Volume Required in a Year



Source: Session Presentation

Key Recommendations

- Develop national clinical guidelines for oxygen therapy in acute medical conditions, endorsed by professional societies.
- Expand oxygen access in emergency and inpatient units of all public and private hospitals.
- Invest in oxygen monitoring and delivery systems, including pulse oximetry, concentrators, and high-flow devices.
- Integrate oxygen readiness assessments into national hospital quality and accreditation programs.
- Promote cross-sector collaboration between government, academia, and the Bangladesh Society of Medicine to develop a national oxygen roadmap.

Surgical Need

Bangladesh Perspective

Professor Dr Rafique Salehin

Professor of Surgery
Secretary General, Society of Surgeons
of Bangladesh



“While only 21% of the atmosphere is oxygen, that small fraction sustains all human life and its absence in clinical settings can be fatal.” Prof. Dr Rafique Salehin opened his presentation on the role of oxygen in surgical and perioperative care, highlighting its centrality to patient safety and surgical success .

Prof. Salehin stressed that safe surgery, safe anaesthesia, and safe oxygen are inseparable. In Bangladesh, approximately 70% of all admitted hospital patients require oxygen at some point during their stay. However, the availability of oxygen remains uneven, with significant disparities between urban centers like Dhaka and rural hospitals.

He described how lack of timely oxygen access delays emergency surgeries, jeopardizing patient outcomes and creating immense stress for healthcare workers. The COVID-19 pandemic, was a pivotal learning moment for enhancing awareness of oxygen delivery systems, flow regulation, and patient monitoring through pulse oximetry.

During surgery, oxygen is administered through ventilators or high-flow devices, and continuous

monitoring of blood oxygen saturation is essential. Beyond its intraoperative use, oxygen therapy is vital in postoperative recovery to prevent complications and ensure optimal healing. He also highlighted advanced applications such as hyperbaric oxygen therapy, which promotes wound healing and tissue regeneration in cases of severe trauma, devitalized tissue, or complex infections. In Bangladesh, surgical demand continues to rise sharply, with over 318,000 cesarean sections and 302,000 other major surgeries performed annually. This upward trend reflects the country’s growing healthcare capacity but also its increasing dependence on reliable oxygen supply. Prof. Salehin underscored the urgent need for scaling up national oxygen production and distribution to match surgical growth. He advocated for public-private partnerships to meet this demand sustainably, ensuring that every operating theatre, regardless of location, has uninterrupted oxygen access.

“Oxygen is life, and life is oxygen. Without it, safe surgery is impossible.”

Surgical Oxygen Demand: Estimated People and Volume Required in a year



Global

259

Million People needed Oxygen

114.8

Million Nm³
Volume of Oxygen Needed



LMIC

212.2

Million People needed Oxygen

94.03

Million Nm³
Volume of Oxygen Needed



South Asia

59.1

Million People needed Oxygen

26.2

Million Nm³
Volume of Oxygen Needed



Bangladesh

5.1

Million People needed Oxygen

2.3

Million Nm³
Volume of Oxygen Needed

Source: Session Presentation

Key Recommendations

- Ensure uninterrupted oxygen availability in all surgical theatres, including rural and private facilities.
- Strengthen anaesthesia safety standards through continuous oxygen monitoring and emergency backup systems.
- Expand national oxygen production capacity to meet the growing demand driven by surgical volume.
- Incorporate oxygen supply planning into surgical infrastructure development and hospital accreditation systems.
- Promote public-private partnerships for sustainable oxygen generation, storage, and distribution networks.

Long-term Oxygen Need

Bangladesh Perspective

Dr Kazi Saifuddin Bennoor

Senior Consultant, Respiratory
Medicine;
Joint Secretary, Bangladesh Lung
Foundation



Essential oxygen is not only an emergency medical intervention but as a continuous lifeline for millions living with chronic respiratory conditions. Dr Kazi Saifuddin Bennoor began his address with scientific lenses, emphasizing oxygen therapy a determinant of survival and quality of life for many patients across Bangladesh and beyond.

Dr Bennoor defined Long-Term Oxygen Therapy (LTOT) as the continuous use of supplemental oxygen, typically for at least 15 hours a day at a flow rate of 1–2 liters per minute for patients with chronic hypoxemia, most commonly those suffering from chronic respiratory diseases such as COPD, ILD (Interstitial Lung Disease), Pneumoconiosis, and Post-Tuberculosis Lung Disease (PTLD).

He highlighted that COPD remains the predominant cause of long-term oxygen dependency. With an estimated 4 million COPD patients in Bangladesh, the burden is significant, though mortality rates remain relatively lower than in neighboring Nepal and Pakistan. He pointed out that ILD and Pneumoconiosis, both linked to environmental and occupational hazards, are rising in Bangladesh, particularly among workers in shipbreaking and

stone-crushing industries.

A particularly concerning development, he noted, is PTLD, a condition that affects over half of individuals even after successful TB treatment.

These patients often continue to experience chronic respiratory impairment, progressing toward oxygen dependency. Encouragingly, the Bangladesh Lung Foundation, in partnership with the National Tuberculosis Program and Damien Foundation, has initiated a pioneering national study on PTLD, potentially the first of its kind globally.

Dr Bennoor also presented comparative data underscoring Bangladesh's growing need for LTOT, which is currently almost 200,000 patients requiring long-term oxygen, representing a demand of nearly 58.3 cubic meters of medical oxygen. While Bangladesh's production capacity is improving, challenges persist in distribution and equitable access, particularly outside urban centers.

He concluded with optimism that the Bangladesh Oxygen Summit 2025 marks a turning point toward addressing these gaps and ensuring sustained oxygen security for chronic respiratory patients.

LTOT need in a Year: Estimating Number and Volume Required (all ages)



Global

9.2

Million People needed Oxygen

3178.8

Million Nm³
Volume of Oxygen Needed



LMIC

6.2

Million People needed Oxygen

2163.6

Million Nm³
Volume of Oxygen Needed



South Asia

1.8

Million People needed Oxygen

639.7

Million Nm³
Volume of Oxygen Needed



Bangladesh

0.2

Million People needed Oxygen

58.3

Million Nm³
Volume of Oxygen Needed

Source: Session Presentation

Key Recommendations

- Integrate LTOT into national respiratory care protocols to ensure consistent supply and equitable access for patients with chronic hypoxemia.
- Develop a national registry for COPD, ILD, Pneumoconiosis, and PTLD to generate reliable data on oxygen therapy needs.
- Strengthen occupational health surveillance to prevent and manage Pneumoconiosis and other workplace-related lung diseases.
- Scale up community-level oxygen infrastructure including concentrators and refill logistics in peripheral and rural hospitals.
- Promote collaborative research and policy development through partnerships between the Bangladesh Lung Foundation, NTP, and global health organizations.



Address from the Chair



Dr Tahmeed Ahmed

Executive Director, icddr,b

As the session chair, Dr Tahmeed Ahmed began his address by acknowledging the insights and evidence shared by the earlier speakers, emphasizing how the day's presentations collectively revealed that oxygen delayed or oxygen denied is life stopped. Although many of us rarely imagine needing oxygen ourselves, the pandemic and current discussions underscore its vital importance. Dr Ahmed highlighted the long-standing contributions of icddr,b in health research across vaccines, nutrition, and maternal and child health, noting that these achievements have been recognized globally and implemented internationally.

He described his own experience during the COVID-19 pandemic, when he oversaw screening, testing, and treatment at the icddr,b hospital. Dr Ahmed recalled how difficult it was

to ensure a continuous oxygen supply, stating, "there were only two producers in our hands and that they had to lobby not to turn off the oxygen supply."

Reflecting on the broader issue, he stressed that oxygen availability depends fundamentally on both demand and supply, but that without good governance, oxygen will never reach the field level where patients, such as a child in a remote village suffering from severe pneumonia, need it most.

Dr Ahmed praised Bangladesh's recent progress in oxygen production but warned that the growing need for long-term oxygen therapy and inadequate access to pulse oximeters require urgent attention. He urged making portable oxygen and monitoring tools more accessible nationwide so that treatment is truly complete for all patients.



Session Two

Oxygen Systems: Oxygen Delivery Mechanism and Oxygen Access



The second session explored how oxygen systems function from production to patient care, emphasizing both delivery mechanisms and access challenges. Speakers discussed the structural and operational gaps that hinder reliable oxygen flow to health facilities, especially in resource-limited areas. Examples from Bangladesh and other countries illustrated how governance, infrastructure, and supply management directly affect patient outcomes.

Session Keynote:

Dr Shams El Arifeen

Senior Scientist (Emeritus), icddr,b
Commissioner, Lancet Global Health Commission on Medical Oxygen Security

Chief Guest:

Professor Dr Md Sayedur Rahman

Honourable Special Assistant (State Minister)
Ministry of Health and Family Welfare

Special Guests:

Md Saidur Rahman

Secretary, Health Services Division, Ministry of Health and Family Welfare

Professor Dr Md. Abu Jafor

Director General, Directorate General of Health Services (DGHS)

Session Chair:

Dr Anisur Rahman

Scientist and Acting Senior Director, Maternal and Child Health Division, icddr,b

Presenters & Discussants:

Dr Md. Moinul Ahsan

Director (Hospital and Clinics)
Directorate General of Health Services (DGHS)

Dr Muhammad Tarik Arafat

Professor of Biomedical Engineering
Bangladesh University of Engineering and Technology (BUET)

Mohamed Infiyaz Hyder

Project Manager
UNOPS Bangladesh

Dr Pyae Phyo Than Cho

Health Officer (Quality of Care)
UNICEF Bangladesh

Engr. M. N. Nashid Rahman

Technical Manager (Training)
NEMEMW&TC

Speakers' affiliations are as stated at the time of their presentations.

Oxygen System

Global Perspective

Dr Shams El Arifeen

Senior Scientist (Emeritus), icddr,b
Commissioner, LANCET Global
Health Commission on Medical
Oxygen Security



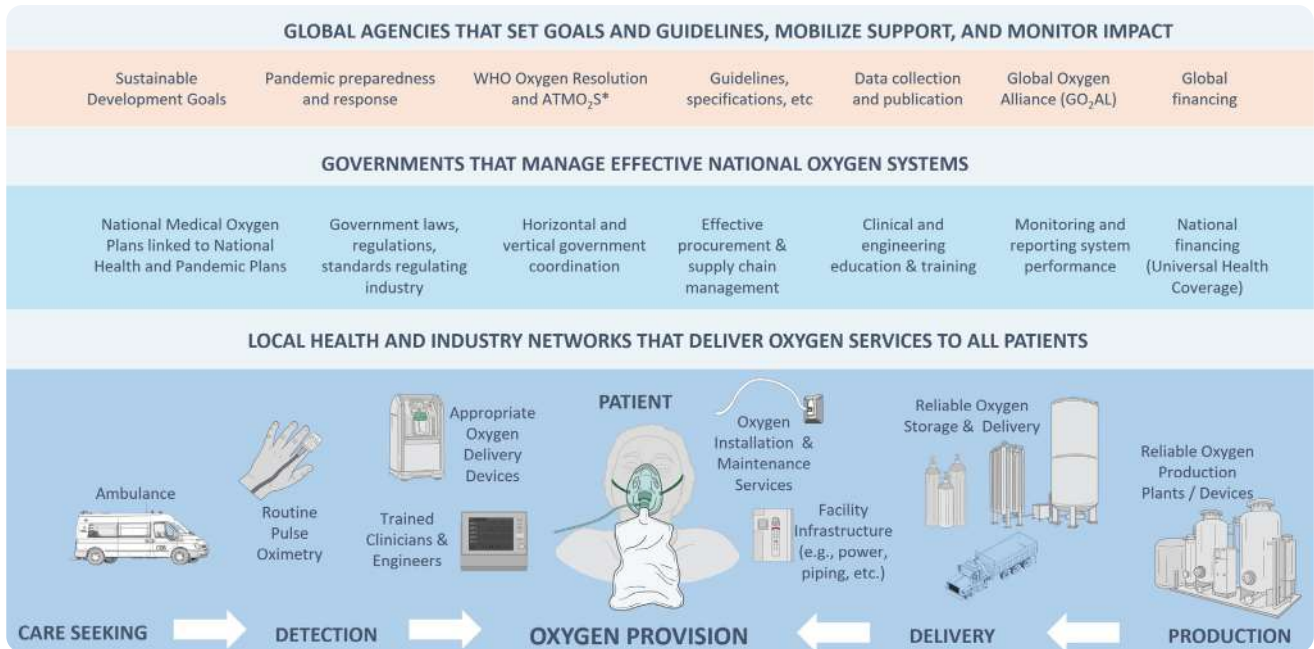
The session was opened by Dr Arifeen, distinguishing medical oxygen from ambient oxygen, which is purified air (approximately 21% oxygen) processed to medical standards, prescribed as a drug for patients with hypoxemia (low blood oxygen levels). This evolves into "oxygen therapy" when administered as treatment, and "oxygen services" when delivered via equipment and trained health workers. These services form part of a broader "oxygen system," encompassing workforce, equipment, infrastructure, supply chains, and financing. At the core of the system is the patient, supported by behavioral factors like care-seeking by families and clinical provisions such as pulse oximetry for assessing needs, alongside trained clinicians, engineers, and delivery mechanisms. Backup elements include installation, maintenance, storage, and distribution, all under government oversight across 5-6 key functions (e.g., regulation, procurement). This operates within global contexts, including standards from the Sustainable Development Goals (SDGs, with at least 8 targets directly impacted by oxygen access), the 76th World Health Assembly resolution on medical oxygen access (influenced by the Lancet Commission), monitoring frameworks like the proposed scorecard, WHO guidelines on systems and equipment specifications, and coalitions such as the Global Oxygen Alliance.

Nationally, the Ministry of Health is central, but the ecosystem extends to local governments, hospitals, patients, caregivers, global donors, investors, non-state partners, academia, research institutions, and crucially,

industry for production and delivery. Dr Arifeen highlights access disparities through an emotional quote from a Bangladeshi parent describing the financial and logistical barriers to transporting a sick child 80 km to a hospital, risking the child's life en route. The analysis shifts to gaps in oxygen coverage, framed through a cascade model: (1) Service contact gap (patients not reaching facilities, e.g., due to distance or cost); (2) Service readiness gap (facilities lacking oxygen, pulse oximeters, or essentials); (3) Service provision gap (insufficient workforce or affordable supply); and (4) Service quality gap (poor monitoring and inappropriate use). Globally, in low- and middle-income countries (LMICs), the overall coverage gap is estimated at 70% (only 30% of those needing oxygen receive it), with the largest drop (46%) in service contact. This compares unfavorably to gaps for HIV (23%) and TB (25%) treatments. Breaking it down, the gap is 67% for surgical needs and 17% for acute medical needs (combined 70%), varying regionally: from 53% in Eastern Europe/Central Asia to 91% in Sub-Saharan Africa, with South Asia at 78% for acute medical conditions. This translates to 19 million people in Sub-Saharan Africa and 25 million in South Asia denied oxygen annually. A quote from a Sierra Leone doctor during COVID-19 underscores real-world impacts, where many of 1,000 oxygen-needing cases went untreated. Facility readiness is a key bottleneck: pulse oximeters and oxygen are available in 32-76% of tertiary hospitals but only 10-12% of primary facilities, with urban and private sites faring better than rural or public ones.

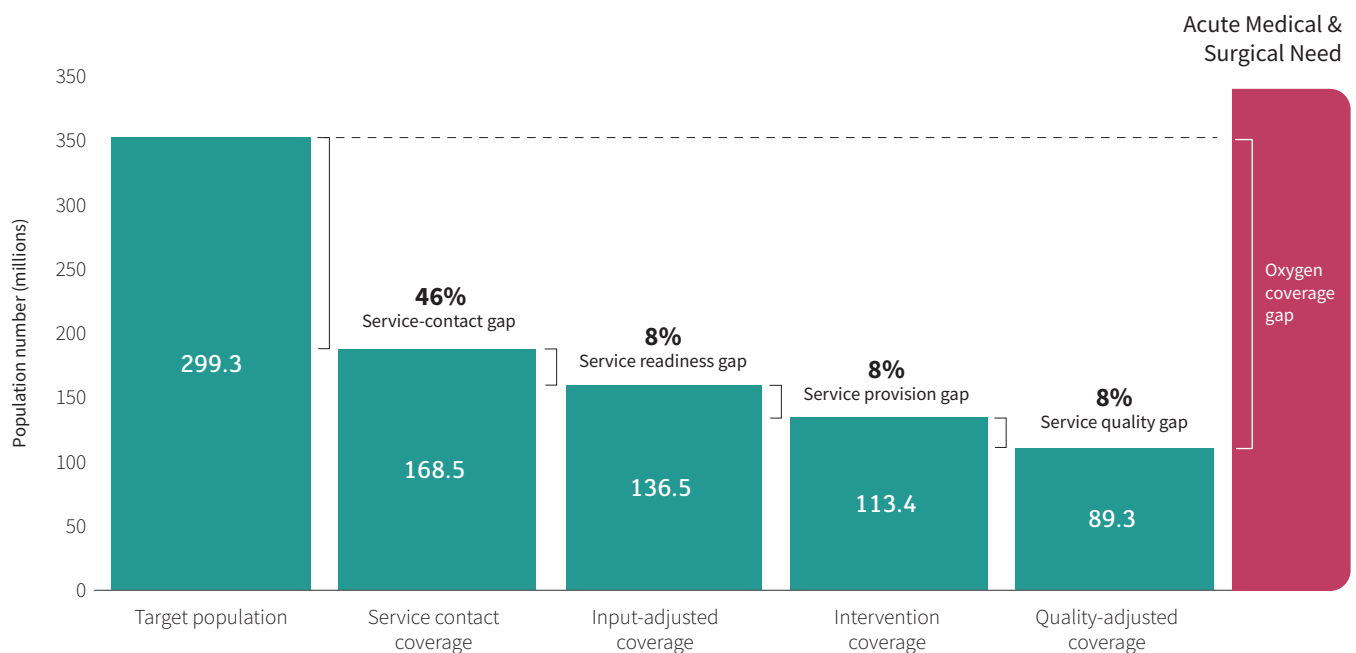
Notably, oxygen is often more available than pulse oximeters, risking inappropriate use without proper assessment. For Bangladesh, specific data is lacking, so South Asian proxies suggest a ~70% gap, primarily

in-service contact, followed by service provision. Dr Arifeen emphasizes the need for systemic improvements to bridge these gaps, aligning with global impetus for equitable oxygen access.



Global Medical Oxygen Need

LMICs acute medical and surgical oxygen coverage to patients



Source: Session Presentation

Medical Oxygen System

Bangladesh Perspective

Dr Md Moinul Ahsan

Director (Hospital and Clinics),
Directorate General of Health
Services (DGHS)



An overview of the current state of oxygen systems across Bangladesh's public health facilities, with a focus on infrastructure, functionality, and management gaps has been brought forward by Dr Md. Moinul Ahsan. His presentation was built upon national assessments under DGHS to identify the operational status of PSA plants, manifold systems, and cylinder-based supplies at different tiers of healthcare delivery.

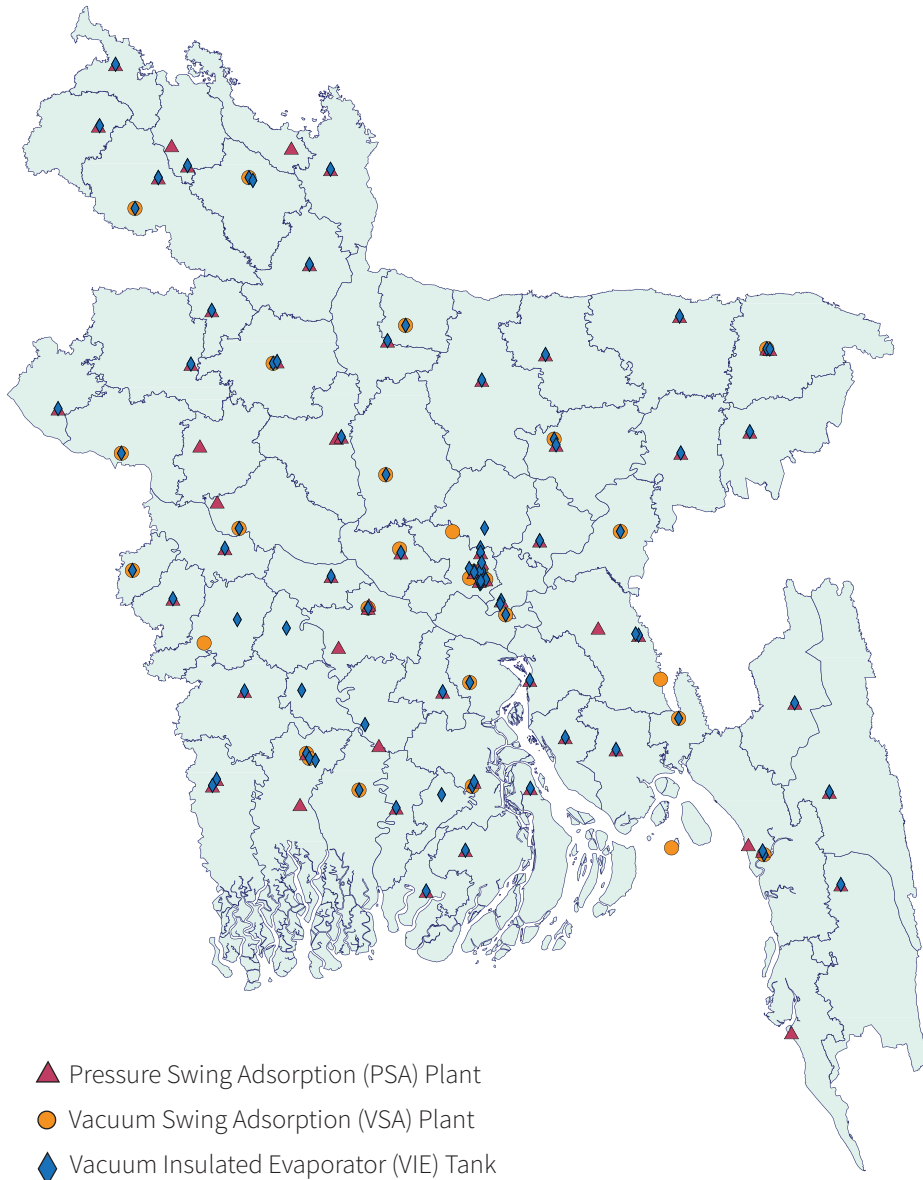
Dr Ahsan explained that oxygen access in Bangladesh has improved significantly since the COVID-19 pandemic, particularly through government investments in PSA plants and central pipeline systems at district and medical college hospitals. However, many of these systems are now operating below capacity or remain non-functional due to lack of maintenance, inadequate technical staff,

and weak monitoring mechanisms.

He emphasized that while over 100 PSA/VSA plants were installed during the pandemic, nearly 70% are not currently functional. Therefore, sustainability and preventive maintenance have become the next critical priorities. He also noted the varying degrees of oxygen availability across healthcare tiers, where tertiary hospitals have better coverage but primary and secondary facilities still rely heavily on cylinders, often facing supply interruptions.

Dr Ahsan also highlighted DGHS's recent initiatives to map oxygen infrastructure nationwide and to develop a digital platform for real-time monitoring of supply and functionality. This initiative aims to improve visibility and coordination between central and peripheral facilities.

Availability & Functionality of PSA/VSA Oxygen Generating Plants



101
Total Plants

65
PSA Plants

36
VSA Plants

98
VIE Tanks

Source: Session Presentation

Key Recommendations

- Strengthen governance and accountability to ensure continuous oxygen supply and maintenance.
- Reactivate and maintain all non-functional PSA plants through a national monitoring plan.
- Establish a digital tracking system for real-time oxygen production and distribution data.
- Build technical capacity of hospital staff for safe oxygen system operation.
- Integrate oxygen security into national health policy as an essential medicine priority.

Building Oxygen Security for Bangladesh: From Crisis Lessons to Sustainable Solutions

Dr Muhammad Tarik Arafat

Professor, Biomedical Engineering,
Bangladesh University of
Engineering and Technology (BUET)



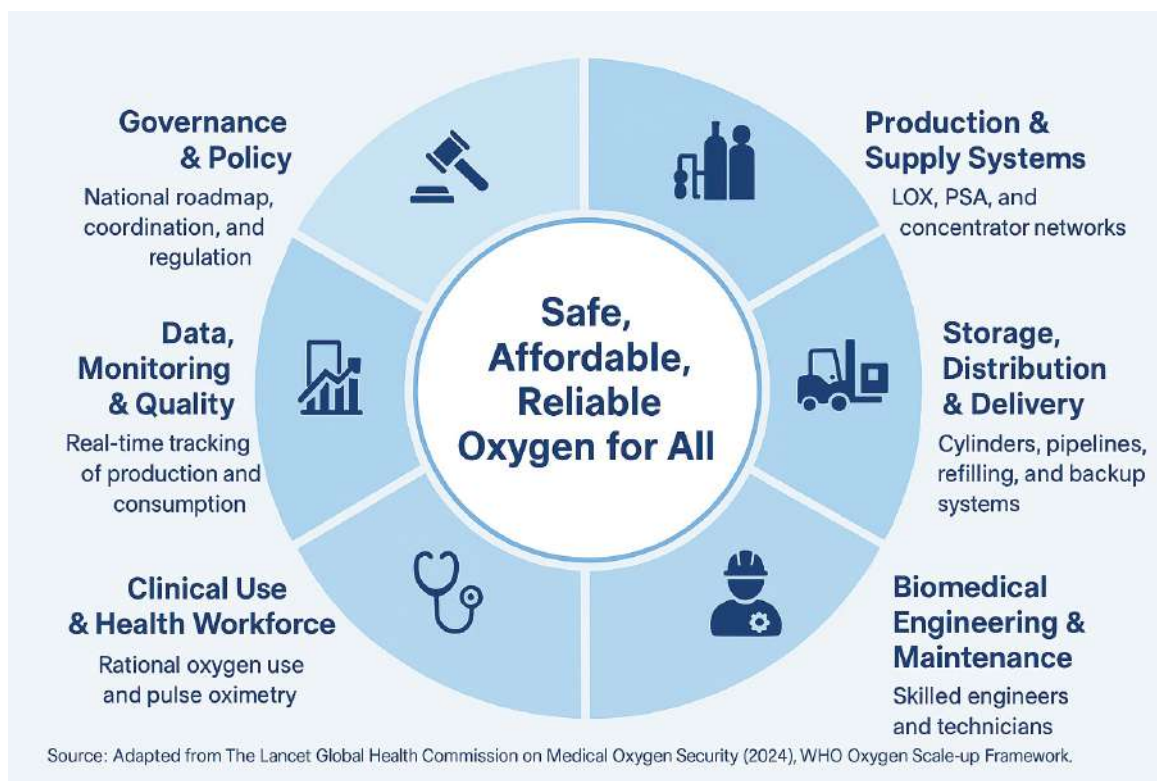
The lessons learned from Bangladesh's oxygen challenges during the COVID-19 pandemic and pathways to sustainable solutions, was the key highlights of Prof. Muhammad Tarik Arafat's presentation. Drawing from his firsthand experiences, Prof. Arafat noted the vulnerabilities in relying on imported oxygen and underscored the critical need for self-sufficiency. The pandemic strengthened Bangladesh's oxygen infrastructure, including PSA and VSA plants, while partnerships helped expand coverage across almost all districts.

Based on the development of comprehensive guidelines by UNOPS and UNICEF, Prof. Arafat emphasized that addressing oxygen security requires more than acquiring equipment. He identified six essential components of oxygen security: governance; data monitoring; clinical use; production supply systems; storage, distribution and delivery; and lastly biomedical engineering and maintenance. While production capacity and distribution are largely sufficient, gaps remain in

governance, quality assurance, data monitoring, and preventive maintenance. Prof. Arafat stressed sustainability as the current challenge, drawing attention to global examples such as Ethiopia, where grassroots innovation and local capacity-building allowed repair and maintenance of ventilators and oxygen equipment, ensuring nationwide continuity. He emphasized that health system actors must clearly understand their roles so that oxygen delivery does not overburden clinical staff.

Data-driven decision-making and maintenance remain critical gaps. Even if oxygen production meets demand, failure in governance, monitoring, and maintenance could compromise patient care. The presenter urged investment in local technical capacity, systematic equipment maintenance, and adherence to quality standards to ensure safe, reliable, and sustainable medical oxygen delivery.

Components of oxygen security



Source: Session Presentation

Key Recommendations

- Strengthen governance and policy frameworks for oxygen security.
- Implement data-driven decision-making to monitor supply, demand, and usage.
- Prioritize biomedical maintenance and quality assurance for equipment sustainability.
- Invest in local capacity-building and grassroots innovation to ensure continuity of oxygen services.
- Clarify roles and responsibilities among healthcare staff to optimize efficiency.
- Adopt best practices from global experiences to improve resilience and long-term sustainability.

Learning from Global Fund's PSA Oxygen Plant Project

Mohamed Infiyaz Hyder

Project Manager, UNOPS
Bangladesh



The key learnings from the Global Fund Emergency Response project, that established 29 PSA (Pressure Swing Adsorption) oxygen plants across 24 districts in Bangladesh, was the highlight of Mohamed Infiyaz Hyder's presentation. The project addressed the oxygen supply crisis during the COVID-19 pandemic by shifting from reliance on liquid oxygen and cylinders to local PSA plant production. Mr. Hyder emphasized the multifaceted approach required for a resilient medical oxygen system, including production, distribution, clinical use, quality assurance, and maintenance. The project's scope involved procurement, installation, commissioning, and handover of PSA plants with backup power systems and associated medical equipment such as BiPAP devices, oxygen masks, and cylinders. Infrastructure development included PSA plant housing, oxygen pipelines, and manifold connections. A major achievement was the comprehensive capacity-building program, training over 150 local operators,

technicians, and engineers to ensure long-term operational sustainability. Key challenges included ensuring uninterrupted power supply, fire safety, integration with existing hospital manifold systems, and building confidence among hospital management regarding the quality of PSA-generated oxygen. Rigorous multi-layered quality checks were conducted to ensure medical-grade oxygen and preventive maintenance protocols were implemented. Additionally, the project emphasized safety, given that pressurized oxygen systems can pose fire and accident risks.

The PSA plants now serve as primary oxygen sources for several hospitals while also providing backup support to surrounding facilities, benefiting an estimated 8.2 million people annually. The project demonstrated that robust stakeholder engagement, repeated training, and quality assurance are critical for sustainable oxygen provision.

Project Concept



New PSA plant and filling station
Primary Source

Primary Supply

Connection point



Secondary Supply



Hospital Wards

Existing Oxygen Liquid tank
Secondary Source



Existing Manifold Room
Tertiary Supply

Source: Session Presentation

Key Recommendations

- Ensure local ownership and operational responsibility of PSA plants to maintain safety and functionality.
- Continue capacity building for operators, technicians, and hospital staff for long-term sustainability.
- Maintain preventive maintenance and quality assurance mechanisms to guarantee medical-grade oxygen.
- Strengthen integration of PSA plants into existing hospital infrastructure for seamless delivery.
- Prioritize safety protocols to mitigate risks associated with pressurized oxygen systems.

Strengthening Medical Oxygen Systems

in Bangladesh

Dr Pyae Phyo Than Cho

Health Officer (Quality of Care),
UNICEF Bangladesh



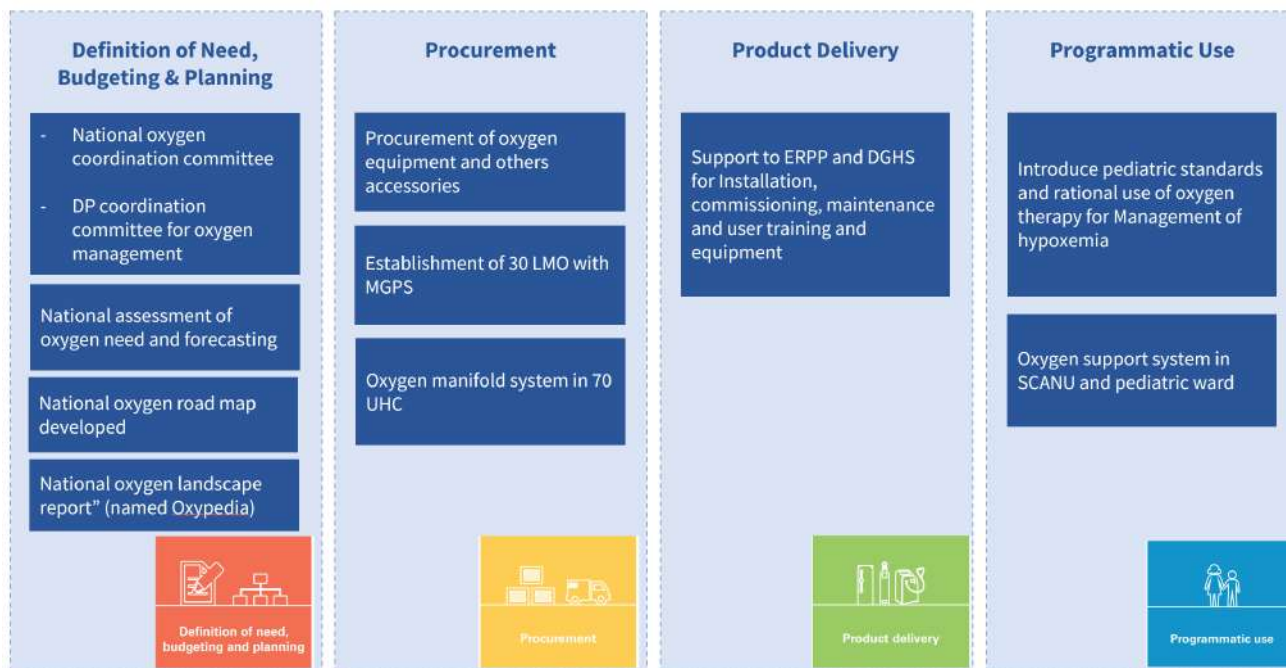
Dr Pyae Phyo Than Cho presented on efforts to strengthen medical oxygen systems in the country. He emphasized that oxygen is essential for patient care, from home-based support with cylinders and concentrators to large-scale delivery in tertiary, secondary, and primary healthcare facilities. During COVID-19, oxygen demand surged, highlighting the need for a robust and well-maintained supply system. UNICEF's support focused on four pillars of the health system, beginning with needs assessment, including budgeting and planning for oxygen requirements. Collaborating with Communicable Disease Control (CDC) under DGHS, Ministry of Health, WHO, and development partners, UNICEF contributed to the National Oxygen Landscape Report, national oxygen assessments, and a roadmap. These initiatives guided procurement, installation, and operationalization of oxygen systems.

During the pandemic, UNICEF assisted with equipment commissioning, user training, and monitoring appropriate clinical use, particularly for newborn care, reducing the risk of oxygen misuse.

Key achievements include the implementation of an Oxygen Management Information System (MIS) to track utilization, development of Standard Operating Procedures (SOPs) for operational guidance, and training modules for healthcare providers on hypoxemia management. These measures strengthened monitoring, rational use, and overall system resilience.

Dr Than Cho highlighted ongoing challenges, including gaps in in-house capacity, operational planning, and technical support within the Ministry of Health and DGHS. Strengthening internal capabilities is essential for effective monitoring, maintenance, and sustainable oxygen delivery.

CO Support across the pillars of oxygen systems scaling framework



Source: Session Presentation

Key Recommendations

- Establish dedicated in-house teams for site assessment, procurement planning, and logistics management within DGHS and MoHFW.
- Expand capacity building and technical training for healthcare staff on oxygen equipment operation and maintenance.
- Strengthen the Oxygen Management Information System for real-time monitoring of utilization and stock management.
- Implement clear Standard Operating Procedures (SOPs) across all levels of healthcare facilities to ensure proper oxygen delivery and maintenance.
- Foster multi-stakeholder collaboration with partners, donors, and government agencies to sustain long-term oxygen system resilience.

NEMEMW&TC and Medical Oxygen Systems: Service and Maintenance in Bangladesh

Engineer M N Nashid Rahman

Technical Manager (Training), National Electro Medical Equipment Maintenance Workshop & Training Center (NEMEMW&TC)



Established in 1983, National Electro Medical Equipment Maintenance Workshop & Training Center (NEMEMW&TC) is responsible for equipment maintenance, human resource development, and round-the-clock support in public hospitals. While the country has expanded oxygen infrastructure rapidly, maintenance gaps have caused frequent equipment failures, pipeline disruptions, and compromised oxygen availability for patients, emphasizing the distinction between oxygen availability and functional medical oxygen systems. Based on this, Engr. M N Nashid Rahman highlighted the critical role of maintenance in ensuring medical oxygen security in Bangladesh.

During the COVID-19 pandemic, sudden surges in demand exposed critical limitations, including lack of local production for medical gas pipelines and other devices.

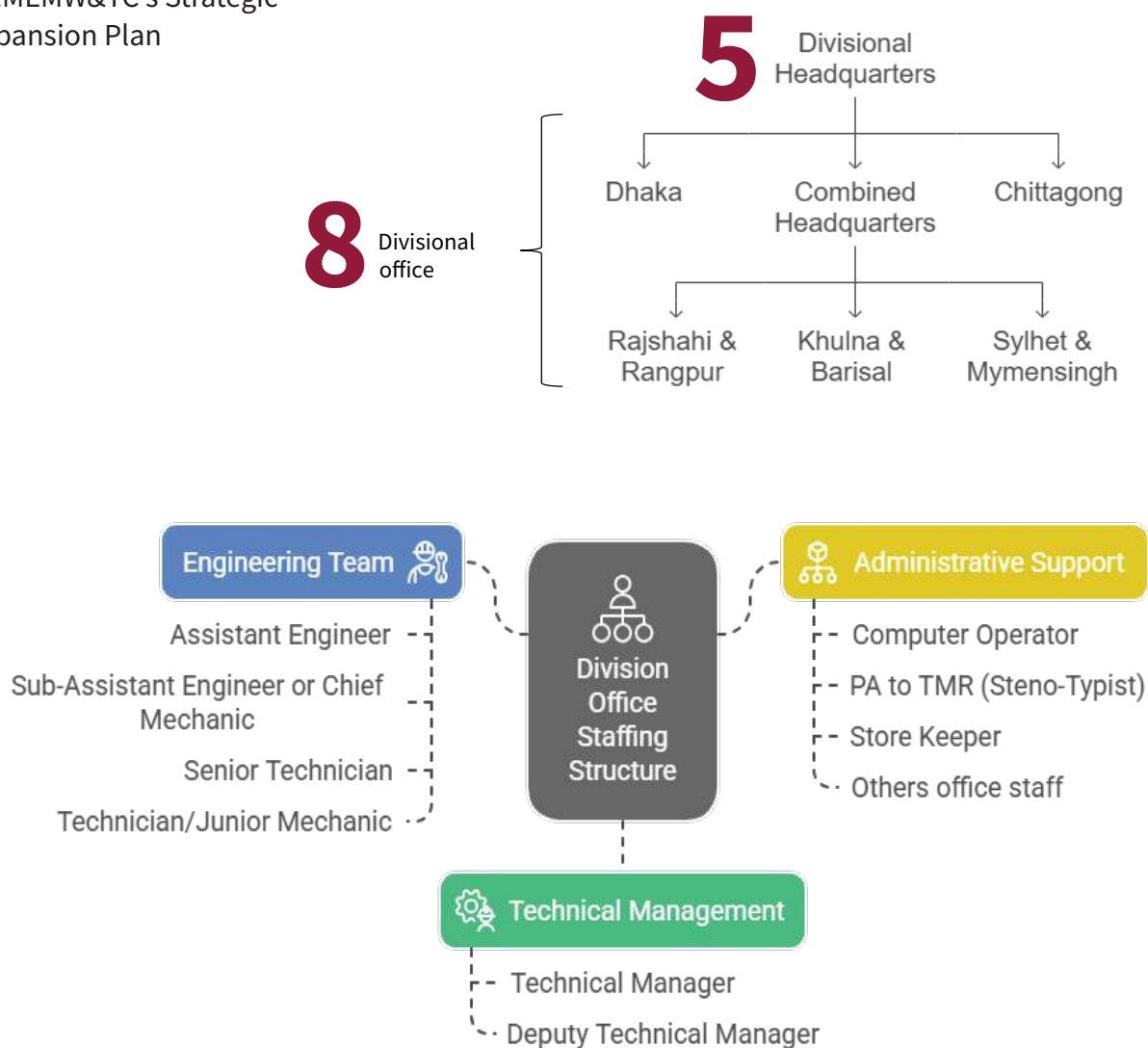
NEMEMW&TC, in collaboration with stakeholders and partners like UNICEF, established 30 VIE tank plants, 25 medical gas outlets, and pipeline networks, and trained staff to ensure uninterrupted supply. SOPs for the National Gas System were developed

with guidance from DGHS, CDC, UNICEF, BUET, and the Ministry of Health and Family Welfare to standardize operations, maintenance, and capacity-building initiatives.

With around 610 public health facilities, the center faced manpower shortages. To address this, NEMEMW&TC is decentralizing operations to divisional and district-level offices, enhancing maintenance coverage and reducing service downtime. Recent achievements include ongoing installations of 22 medical gas plants, distribution of 75 high-flow nasal cannula, and 20 plant repairs. Divisional expansion is expected to optimize logistics, expertise, and rapid response, enhancing the reliability, efficiency, and resilience of oxygen supply.

Despite infrastructure growth, maintenance and planning systems remain insufficient, leading to service interruptions and financial inefficiencies. Strategic expansion and digital asset tracking are key measures to strengthen the sustainability of Bangladesh's medical oxygen system.

NEMEMW&TC's Strategic Expansion Plan



Source: Session Presentation

Key Recommendations

- Strengthen maintenance infrastructure and deploy trained technicians, biomedical engineers, and technical staff in all hospitals.
- Implement digital asset registers to track all service-related equipment and repairs centrally.
- Develop and enforce standard operating procedures (SOPs) across all healthcare facilities.
- Expand capacity-building programs for technical staff in partnership with stakeholders.
- Optimize logistics and rapid response mechanisms through divisional and district-level offices.
- Ensure adequate budgeting for maintenance, training, and infrastructure expansion.



Address from the Special Guest

Md Saidur Rahman

Secretary, Health Services Division, Ministry of Health and Family Welfare

One of the special guest of the summit, Md Saidur Rahman reflected on the critical importance of oxygen, especially highlighted during the COVID-19 pandemic. With sharing his personal experience, Mr. Rahman pointed out the importance of coordinating oxygen supply and the true significance of oxygen management is understood only by those involved in hospital-level processes. He noted that timely oxygen supply was a major challenge, with monitoring systems often non-functional at the upazila level.

While strong preparedness existed during the crisis, it was not sustained post-pandemic. He highlighted the need to preserve past preparations and address manpower gaps, particularly skilled engineers and technicians, to ensure uninterrupted oxygen access.

Mr. Rahman affirmed the government's responsibility to guarantee that all patients receive the oxygen they need and pledged coordinated efforts to strengthen oxygen management across health facilities.



Address from the Special Guest

Professor Dr Md. Abu Jafor

Director General, Directorate General of Health Services (DGHS)

In his address, Prof. Dr Md. Abu Jafor emphasized that oxygen is not just a product but a divine gift essential for life and must be recognized as an essential public service. Citing the Lancet Global Health Commission on Medical Oxygen Security, he pointed out that over 70% of the global population still lack access to safe and affordable oxygen, with low- and middle-income countries most affected.

He highlighted Bangladesh's leadership in the global oxygen movement, with contributions from icddr,b and DGHS shaping global policy and earning recognition for scaling up pulse oximetry

nationwide. Reflecting on the COVID-19 pandemic, he acknowledged government-led expansions of PSA plants and liquid oxygen capacity, while stressing that infrastructure alone is not enough trained manpower, maintenance, and monitoring are equally vital. He stated, "Oxygen delayed is life denied. No patient in Bangladesh should die because oxygen was not available when needed."

Prof. Jafor concluded his remark by calling for continued collaboration to build a resilient, equitable, and environmentally sustainable oxygen system.



Address from the Chair



Dr Anisur Rahman

Scientist and Acting Senior Director
Maternal and Child Health Division, icddr,b

The chair of the session, Dr Anisur Rahman began his remarks by expressing gratitude to all presenters, participants, and distinguished guests for their active engagement throughout the session. He acknowledged the depth of the discussions and extended special thanks to the special guests whose insights added great value to the summit's dialogue. He also recognized the leadership of his colleagues, Dr Shams El Arifeen and Dr Ahmed Ehsanur Rahman, for their global and national contributions through the Lancet Global Health Commission on Medical Oxygen Security, and thanked Dr Tahmeed Ahmed, Executive Director of icddr,b, for his guidance and support.

Reflecting on the importance of the session's theme, Dr Rahman emphasized that sustaining a functional and equitable oxygen system requires consistent investment. He highlighted the role of the DGHS and other stakeholders in ensuring this goal is met. He also pointed out that while oxygen availability in district level is improving, shortages remain critical at peripheral and upazila levels. Dr Rahman noted that the absence of pulse oximeters continues to hinder effective diagnosis and care. The session chair concluded by reminding the audience that achieving the SDGs by 2030 depends heavily on strengthening oxygen eco systems that reach every community equitably.



Address from the Chief Guest



Professor Dr Md. Sayedur Rahman

Honourable Special Assistant (State Minister), Ministry of Health and Family Welfare

In his address, the chief guest of the Summit, Prof. Dr Md Sayedur Rahman began by appreciating the purpose and scale of the dissemination event, pronouncing that the depth of research and dialogue clearly reflected its policy importance. The honorable chief guest, emphasized that the discussions on governance, regulation, and system efficiency revealed how oxygen access remains a critical challenge, despite national progress.

Reflecting on the findings shared during the first two sessions, the overall message is unmistakable: oxygen has not been given adequate priority in medical education or healthcare planning in Bangladesh. Drawing from recent national experiences, he shared that during the COVID-19 crisis, Bangladesh had responded effectively in securing equipment and emergency supplies, yet the system's sustainability remained a concern. Prof. Rahman emphasized the ongoing efforts of the government to establish a

National Oxygen Network and restore full operational capacity. He stated that health security is inseparable from national security. Local oxygen production, vaccine development, and other essential health commodities must be viewed as components of sovereignty and resilience. Concluding his remarks, the honourable chief guest praised the idea of organizing an "Oxygen Summit," calling it a timely initiative that bridges research and policy. He declared oxygen as an essential medicine, and stressed the need to ensure its availability across all hospitals and upazilas, alongside safe and reliable delivery systems by developing a time appropriate oxygen roadmap. He commended the scientists and organizers for leading a globally relevant dialogue from Bangladesh, urging that the insights gained at the summit must now translate into real, equitable access to life-saving oxygen for every citizen.

Session Three

Oxygen Production, Regulations and Investments



The third and parallel discussion session brought together experts from the government, private sector, development partners, and academia to discuss pathways for strengthening the country's oxygen production, regulation, and investment landscape. The roundtable brought together diverse perspectives on how Bangladesh can achieve self-sufficiency and resilience in medical oxygen supply.

Moderator:

Mr Kazi Delwar Hossain

Additional Secretary (Planning), Health Services Division,
Ministry of Health and Family Welfare

Presenters & Disussants:

Dr Shams El Arifeen

Senior Scientist (Emeritus), icddr,b
Commissioner, Lancet Global Health Commission on Medical Oxygen Security

Md. Mohid Islam

Assistant Director
Directorate General of Drug Administration (DGDA)

Ms. Iffat Mahmud

Senior Operations Officer
The World Bank

Rui Liu

Senior Health Specialist
Asian Development Bank (ADB)

Redwan Al Hameed

Chief Strategy Officer, Spectra International Limited

Farid Sikder

Managing Director
Linde Bangladesh Limited

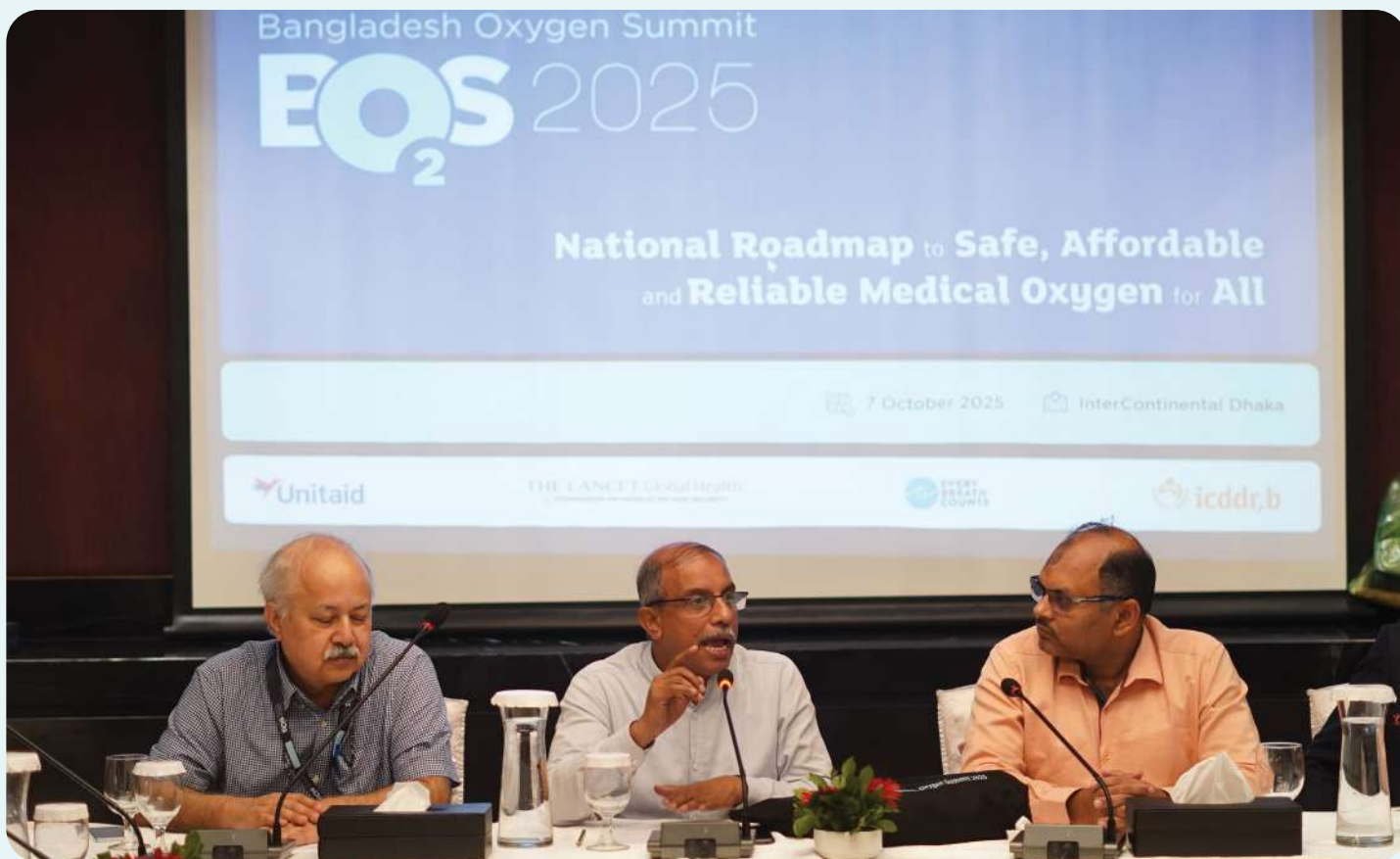
Engr. Shohrab Uddin Ahmed

Head of Gas Business
Abul Khair Group

Engr. Mushfique Akhter

General Manager – Sales & Operations
Fresh Oxygen & Gases, Meghna Group of IndustriesLinde Bangladesh Limited

Speakers' affiliations are as stated at the time of their presentations.



Discussion Summary

The discussion of this session was opened by Dr Shams El Arifeen, with an overview of global evidence on oxygen production technologies and market challenges. Dr Arifeen highlighted the need for context-specific solutions, local innovation, and sound financial planning to ensure sustainable oxygen supply. The session reviewed diverse production methods including PSA, VSA, and cryogenic systems, each with distinct purity, cost, and maintenance considerations. He underscored the urgency of establishing robust regulations and investments that reflect local realities, especially in LMICs, where representation in international standard-setting remains limited.

From the regulatory perspective, Md. Mohid Islam, explained that medical oxygen is treated as a medicine under the Drug and Cosmetic Act 2023, and that DGDA licenses and inspects manufacturers following international standards such as ISO 13485. However, he acknowledged existing challenges including, insufficient manpower, limited testing

capacity, and weak coordination with stakeholders. He emphasized the need for digital monitoring and enhanced vigilance to ensure quality control. Representing the Asian Development Bank (ADB), Rui Liu, shared how ADB's COVID-19 Emergency Response supported Bangladesh through the procurement of oxygen plants, ventilators, and ICU equipment, while also building long-term system capacity. He stressed the importance of maintenance and human resource investment to sustain these gains.

Ms. Iffat Mahmud, from World Bank, highlighted that World Bank provided over USD 600 million to strengthen pandemic response and vaccination efforts. She reported significant infrastructure achievements: ICUs established in 23 hospitals, 2,000 concentrators provided, and 30 liquid oxygen systems installed. She noted that new initiatives are being developed to integrate human, animal, and environmental health systems for future preparedness.



The session also engaged the private sector perspectives from relevant industrial leads. Engr. Shohrab Uddin Ahmed, from the Abul Khair Group, outlined the company's capacity to meet domestic demand for medical gases but called for fair market competition and stronger regulatory oversight. Farid Sikder from the Linde Bangladesh Limited, reflected on Linde's seven decades of service, including delivering 175 tons of oxygen per day during the pandemic. He identified unequal market conditions and limited safety awareness as persistent barriers. From Meghna Group of Industries, Engr. Mushfique Akhter, spoke about expanding production capacity and installing new ASU plants. He urged regulatory support and joint planning to meet future healthcare needs. Redwan Al Hameed, from the Spectra International Ltd., highlighted his company's rapid COVID-era response but warned that unreliable power supply and insufficient incentives threaten

sustainability. He called for joint action between public and private sectors to secure long-term oxygen systems.

Maruf Hasan from UNOPS, shared details of the government's initiative to establish a sustainable national oxygen ecosystem. He pointed out that with support from ADB, Global Fund, and GoB, 99 PSA and VSA plants were procured, producing oxygen within WHO purity standards. He highlighted the need for formal maintenance budgets and institutional responsibility for NEMEMW&TC to ensure sustainability.

The session concluded with strong consensus: ensuring medical oxygen security requires collective accountability with effective regulation, equitable investments, and cross-sectoral partnerships that prioritize patient lives over procurement cycles.

Discussion Highlights

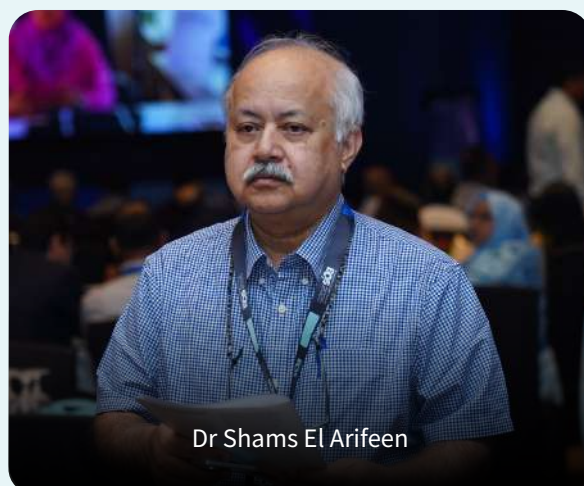
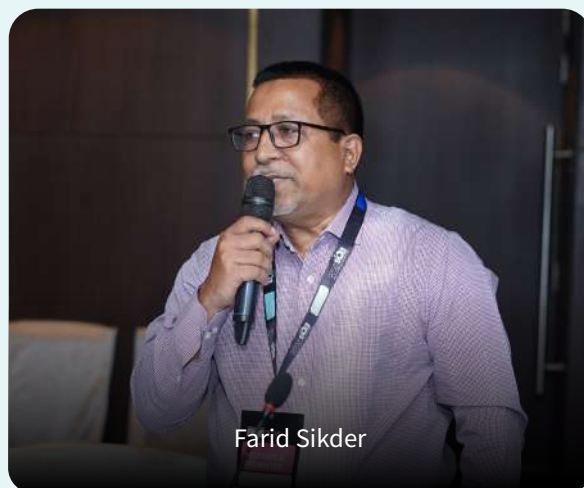
Key Question Raised:

The discussion centered on ensuring the safety, quality, and regulation of medical oxygen across the country. Participants raised concerns about:

- The presence of unauthorized or unregulated oxygen suppliers.
- The lack of clarity in hospital-level procurement mechanisms after the end of centralized tender processes.
- Unequal application of regulatory standards between public and private hospitals.
- Sustainability of PSA plants, given limited technical manpower and maintenance capacity.

Commitments:

- DGDA reaffirmed its commitment to regulate all oxygen production units and requested a list of hospital-based PSA/VSA plants for inspection and quality assurance.
- The Director of Hospital Services Management clarified that public hospitals can now directly procure oxygen, decentralizing the system for greater flexibility.
- Participants agreed that all oxygen plants public or private should follow a unified national standard under DGDA oversight.
- It was proposed to develop a National Oxygen Policy to guide production, regulation, and investment, ensuring coordinated management and sustainability.
- The moderator emphasized the need for technical manpower development and regular maintenance to keep PSA plants functional.





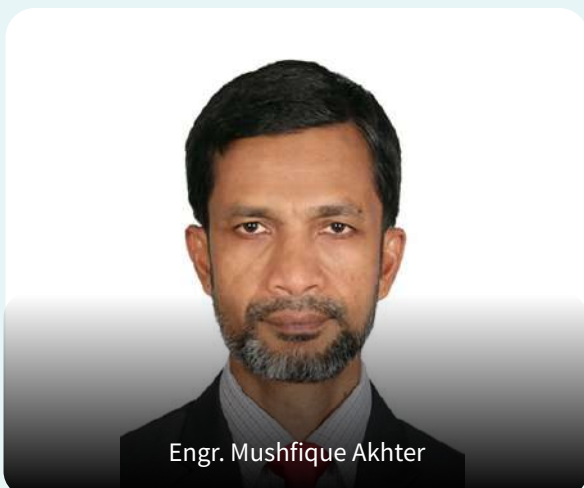
Redwan Al Hameed



Rui Liu



Engr. Shohrab Uddin Ahmed



Engr. Mushfique Akhter



Key Recommendations

- Strengthen national regulatory systems under DGDA for medical oxygen production, distribution, and maintenance monitoring.
- Ensure fair competition and quality compliance across public and private suppliers through transparent procurement and safety enforcement.
- Invest in maintenance and human resources, expanding technical training for biomedical engineers and plant operators.
- Encourage public-private collaboration to expand production capacity, strengthen logistics, and ensure sustainable supply chains.
- Promote innovation and local manufacturing to reduce dependence on imports and enhance self-sufficiency.
- Develop digital monitoring systems for real-time tracking of oxygen production, purity, and supply reliability.
- Secure long-term financial commitments from government and development partners for infrastructure, maintenance, and technology upgrades.

Session Four

Oxygen Research, Innovation and Education: What are the Solutions and Where are the Evidences?



The final session focused on research, innovation, and education as the pathways to sustainable oxygen security. It explored how evidence-driven approaches and locally developed solutions can address gaps in oxygen access and utilization across different levels of the health system.

Speakers highlighted innovations in medical oxygen delivery, training, and system integration that emerged from both global experience and Bangladesh's own context.

Moderator:

Dr Sharful Islam Khan

Scientist, icddr,b

Special Guestes:

Professor Abul Kalam Azad

Pro Vice Chancellor
Bangladesh Medical University

Professor Dr Nazmul Hosain

Director General
Directorate General of Medical Education

Kazi Delwar Hossain

Additional Secretary (Planning)
Health Services Division
Ministry of Health and Family Welfare

Md Mohiuddin Al Helal

Senior Assistant Secretary & Program Manager
Policy and Program Monitoring
Ministry of Health and Family Welfare

Presenters:

Dr Ahmed Ehsanur Rahman

Scientist, icddr,b
Member, Executive Committee, Lancet
Global Health Commission on Medical
Oxygen Security

Dr Mohammad Jobayer Chisti

Senior Scientist, icddr,b

Dr Md. Mominul Islam

Professor, Department of Chemistry
University of Dhaka

Dr Taufiq Hasan

Professor of Biomedical Engineering
Bangladesh University of Engineering
and Technology

Md Hafizul Imran

Assistant Professor
Department of Software Engineering
Daffodil International University

Dr Mohammad Hasan Imam

Associate Professor
Faculty of Engineering
American International University
Bangladesh

Engr Md Nazmul Hassan

Chief Executive Officer
MEGASAN Bangladesh

Md Hasib Mamun

Statistician, National Institute of
Population Research and Training

Speakers' affiliations are as stated at the time of their presentations.

Innovation and Investment in Medical Oxygen Security

Global Perspective

Dr Ahmed Ehsanur Rahman

Scientist, icddr,b

Member, Executive Committee, Lancet Global Health Commission on Medical Oxygen Security

Required by over 373 million people worldwide each year, including 105 million for acute conditions, 260 million for surgeries, and 9 million for chronic diseases, Dr Ahmed Ehsanur Rahman opened his presentation emphasizing on the investment in medical oxygen security. Despite this vast demand, 60 to 70% of the patients in LMICs, lack timely access to medical oxygen, reflecting what Dr Rahman pointed out as “a big need, limited access, and inadequate investment.”

He highlighted that an estimated USD 6.8 billion annually is required globally to close the oxygen access gap (excluding long-term therapy). Dr Rahman underscored that innovation is not merely invention but also

contextual adaptation, optimizing what already exists to make it scalable and affordable. He cited successful models such as Open Oximetry for global pulse oximeter data sharing, the Open O₂ Movement for rapid biomedical equipment repair, and the WHO endorsed 93% medical-grade oxygen for cost-effective production.

To accelerate progress, he identified six research and policy priorities: improving need assessment, ensuring equitable access, optimizing demand, strengthening delivery systems, updating clinical guidelines, and building skilled oxygen workforce capacity.



Key Recommendations & Takeaways:

- Develop a national oxygen roadmap aligned with the Lancet Global Health Commission framework.
- Strengthen oxygen data systems for real-time monitoring of production, supply, and usage.
- Foster local innovation ecosystems to adapt global models like Open O₂ and Open Oximetry.
- Secure sustainable financing and governance mechanisms to guarantee equitable access for all.

Low-Cost Continuous Positive Airway Pressure (CPAP)

Dr Mohammad Jobayer Chisti

Senior Scientist, icddr,b



Locally Made Bubble CPAP: A Low-Cost and Life-Saving Medical Oxygen Therapy for the Treatment of Childhood Severe Pneumonia

Dr Chisti's work focused on developing a low-cost bubble CPAP system to treat severe childhood pneumonia, a leading cause of death among children under five. Traditional CPAP devices are expensive, require complex maintenance, and are often unavailable in low-resource settings. The locally developed bubble CPAP system uses affordable materials and simple design principles to deliver effective respiratory support.

The development process of Dr Chisti's bubble CPAP included adaptation of neonatal CPAP

techniques for children beyond the neonatal period. The system was tested in randomized controlled trials at Dhaka Hospital, icddr,b, comparing low-flow oxygen, high-flow nasal cannula, and bubble CPAP. Results showed that bubble CPAP performed comparably or better in improving oxygenation and reducing the need for mechanical ventilation. The system is safe, easy to operate, and requires minimal training, making it suitable for broader deployment in hospitals across Bangladesh.

Impact:

Bubble CPAP significantly reduces mortality in children with severe pneumonia, lowers oxygen consumption costs, and increases access to life-saving respiratory support. Its low-cost, locally produced design allows scale-up in resource-limited settings, with implementation already beginning in hospitals across Bangladesh and Africa. The innovation demonstrates that simple, evidence-based solutions can improve child health outcomes while conserving medical resources.

Electrochemical Oxygen Generator

Dr Md. Mominul Islam

Professor, Department of
Chemistry, University of Dhaka



Electrochemistry in the Oxygen Supply Chain: Toward a Future Paradigm

The electrochemical oxygen generator provides an alternative to conventional Pressure Swing Adsorption (PSA) oxygen systems by producing oxygen through electrochemical water splitting. Oxygen is generated at the anode, while hydrogen is produced at the cathode. This method allows for compact, modular, and portable devices that can produce 99.9% pure oxygen and can be powered using solar energy or batteries.

Dr Islam and his team focused on designing small-scale units suitable for hospitals, remote clinics, and emergency setups. The system is flexible, scalable, and reduces reliance on cylinders or large oxygen plants. It also supports sustainable healthcare by enabling renewable energy integration and producing hydrogen as a byproduct that could be used for other purposes.

Impact:

This electrochemical method reduces energy consumption, increases accessibility of medical oxygen in remote areas, and provides a scalable solution for decentralized oxygen generation. It addresses supply chain vulnerabilities, supports continuous care during crises, and contributes to a sustainable approach for oxygen delivery in Bangladesh and similar LMIC contexts.

OxyJet: Low-Cost, Electricity-Free CPAP

Dr Taufiq Hasan

Professor, Biomedical Engineering,
Bangladesh University of Engineering
and Technology



OxyJet: Low-Cost, Electricity-Free CPAP for Respiratory Care in Low-Resource Settings

OxyJet is a locally developed CPAP device designed for resource-constrained settings, particularly during the COVID-19 crisis when high-flow oxygen and ventilators were in short supply. Dr Hasan and his team at BUET developed OxyJet using a Venturi-based jet-mixing system to amplify oxygen flow without electricity. The device mixes a primary oxygen supply of 15 L/min with ambient air, producing flow rates up to 60 L/min. Oxygen concentration (40–100%) and positive pressure (5–20 cm) are adjustable.

The device is 3D-printable, low-cost, simple to operate, and compatible with existing hospital oxygen infrastructure. The development followed iterative prototyping, starting from Ambu bag ventilators and neonatal bubble CPAP systems adapted for adults. Each prototype underwent design improvements based on clinical testing and technical assessment. Full clinical trials were conducted at DMCH and NIDCH, confirming the device's safety, oxygen efficiency, and compliance with CPAP guidelines.

Impact:

OxyJet reduces oxygen consumption by up to 30% compared to standard nasal cannulas, lowers reliance on electricity, and can function in off-grid settings. It addresses critical gaps in respiratory care during emergencies and expands access to CPAP therapy in low-resource hospitals. The device has received regulatory approval from DGDA in Bangladesh and has been recognized in international innovation contests. OxyJet demonstrates that locally developed solutions can meet urgent clinical needs while remaining affordable and sustainable.

NISHASH: Low-Cost Mechanical Ventilator

Md Hafizul Imran

Assistant Professor, Department
of Software Engineering, Daffodil
International University



NISHASH: A Reasonable Cost-Effective Mechanical Ventilator for COVID-Affected Patients in Bangladesh

NISHASH is a mechanical ventilator developed in Bangladesh during the COVID-19 pandemic to address the severe shortage of imported ventilators. Conventional ventilators were expensive, complex, and inaccessible for many hospitals and remote areas. Md Hafizul Imran and his team designed a low-cost ventilator using locally available materials with a target cost below USD 200.

The ventilator uses a motorized Ambu bag to

deliver air, with adjustable pressure and volume controlled by a servo motor and PWM system. A spring-sliding mechanism compresses and releases the bag continuously for ventilation. The design is portable, easy to assemble, and requires minimal technical expertise to operate. Testing in hospital settings confirmed its reliability, consistent ventilation, and suitability for emergency and routine clinical use.

Impact:

NISHASH provides a practical, low-cost solution to mechanical ventilation shortages, enabling hospitals to treat critically ill patients without relying on imported devices. Its simplicity and affordability allow deployment in remote or under-resourced areas, while ongoing improvements, such as durable materials and real-time monitoring, are planned to enhance performance. This innovation demonstrates the potential for locally developed medical devices to fill critical gaps in healthcare delivery.

Non-Invasive Ventilator with Feedback System

Dr Mohammad Hasan Imam

Associate Professor, Faculty of Engineering, American International University Bangladesh



Design of a Low-Cost Non-Invasive Ventilator Control with Feedback Mechanism to Conserve Medical Oxygen

Dr Imam's project addresses oxygen conservation in ventilator systems by developing a non-invasive, portable ventilator that adjusts oxygen delivery based on patient biofeedback. The system monitors oxygen saturation and respiratory rate to automatically control oxygen flow, reducing unnecessary use while ensuring effective therapy.

The ventilator is designed for clinical and home

settings, with a focus on low-resource environments where oxygen is scarce. By integrating a feedback controller system, the device reduces dependency on highly trained specialists and minimizes wastage of medical oxygen. The design is based on global biofeedback technologies adapted for local use and can be implemented with simple electronics and mechanical components.

Impact:

The ventilator preserves oxygen as a valuable medical resource, reduces operational costs, and allows safe use in hospitals and homes. It contributes to efficient healthcare delivery and demonstrates the importance of locally developed control systems in optimizing oxygen use in Bangladesh and similar settings.

PSA Oxygen Plants with Smart Monitoring

Engr Md Nazmul Hassan

Chief Executive Officer,
MEGASAN Bangladesh



Public-Private Partnership for Smart PSA Oxygen Plants to Improve Access and Reduce Wastage

Engr Nazmul Hassan presented a plan to address Bangladesh's oxygen shortage and wastage by installing locally assembled PSA oxygen plants at key hospitals. These plants will act as oxygen hubs, supplying district and surrounding health facilities. The system incorporates smart IT-based monitoring, enabling remote troubleshooting and real-time

efficiency improvement.

The innovation focuses on reducing import dependency, lowering costs, and ensuring a reliable supply of high-quality medical oxygen. Local assembly and public-private partnership ensure sustainability, while smart monitoring addresses maintenance and operational challenges.

Impact:

This approach has the potential to reduce oxygen costs by 65%, minimize wastage, and improve access in underserved areas. It strengthens healthcare infrastructure and ensures timely oxygen availability for patients, particularly during crises.

National Oxygen Service Readiness Survey

Md Hasib Mamun

Statistician, National Institute of Population Research and Training



Medical Oxygen Service Readiness among Health Facilities in Bangladesh: Findings from BHFS 2022

The Bangladesh Health Facility Survey (BHFS) 2022 assessed oxygen system readiness in 1,557 health facilities across Bangladesh. Using WHO-UNICEF frameworks, the survey examined oxygen source, distribution, regulation, delivery, and patient monitoring. Findings revealed disparities: while higher-level hospitals had

functional oxygen systems, union-level and community clinics were poorly equipped. Only 55% of facilities had at least one functional oxygen source, and only 34% could deliver oxygen effectively.

Impact:

BHFS identifies gaps in service delivery, informs policy and investment priorities, and provides baseline data for strengthening oxygen systems. Recommendations include focusing on union-level facilities, increasing fund allocation, and improving monitoring. The survey guides national planning for equitable oxygen access.



Address from the Special Guest



Professor Abul Kalam Azad

Pro-Vice Chancellor
Bangladesh Medical University

Professor Abul Kalam Azad, emphasized that oxygen is a drug and requires proper understanding of its appropriate use. He stated that overuse of oxygen can cause toxicity, leading to brain damage, eye complications in premature infants, and lung injury. He noted that in many hospitals, patients are often kept on oxygen without proper monitoring, which can result in respiratory failure due to overexposure. He highlighted that 96 to 100 oxygen saturation

for a normal person and 92 and above for a COPD patient is sufficient. However, giving medical oxygen to any patient within these levels will result toxicity and financial waste. He recommended that biomedical engineers and innovators develop AI-based devices capable of determining and supplying only the required amount of oxygen for each patient. Such innovations, he suggested, would help achieve the core objectives of the Bangladesh Oxygen Summit.



Address from the Special Guest



Professor Dr Nazmul Hosain

Director General
Directorate General of Medical Education

Professor Dr Nazmul Hossain, stated that “The concept of Oxygen Summit is an excellent idea.” Through a short story, he illustrated that oxygen is the essence of life and the foundation of all living beings. He explained that with its eight protons and electrons, oxygen forms the molecular basis of life on earth. He highlighted that, “Every problem is an opportunity. The COVID-19 pandemic taught us the true value of oxygen, as many precious lives were lost due to its scarcity”.

He remarked that during COVID-19, Bangladesh developed local capacity for

ventilator and CPAP machine production.

Therefore, he stressed the importance of enhancing national preparedness in oxygen generation, delivery systems, and healthcare provider training to handle future crises effectively.

He also cautioned that “Excess of anything is bad,” emphasizing that oxygen overuse can be harmful.

He recommended educating medical students on the real value and proper use of oxygen.



Address from the Special Guest



Kazi Delwar Hossain

Additional Secretary (Planning)
Health Services Division
Ministry of Health and Family Welfare

Kazi Delwar Hossain, emphasized that “Excess of anything is harmful, it can be regarding oxygen or water”. The speaker highlighted the importance of setting proper limits in every aspect, including oxygen use. He strongly recommended that, Bangladesh urgently needs a National Medical Oxygen Policy, as such a policy would enable the establishment of necessary standards of oxygen.

Sharing a personal experience, he mentioned that his premature daughter had to be taken abroad in 2002 due to excessive oxygen supply, which underscores the lack of

proper oxygen dosage standards at that time. He also mentioned that “In our medical curriculum may be oxygen was not in actually covered that much, and therefore, this issue should be addressed within medical education.”

While recognizing Bangladesh’s potential for innovation, he noted that sustaining such progress remains a major challenge.

In conclusion, he recommended that, “The best output that Bangladesh can get from this summit is a national medical oxygen roadmap.”



Address from the Special Guest



Md Mohiuddin Al Helal

Senior Assistant Secretary & Program Manager
Policy and Program Monitoring
Ministry of Health and Family Welfare

Md. Mohiuddin Al Helal in his address, mentioned that Bangladesh, along with 31 countries, proposed a historic resolution at the 76th World Health Assembly (Resolution 76.3), declaring that oxygen is essential, non-substitutable, and there should be no excuse for its unavailability.

Al Helal highlighted the Access to Medical Oxygen Scorecard developed by the Lancet Global Health Commission on Medical Oxygen Security, noting Bangladesh's contribution to the process.

Regarding national progress, he mentioned that Bangladesh implemented PSA oxygen plant projects, which are safe, reliable, and cost-effective. Capacity-building activities for PSA operators were conducted, and a National Taskforce for Essential Medicines

was established.

As a way forward, he announced plans to develop a National Medical Oxygen Road Map aligned with Resolution 76.3, integrate DHIS2 into the national oxygen reporting system, and ensure both technical and financial sustainability. He also shared plans to publish an annual "oxygen brief" based on DHIS2 data.

In conclusion, he stated, "Every safe breath in a ward, every newborn child, and every mother which breathe safely that will be a tribute to our work." He expressed confidence that, with support from ADB, World Bank, UNOPS, and the Global Fund, Bangladesh will be able to deliver safe, reliable, and accessible oxygen services nationwide.



Address from the Session Chair



Dr Shariful Islam Khan

Scientist
icddr,b

In his concluding remarks, Dr Shariful Islam Khan emphasized the urgent need to bridge the gap between innovation and implementation. He stated that strengthening medical oxygen infrastructure directly contributes to reducing preventable deaths, particularly among children and mothers.

Innovation in medical oxygen systems offers a transformative pathway. Decentralized PSA plants in district hospitals, solar-powered concentrators in off-grid facilities, and digital supply-chain monitoring can close systemic gaps between demand and delivery. Yet, as emphasized by Dr Khan at the Oxygen Summit, innovation alone is insufficient without effective implementation. Policies often celebrate technological advancement, but operationalization, maintenance,

financing, and governance frequently lag behind. Bangladesh now has a strategic opportunity to contribute meaningfully to the global oxygen agenda if innovation is matched with accountability and systems thinking.

Oxygen is fundamentally a human right. Nature provides it freely, yet structural inefficiencies, corruption, and market distortions have rendered medical oxygen complex and costly. The suffering of a breathless child, the silent plea of an elderly mother, or a life lost inside an ambulance are stark reminders that oxygen is not merely a commodity; it is the invisible foundation of survival. Strengthening oxygen innovation in Bangladesh is therefore an ethical imperative as much as a health-sector priority.

Marketplace

BO2S2025 has brought together the private entities engaged in the infrastructure, production, and distribution of medical oxygen across the country. The ones joined at the marketplace are:

- Abul Khair Group
- Fresh Oxygen and Gases
- GPH Oxygen Limited
- Linde Bangladesh Limited
- Megasan Bangladesh
- Spectra International Limited
- Union Oxygen PLC

Listed alphabetically



Abstracts and Innovations

The Summit called for abstracts from leading research organizations, universities, and academia across broad thematic areas: hypoxaemia and oxygen needs; oxygen delivery systems and access; oxygen regulation and investment; oxygen innovation and research; and cross-cutting and emerging issues.

The Risk Factors of Paediatric Acute Respiratory Infection among Under-Five Children in Bangladesh: Evidence from BDHS 2022

Moss. Maharun Nahar Jui^{1*}

¹Institute of statistical Research and Training, University of Dhaka

*mmjui@isrt.ac.bd

Background & Objectives

Acute Respiratory Infection (ARI) plays a hazardous role in the burden of hypoxaemia in Bangladesh. This study aimed to estimate the prevalence of ARI and identify the risk factors associated with ARI among under-five children using the 2022 Bangladesh Demographic and Health Survey (BDHS) data.

Methods

A total of 5,850 children aged 1–59 months were included in this complete records analysis from the BDHS (KR) dataset. ARI was defined as cough and abnormal breathing in the two weeks preceding the survey. Binary logistic regression was conducted to identify independent risk factors associated with ARI.

Results

The prevalence of ARI was 6.9%. Female children had lower odds (OR=0.67 [0.45-1.01]) of ARI compared to males. Higher birth order (≥ 3) was associated with increased ARI risk (OR up to 86.3 [3.01-2473.55] for seventh-born children). Children from Dhaka and Rangpur regions had significantly lower odds of ARI (OR=0.38 [0.17-0.83]; OR=0.48 [0.22-1.03], respectively) compared to Barisal. Children from rural areas had slightly higher odds of ARI compared to those from urban (OR=1.06 [0.60-1.86]). Children with media access had lower odds of ARI (OR=0.88 [0.57-1.35]). Normal and high birth weight children showed slightly reduced odds (OR=0.71 [0.33-1.53] and OR=0.75 [0.35-1.62], respectively) compared to low birth weight children (<2.5 kg), though differences were not statistically significant.

Conclusions

ARI remains a notable health concern among under-five children, leading to an increase in oxygen demand in Bangladesh, with birth order, media access and regional disparities being key risk factors. Targeted interventions focusing on family planning, awareness in undeveloped areas and child nutrition could help reduce ARI prevalence and improve child health outcomes.

Themes and Cross-Cutting Topics

Child health, maternal factors, household environment, epidemiology, Bangladesh.

Oxygen Resources in Bangladeshi Health Facilities: Availability, Utilization, and Inequalities

Ayesha Siddika^{1*}

¹Institute of Statistical Research and Training, University of Dhaka

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Background & Objectives

Oxygen therapy is crucial for patients with severe respiratory illness, yet consistent and equitable deployment across healthcare facilities in Bangladesh remains uncertain and poorly documented. This study aims to assess the facility-level distribution, preparedness and disparities in oxygen resources, alongside compliance with the minimum planning standard of one oxygen source for every 100 beds.

Methods

This study used data from 599 health facilities from the DGHS COVID-19 Bed Status Dashboard (<https://dashboard.dghs.gov.bd/pages/covid19-bedstatus-display-summary.php>). Missing values were median-imputed, and indicators included oxygen-to-bed ratio, HFNC utilisation, and an oxygen readiness index were derived. Inequality in continuous oxygen supply (central points plus concentrators) was quantified using Gini and Theil indices, division-level compliance with 1 oxygen source per 100 beds was calculated as the planning ratio, and associations with bed occupancy were examined using linear regression.

Results

Median beds per facility ranged 10-20. Average oxygen-equipped beds, concentrators, cylinders, and HFNC devices showed greater variability, with numerous facilities having no availability of certain resources. Continuous oxygen supply exhibited pronounced inequality (Gini = 0.893; Theil = 2.922), with division-level Gini ranging 0.695–0.867. Nationally, 84.2% facilities met the planning benchmark, with marked variation across divisions (highest: Barisal 92.3%; lowest: Rajshahi 75.8%). District level inequality was also noticeable. Analysis using regression model indicated no significant association between oxygen resources and bed occupancy ($R^2 = 0.0048$, $p = 0.58$).

Conclusions

Oxygen resources availability in Bangladesh is highly uneven across facilities and regions, despite a majority meeting the planning benchmark. These findings underscore the need for interventions to address inequities and bolster facility-level preparedness.

Themes and Cross-Cutting Topics

Health system inequality, oxygen therapy, facility-level readiness, resource distribution, pandemic preparedness.

From Water to Breath and Fuel: Magnetic Field-Assisted Electrochemical O₂ Generation

Tabassum Taspaya^{1,2}, Md. Mominul Islam^{2*}

¹Department of Mathematics and Natural Sciences, BRAC University

²Department of Chemistry, University of Dhaka

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Background & Objectives

The increasing demand for clean and sustainable oxygen (O₂) in clinical and emergency healthcare highlights the need for alternatives to conventional O₂ cylinders and storage systems. Electrochemical water splitting presents a promising approach, enabling on-demand generation of high-purity medical-grade O₂ while simultaneously producing H₂ as a clean energy byproduct. This dual-generation pathway provides both healthcare and energy benefits in a single system. This study designs and evaluates magnetic Ni-Fe oxide catalysts to enhance O₂ production through facilitating singlet-to-triplet O₂ conversion at the electrode surface.

Methods

Ni-Fe mixed oxides were synthesized and characterized for composition, morphology, magnetic response, and surface states. O₂ production was evaluated under an external magnetic field, and a dual-chamber water-splitting reactor was conceptualized for continuous, scalable generation of high-purity O₂.

Results

The developed catalyst demonstrated superior O₂ production performance, achieving lower overpotential and higher current density under a magnetic field. The superparamagnetic nature of catalyst promoted spin-aligned charge transfer, lowering energy barriers for O₂ evolution from water. Strong Fe-Ni electronic interactions, increased active surface area, and structural stability during prolonged operation were identified as key factors in enhancing catalytic performance. The catalyst's earth-abundant composition, facile synthesis, and magnetic recyclability support scalability. The integrated reactor successfully generated continuous, medical-grade O₂ while producing H₂ as a valuable clean energy byproduct.

Conclusions

Magnetic-field-assisted water splitting using Ni-Fe mixed oxide catalysts offers a sustainable, portable, and cost-effective route for dual-generation of medical-grade O₂ and clean H₂. This approach aligns energy and healthcare objectives and supports decentralized oxygen supply for hospitals, emergency services, and remote healthcare facilities.

Themes and Cross-Cutting Topics

Sustainable water splitting; Magnetic-field-enhanced O₂ production; Dual-generation of medical O₂ and H₂; Portable, scalable O₂ technology.

From Water to Breath: MOF-Based Electrocatalysts for Medical-Grade Oxygen Generation

Rowshan Yeasmin Snigdha¹, Tabassum Taspya¹, and Md. Mominul Islam^{1*}

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*mominul@du.ac.bd

Background & Objectives

Medical-grade oxygen (O₂) with purity higher than 99.5% is crucial for hospitals, pandemic and disaster relief in remote locations, and space missions, highlighting the need for reliable O₂ generation and storage. Electrochemical water splitting outperforms conventional methods in energy efficiency, portability, decentralization, infrastructure demands, maintenance, and environmental impact. Additionally, two moles of hydrogen (H₂) are generated with one mole of O₂ (approximately 8 kg H₂ per 1 kg O₂), providing economic value as fuel and offsetting operational costs. This study develops efficient, abundant, economical bifunctional hybrid electrocatalysts for dual-chamber electrolyzers enabling decentralized, on-demand medical-grade O₂ supply.

Methods

Scalable hybrid electrocatalyst based on nanostructured Metal-Organic Framework (MOF) was synthesized via MOF-on-MOF strategy for water splitting. The structural formation and catalytic activity were characterized by sophisticated techniques. The dual-chamber electrolyzer will enable simultaneous generation, separation and collection of high-purity O₂.

Results

The hybrid MOF showed excellent catalytic activity with low overpotential to achieve solar-cell equivalent current density in 1.0 M KOH solution. Benefiting from high exposure of surface-active sites, tunable porosity, diverse metal centers, and functional groups, electron transfer capacity of the hybrid was enhanced, outperforming state-of-the-art catalysts. Implementation into dual-chamber electrolyzers is underway, showing promising performance toward practical medical-grade O₂ supply.

Conclusions

Tunable structures, diverse metal centers, cost-effective, environment-friendly MOF-based materials showcased outstanding catalytic activity. Thus, a sustainable pathway for on-demand medical-grade O₂ supply and H₂ fuel production, addressing healthcare and energy needs simultaneously is strategized.

Themes and Cross-Cutting Topics

Oxygen innovation; Medical O₂ supply; Green H₂; Water splitting Catalyst innovation; On-demand and portable production.

Electrochemistry in the Oxygen Supply Chain: Toward a Future Paradigm

Md. Mominul Islam^{1*}, Taspya Tabassum¹, Mohsina Tayeba¹, Rowshan Yeasmin Snigdha¹, Chandon Kumar Saha¹

¹Department of Chemistry, University of Dhaka

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Background & Objectives

Oxygen (O₂) is far more than just a gas in a cylinder. Globally, about 374 million people require medical O₂ each year, with over 80% of the need in low- and middle-income countries. Conventional O₂ production via cryogenic air separation and pressure swing adsorption ensures high purity but depends on centralized plants, transport, and storage, while chemical generation offers short-term support but lacks scalability. This work explores how electrochemistry can provide a sustainable, decentralized alternative.

Methods

Electrochemical O₂ generator (EO₂G) function both as cathodic electrolyzer, recycling O₂ from air, and as anodic electrolyzer, producing O₂ via water splitting. Efficient electrodes were fabricated for EO₂G prototype. A comparative analysis was conducted between conventional and electrochemical methods.

Results

Cathodic EO₂G consumes electricity and air to produce O₂ via one- or two-electron redox reactions. In anodic operation, water serves as the feed, generating O₂ at the anode and green H₂, a valuable byproduct, at the cathode. Highly robust catalysts, including transition metal phosphates, magnetic oxides, metal-organic frameworks, and modified carbon, have been studied and shown to hold promise for developing efficient EO₂G. A portable EO₂G can be operated continuously to produce O₂ with >99.9% purity using a solar cell or even a battery. Anodic EO₂G adds value through its H₂ byproduct, whose market worth and carbon savings from fossil fuel displacement underscore its impact.

Conclusions

EO₂G is emerging as a viable complement to conventional O₂ generation. The vicinity of an EO₂G electrode is not merely a site of practicing science, but a space where hope and life are sustained, as each bubble of O₂ rising from its surface brings breath to the breathless, strength to the weak, and life to those in need. Broader deployment will require supportive policy, investment, and integration into health systems to ensure equitable access.

Themes and Cross-Cutting Topics

Equity in healthcare; On-site O₂ solutions; sustainability; Renewable energy integration; Resilient supply chains.

Electrochemical Production of H₂O₂ as a Sustainable Pathway for On-Demand O₂ Supply

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Background & Objectives

Conventional methods for oxygen (O₂) generation and storage face significant challenges related to cost, transportation, and sustainability, particularly for medical applications. Electrochemical generation of hydrogen peroxide (H₂O₂) from air offers an indirect but promising route for O₂ production, since H₂O₂ readily decomposes into medical grade O₂ and H₂O. In this regard, electrochemical methods are widely recognized as simple, smart, portable, and scalable- from household to industrial applications. This study aims to develop low-cost, metal-free electrocatalysts for H₂O₂ generator, enabling decentralized and on-demand O₂ supply.

Methods

As catalysts for H₂O₂ generator, nitrogen-doped (N-doped) graphite were synthesized by tailoring the distribution and configuration of nitrogen through controlled annealing. Structural and compositional properties were characterized using various sophisticated techniques. H₂O₂ generator activity was systematically investigated in O₂-saturated H₂SO₄ solutions through electrochemical techniques. A prototype flow-cell reactor was employed for bulk H₂O₂ production.

Results

Characterization confirmed successful graphitization and tunable nitrogen functionalities. The electrochemical studies revealed that the distribution of nitrogen species strongly influenced selectivity and kinetics for H₂O₂ production. The optimized N-doped material demonstrated ~60% selectivity toward H₂O₂ production, achieving high yields within the flow-cell setup.

Conclusions

Electrochemical production of H₂O₂ using engineered graphite electrode provides a viable, sustainable, and portable pathway for in-situ generating O₂ on demand. The approach has strong potential for decentralized healthcare facilities, particularly in resource-limited settings, as well as for environmental applications.

Themes and Cross-Cutting Topics

Sustainable electrochemical processes; Selective H₂O₂ generation from air; Green and portable O₂ supply technology.

From Water to Life: Electrocatalytic Water Oxidation for On-Demand Medical-Grade O₂ Production

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Background & Objectives

Conventional medical oxygen (O₂) generation technologies, such as cryogenic air separation, pressure swing adsorption, and high-pressure cylinders, are capital- and energy-intensive, often centralized, and limited in accessibility across low- and middle-income countries. The COVID-19 pandemic exposed the fragility of these systems, emphasizing the urgent need for decentralized and sustainable O₂ generation platforms. Water splitting offers a dual advantage, simultaneously generating H₂ as a clean, storable energy vector and O₂ suitable for clinical use. This study focuses on electrocatalytic water oxidation using Monophosphate Tungsten Bronzes (MPTBs) as acid-stable OER catalysts for efficient and durable O₂ production.

Methods

MPTBs were synthesized through controlled solid-state reactions. These catalysts were characterized for their structural and surface features, electrochemical performance in acidic media, and operational stability under extended testing.

Results

The MPTB catalysts demonstrated excellent O₂ production activity and durability in acidic environments. Their tunnel-like framework facilitated efficient ion and electron transport, resulting in low overpotentials, reduced charge-transfer resistance, and sustained catalytic performance. Continuous operation confirmed exceptional structural stability with minimal degradation, highlighting MPTBs as robust water oxidation catalysts for dual-chamber electrolyzers, simultaneously generating O₂ at the anode and H₂ at the cathode from electricity and water.

Conclusions

MPTB represent a dual-function electrocatalytic system, capable of addressing two critical global challenges, clean hydrogen energy production and decentralized medical O₂ generation. Their scalability, structural resilience, and catalytic efficiency make them promising candidates for integration into modular electrochemical systems powered by renewable energy, contributing to both the energy transition and global health security.

Themes and Cross-Cutting Topics

Electrocatalytic O₂ evolution; Decentralized medical O₂ production; Integrated electrochemical systems for dual O₂-H₂ generation.

Design and Development of a Cost-Effective and Portable BiPAP Device for Improving Oxygen Access in Resource-Limited Healthcare Settings

Mst Tasnim Fariha Khanom¹, Nafisa Ferdous¹, Jesia Briti¹, Md Ibtesham Rashid¹, Avijeet Debnath¹, Prosanta Bhowmik¹, Kaisar Ahmed Alman², Md Abdullah Al Mamun¹, Samiul Based Shuvo¹, Taufiq Hasan^{1*}

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Background & Objectives

Medical oxygen is essential for critical care, yet its availability remains a significant challenge in Bangladesh, especially outside tertiary care centers. Devices designed for non-invasive ventilation, such as Bi-level Positive Airway Pressure (BiPAP) systems, play a crucial role in facilitating oxygen therapy for conditions including COPD and acute respiratory distress. However, the high cost of commercial devices significantly limits their use in the national oxygen framework. This project aims to develop and validate a cost-effective, portable BiPAP device to enhance access to locally developed non-invasive respiratory support devices, thereby supporting Bangladesh's oxygen initiative.

Methods

A prototype was developed using a 150 W AC blower controlled by an Arduino-based TRIAC circuit to regulate oxygen flow and pressure. The system featured a hybrid interface with a keypad and a TFT display for monitoring therapy parameters, as well as a 20-second auto-calibration phase to estimate the inspiratory-to-expiratory ratio. A heat-moisture exchanger filter ensured safe oxygen delivery. The device's performance was evaluated through bench tests with an IMT analytics flow analyzer, comparing it to clinical ventilation and oxygen therapy standards.

Results

The device consistently achieved therapeutic pressure levels (IPAP 18.5–19.0 cmH₂O, EPAP 4.0–4.5 cmH₂O) and peak flow rates of 87 L/min, making it suitable for oxygen therapy. The recorded rise time (0.6–0.8 s) adhered to clinical benchmarks. At a total construction cost of USD 75, about one-tenth the price of imported alternatives, the device potentially supports scalable local production in Bangladesh.

Conclusions

This affordable non-invasive ventilation device can enhance emergency responsiveness and strengthen national oxygen security. Facilitating local manufacturing reduces reliance on imports and aligns with Bangladesh's goal of sustainable and equitable access to oxygen and respiratory support therapy.

Themes and Cross-Cutting Topics

Oxygen innovations and research; Biomedical engineering approaches; Integration into oxygen delivery systems; Emergency preparedness.

Quantifying Oxygen Needs in Burn-Related ARDS: Insights from Global and Regional Data

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Background & Objectives

According to the World Health Organization, more than ten million people with burns require medical attention each year. Oxygen plays an unavoidable role in managing patients with burns from the early stage despite hypoxemia, to later severe respiratory complications. In particular, Acute respiratory distress syndrome (ARDS) is one of the most common and significant burn complications that requires continuous oxygen therapy during hospital stay. Therefore, the goal of this study is to quantify the minimum expected cases in burn patients requiring oxygen based on ARDS.

Methods

We have utilized burn incidence data from the Global Burden of Disease (GBD) 2021 estimates. In addition, the prevalence of ARDS among burn patients was derived from systematic review evidence, with stratification for high-income countries (HICs) and Low- and Middle-Income Countries (LMICs). Finally, oxygen need was estimated by multiplying GBD burn incidence, care-seeking rates for burn patients, and ARDS prevalence from the systematic review.

Results

Specific percentage of ARDS among burn patients was calculated 19 (95% CI: 13–26) in LMICs and 24 (95% CI: 16–33) in HICs. Accordingly, the global oxygen need for burn-related ARDS was approximately 1.3 million cases. Of these, nearly 70% (0.9 million) occurred in LMICs, with South Asia accounting for 0.1 million cases and Bangladesh contributing 0.01 million cases.

Conclusions

The global burden of burn-related ARDS creates a substantial oxygen demand. This need is disproportionately higher in LMICs. However, considering ARDS alone does not reveal the whole scenario of post-burn cases requiring oxygen. These findings lead us towards the bigger picture, which is needed to strengthen oxygen supply and burn care capacity in resource-limited settings.

Themes and Cross-Cutting Topics

Burn injuries, ARDS, Oxygen need.

OxyJet: Low-Cost, Electricity-Free CPAP for Respiratory Care in Low-Resource Settings

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Background & Objectives

In low-resource healthcare settings, general hospital wards often lack the capacity to provide more than 15 liters/min of oxygen. Oxygen-supplemented Continuous Positive Airway Pressure (CPAP) and High-Flow Nasal Oxygen (HFNO) can be effective bridging therapies in general wards, reducing ICU admissions. However, such devices are expensive and not widely available. To address this gap, we developed OxyJet, a locally manufactured, innovative CPAP device that provides up to 60 L/min of oxygen without the need for electricity and can be used outside the ICU.

Methods

OxyJet CPAP was designed and validated in accordance with the UK MHRA guidelines. Initial studies on healthy volunteers (n = 5) and hypoxemic patients (n = 5) aimed to establish that the device maintains adequate positive pressure and can improve oxygen saturation. Two separate Randomized Controlled Trials (RCTs) were done using the device: (i) Compare OxyJet with a standard CE-certified CPAP device to establish equivalence (n = 23), conducted at the National Institute of Diseases of the Chest and Hospital (NIDCH), and (ii) Compare OxyJet with HFNO treatment to establish non-inferiority (n = 45), conducted at the Dhaka Medical College Hospital (DMCH).

Results

The different studies have shown that OxyJet CPAP: (i) can significantly improve oxygen saturation by 11.2% within 30 minutes, (ii) can be considered equivalent compared to a standard CE-certified CPAP device, (iii) can be considered non-inferior compared to the HFNO treatment, and (iv) uses about 30% less oxygen compared to HFNO. No adverse effects were observed during the studies.

Conclusions

The study results suggest that OxyJet can be used in both general and emergency wards, potentially reducing the need for ICU admissions. The device can be used across multiple levels of healthcare facilities—including community clinics, district hospitals, and ambulance-based emergency transport—thus strengthening the overall healthcare system.

Themes and Cross-Cutting Topics

Biomedical engineering approaches; Equity in oxygen access and at different levels of health facilities; Community-level or ambulance-based oxygen innovations; emergency preparedness and pandemic response.

Mitigating Demographic Bias in AI Performance: A Case Study on Automatic Detection of Pediatric Pneumonia from Chest X-rays

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Background & Objectives

Pediatric pneumonia is a leading cause of child mortality, demanding accurate and accessible diagnostic tools. Recent advances in Machine learning (ML) algorithms have demonstrated high accuracy in chest X-ray-based detection; however, their clinical utility is limited by domain shift, a problem that arises when models trained on one hospital or population perform poorly on data from different devices, protocols, or demographics. This study develops a domain adaptation framework to overcome domain shift and improve cross-population generalizability for pediatric pneumonia classification.

Methods

We propose a three-step framework: (1) intelligent selection of images from the source domain, (2) use Cycle Generative Adversarial Network (CycleGAN) to transform selected source X-rays into the target domain, and (3) fine-tune ConvNeXt and Swin-Transformer models on target and adapted X-rays. We evaluate performance using accuracy, AUC, sensitivity, and specificity, training on source datasets and testing on target datasets across multiple populations.

Results

We evaluated our framework using three geographically diverse sources: China, Vietnam, and Bangladesh. ConvNeXt, a state-of-the-art deep learning architecture trained on the China data, demonstrated excellent within-domain performance, achieving an accuracy and sensitivity of 96% and 99%, respectively. However, cross-domain testing revealed severe performance degradation, with accuracy dropping to 62% and 59% for the Bangladesh and Vietnam data, respectively. Applying our proposed domain adaptation framework substantially improved generalizability, boosting accuracy to 83% (+21%) and 78% (+19%), for the Bangladesh and Vietnam datasets, respectively. Comparable enhancements were observed across AUC, sensitivity, and specificity metrics.

Conclusions

The proposed domain adaptation method effectively reduces the cross-population performance gap of AI tools for early pneumonia detection, a crucial step in enabling timely oxygen therapy and improving child health outcomes.

Themes and Cross-Cutting Topics

This study aligns with Hypoxaemia and Oxygen Needs, Oxygen Innovations and Research, and Cross-Cutting and emerging issues to enhance child health outcomes.

Media Coverage

25+

Media Houses

45+

Journalists

30+

Media Coverage

The summit achieved extensive visibility across television, print, and online platforms, positioning medical oxygen as a national public health and policy priority. A total of 34 media items were recorded across leading Bangla and English outlets, including national television channels, wire services, and top-tier newspapers. Coverage prominently featured government commitments to include medical oxygen in the Essential Drug List and highlighted critical access gaps.

Oxygen to be included in 'essential drug' list: CA's special assistant on health

The CA's special assistant on health said that the government is planning to include oxygen in the 'essential drug' list to ensure its availability to all patients.



icddr,b organises Bangladesh Oxygen Summit 2025

The summit, organized by icddr,b, focused on addressing the challenges of oxygen supply and demand in Bangladesh.



70% in Bangladesh still lack access to medical oxygen

- Challenges in the medical oxygen supply chain
Only 30% of the population has access
Shortage of skilled staff and equipment
Lack of regulatory oversight



কম্পোজিট

কম্পোজিট প্রোগ্রামের সময় ১০ শতাংশ মানুষ অক্সিজেন পায় না

একটি গবেষণা অনুযায়ী, বাংলাদেশে এখনও ৭০ শতাংশ মানুষ চিকিৎসা অক্সিজেনের অভাবে ভুগছেন।



Oxygen to be included in 'essential drug' list

Says CA's special assistant on health

The CA's special assistant on health said that the government is planning to include oxygen in the 'essential drug' list to ensure its availability to all patients.

Oxygen to be included

From Page 3 and anti-rabies medicines domestically, he said the government is planning to include oxygen in the 'essential drug' list to ensure its availability to all patients.



মেডিক্যাল অক্সিজেনকে অত্যাৱশ্যকীয় তালিকাভুক্ত করবে সরকার

গণস্বাস্থ্য প্রতিবেদক

মেডিক্যাল অক্সিজেনকে সরকারি অত্যাৱশ্যকীয় তালিকাভুক্ত করবে। জীবন রক্ষাকারী এই গ্যাস হাসপাতাল ভেদে বিক্রি নামে বিক্রি হয়ে থাকে। এতে অনেক সময় রোগীরা হারিয়ে যান। অক্সিজেনকে অত্যাৱশ্যকীয় তালিকাভুক্ত করা হলে সব হাসপাতালে একই দামে অক্সিজেন পাওয়া যাবে।

প্রয়োজনে ৭০% মানুষ অক্সিজেন পায় না

কম্পোজিট

একটি গবেষণা অনুযায়ী, বাংলাদেশে এখনও ৭০ শতাংশ মানুষ চিকিৎসা অক্সিজেনের অভাবে ভুগছেন।



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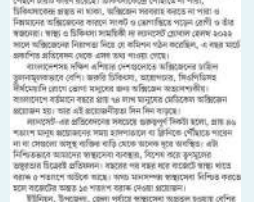
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জ্বরুরি ওষুধের তালিকাভুক্ত হচ্ছে অক্সিজেন

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The Secretariat of the Bangladesh Oxygen Summit 2025 acknowledges its contributors

Government



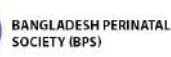
Institutes and Academia



Development Partners



Professional Bodies

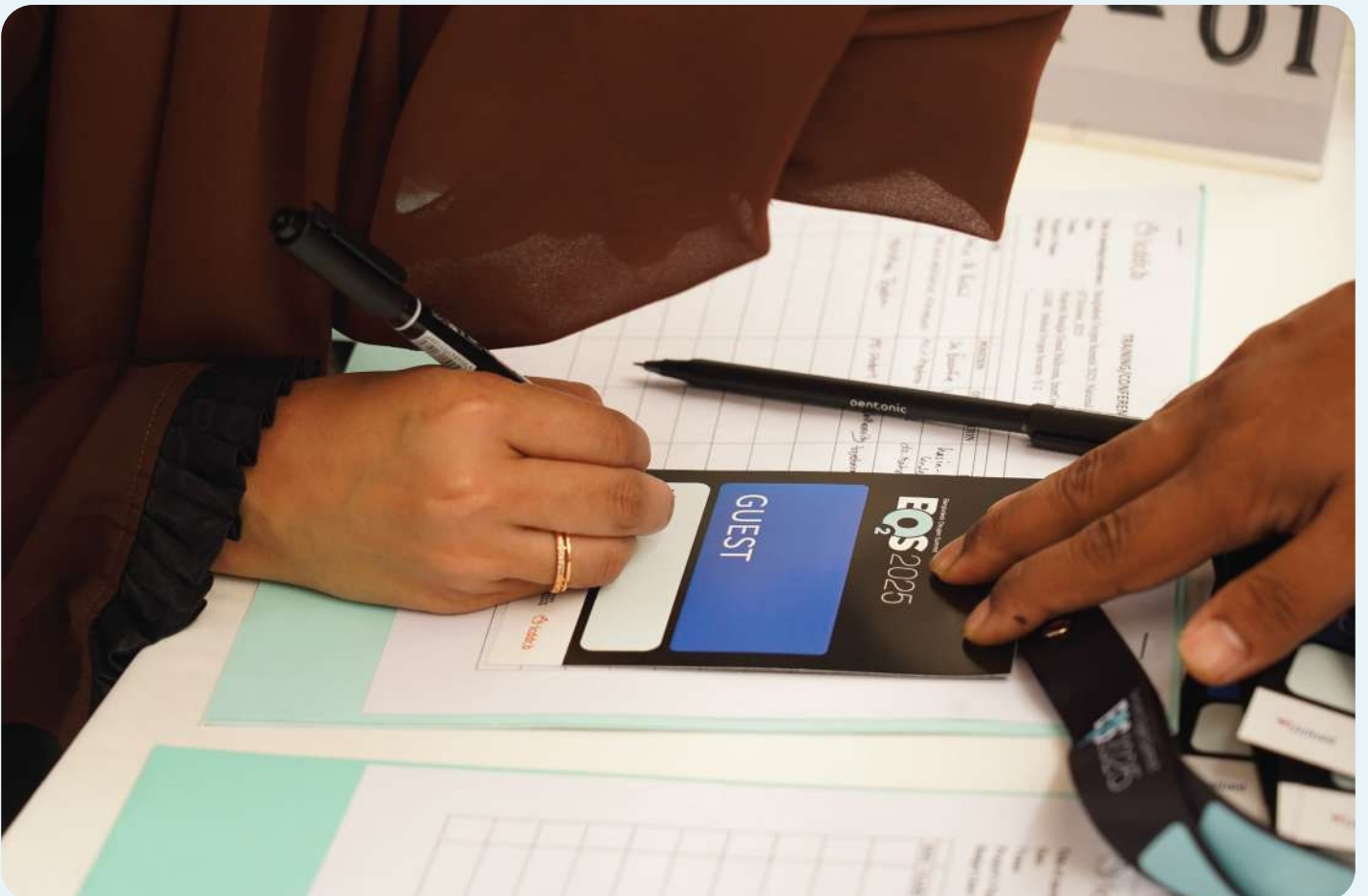


Private Sectors



Listed alphabetically

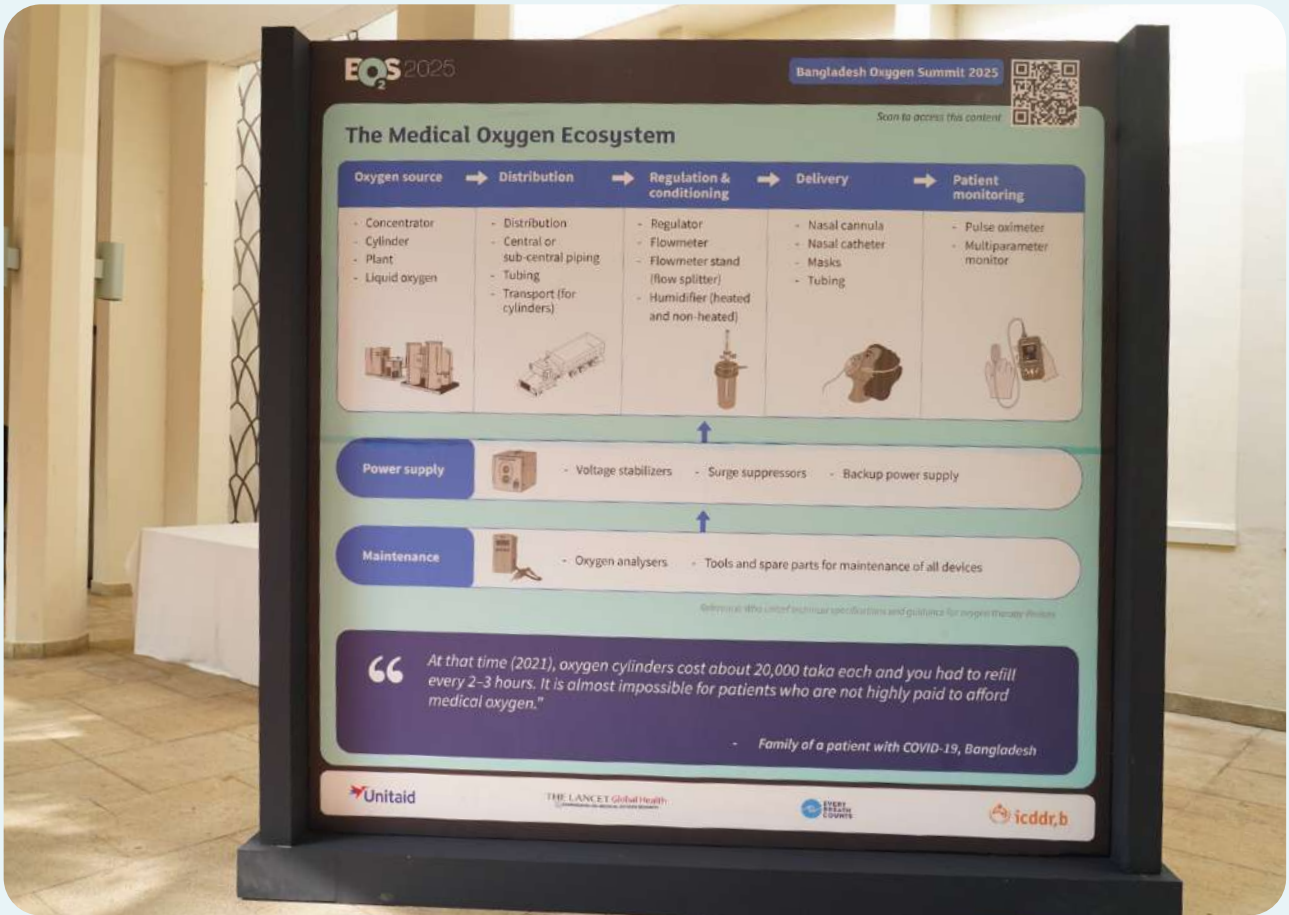
Branding

















Annex

The official memorandum issued by the Government of the People's Republic of Bangladesh, through the Ministry of Health and Family Welfare, Health Services Division, Planning Sub-division, Bangladesh Secretariat, Dhaka, for the formal establishment of a Technical Working Group (TWG) tasked with developing the “Bangladesh National Medical Oxygen Roadmap (2026–2030)”.

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়
স্বাস্থ্য সেবা বিভাগ
পরিকল্পনা অনুবিভাগ
বাংলাদেশ সচিবালয়, ঢাকা
www.hsd.gov.bd

নং-৪৫.০০.০০০০.০০০.১৯২.৭৪.০০০১.২৬-১৭

তারিখ: ২৭ মাঘ ১৪৩২
১০ ফেব্রুয়ারি ২০২৬

বিষয়: ‘বাংলাদেশ ন্যাশনাল মেডিকেল অক্সিজেন রোডম্যাপ (২০২৬-২০৩০)’ প্রণয়নের লক্ষ্যে টেকনিক্যাল ওয়ার্কিং গ্রুপ গঠন।

‘বাংলাদেশ ন্যাশনাল মেডিকেল অক্সিজেন রোডম্যাপ (২০২৬-২০৩০)’ প্রণয়নের লক্ষ্যে নির্দেশক্রমে নিম্নরূপ টেকনিক্যাল ওয়ার্কিং গ্রুপ গঠন করা হলো:

ক্রম.	নাম, পদবি ও দপ্তর/সংস্থা/প্রতিষ্ঠান (জ্যেষ্ঠতার ক্রমানুসারে নয়)	ওয়ার্কিং গ্রুপে ভূমিকা
১.	অতিরিক্ত সচিব (পরিকল্পনা), স্বাস্থ্য সেবা বিভাগ	সভাপতি
২.	মিজ শিরিন আখতার, যুগ্মসচিব (স্বাস্থ্য-৫), স্বাস্থ্য সেবা বিভাগ	সদস্য
৩.	ড. মুহাম্মদ মুস্তাফিজুর রহমান, যুগ্মসচিব (হাসপাতাল অনুবিভাগ), স্বাস্থ্য সেবা বিভাগ	সদস্য
৪.	জনাব মোঃ গোলাম কিবরিয়া, উপসচিব (জনস্বাস্থ্য -২), স্বাস্থ্য সেবা বিভাগ	সদস্য
৫.	জনাব মো. মহিউদ্দিন আল হেলাল, সিনিয়র সহকারী সচিব (বিশ্বস্বাস্থ্য-২), স্বাস্থ্য সেবা বিভাগ	সদস্য
৬.	ডা. মোঃ মঈনুল আহসান, পরিচালক (হাসপাতাল ও ক্লিনিকসমূহ), স্বাস্থ্য অধিদপ্তর	সদস্য
৭.	ডা. সৈয়দ কামরুল ইসলাম, পরিচালক (প্রাথমিক স্বাস্থ্য সেবা), স্বাস্থ্য অধিদপ্তর	সদস্য
৮.	অধ্যাপক ডা. মোঃ হালিমুর রশিদ, পরিচালক (রোগ নিয়ন্ত্রণ), স্বাস্থ্য অধিদপ্তর	সদস্য
৯.	ডা. আবু আহম্মাদ আল মামুন, পরিচালক (এমআইএস), স্বাস্থ্য অধিদপ্তর	সদস্য
১০.	ডা. মোঃ আক্তার হোসেন, পরিচালক (ফার্মাকোভিজিলাপ্স), ঔষধ প্রশাসন অধিদপ্তর	সদস্য
১১.	ডা. কে. এম. হাম্মান কবির, উপপরিচালক, কেন্দ্রীয় ঔষধাগার, স্বাস্থ্য অধিদপ্তর	সদস্য
১২.	ইঞ্জি. মোঃ মঈনুল ইসলাম, টেকনিক্যাল ম্যানেজার (রিপেয়ার), ন্যাশনাল ইলেকট্রো-মেডিক্যাল ইকুইপমেন্ট মেইনটেন্যান্স ওয়ার্কশপ এন্ড ট্রেনিং সেন্টার	সদস্য
১৩.	প্রতিনিধি, বিশ্ব ব্যাংক	সদস্য
১৪.	প্রতিনিধি, এশিয়ান ডেভেলপমেন্ট ব্যাংক (এডিবি)	সদস্য
১৫.	প্রতিনিধি, গ্লোবাল ফান্ড	সদস্য
১৬.	প্রতিনিধি, বিশ্ব স্বাস্থ্য সংস্থা	সদস্য
১৭.	প্রতিনিধি, ইউএনএফপিএ	সদস্য
১৮.	প্রতিনিধি, ইউএনওপিএস	সদস্য
১৯.	প্রতিনিধি, ইউনিসেফ	সদস্য
২০.	ডা. মোহাম্মদ জাকারিয়া-আল-আজিজ, সেক্রেটারি, বাংলাদেশ সোসাইটি অব মেডিসিন	সদস্য
২১.	অধ্যাপক ডা. রফিকুস সালেহিন, সেক্রেটারি, সোসাইটি অব সার্জনস অব বাংলাদেশ	সদস্য


পৃষ্ঠা নং-১/৯

ক্রম.	নাম, পদবি ও দপ্তর/সংস্থা/প্রতিষ্ঠান (জ্যেষ্ঠতার ক্রমানুসারে নয়)	ওয়ার্কিং গ্রুপে ভূমিকা
২২.	অধ্যাপক ডা. মুসাররাত সুলতানা সুমি, সেক্রেটারি, অবস্টেট্রিক্যাল অ্যান্ড গাইনোকোলজিক্যাল সোসাইটি অব বাংলাদেশ	সদস্য
২৩.	ডা. কাজী সাইফউদ্দিন বেননূর, পরিচালক, বাংলাদেশ চিকিৎসা গবেষণা পরিষদ	সদস্য
২৪.	ডা. মুহাম্মদ আরিক আরাফাত, অধ্যাপক, বায়োমেডিক্যাল ইঞ্জিনিয়ারিং, বাংলাদেশ প্রকৌশল বিশ্ববিদ্যালয়	সদস্য
২৫.	ডা. শামস এল আরিফীন, সিনিয়র সায়েন্টিস্ট (এমেরিটাস); কমিশনার, ল্যানসেট গ্লোবাল হেলথ কমিশন অন মেডিক্যাল অসিজেন সিকিউরিটি, আইসিডিডিআর,বি	সদস্য
২৬.	ডা. আহমদ এহসানুর রহমান, সায়েন্টিস্ট; এক্সিকিউটিভ কমিটি সদস্য, ল্যানসেট গ্লোবাল হেলথ কমিশন অন মেডিক্যাল অসিজেন সিকিউরিটি, আইসিডিডিআর,বি	সদস্য

০২. টেকনিক্যাল ওয়ার্কিং গ্রুপের কার্যপরিধি:

ক) দেশের স্বাস্থ্য ব্যবস্থার সকল স্তরে অসিজেনের প্রাপ্যতা, মাননিয়ন্ত্রণ ও টেকসই ব্যবস্থাপনা নিশ্চিত করতে একটি কার্যকর গাইডলাইন প্রণয়ন;

খ) টেকনিক্যাল ওয়ার্কিং গ্রুপ প্রয়োজনবোধে সদস্য কো-অপ্ট করতে পারবে।


 (এবিএম ইফতেখারুল ইসলাম খন্দকার)
 উপসচিব
 মোবাইল ফোন: ০১৯২৩৮৮৮৪৫
 e-mail: health2@hds.gov.bd

বিতরণ (জ্যেষ্ঠতার ক্রমানুসারে নয়):

১. অতিরিক্ত সচিব (পরিচালনা), স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়, ঢাকা।
২. মিজ শিরিন আখতার, যুগ্মসচিব (স্বাস্থ্য-৫), স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়, ঢাকা।
৩. ড. মুহাম্মদ মুস্তাফিজুর রহমান, যুগ্মসচিব (হাসপাতাল অনুবিভাগ), স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়, ঢাকা।
৪. জনাব মোঃ গোলাম কিবরিয়া, উপসচিব (জনস্বাস্থ্য -২), স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়, ঢাকা।
৫. জনাব মো. মহিউদ্দিন আল হেলাল, সিনিয়র সহকারী সচিব (বিশ্বস্বাস্থ্য-২), স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়, ঢাকা।
৬. ডা. মোঃ মঈনুল আহসান, পরিচালক (হাসপাতাল ও ক্লিনিকসমূহ), স্বাস্থ্য অধিদপ্তর, মহাখালী, ঢাকা।
৭. ডা. সৈয়দ কামরুল ইসলাম, পরিচালক (প্রাথমিক স্বাস্থ্যসেবা), স্বাস্থ্য অধিদপ্তর, মহাখালী, ঢাকা।
৮. অধ্যাপক ডা. মোঃ হালিমুর রশিদ, পরিচালক (রোগ নিয়ন্ত্রণ), স্বাস্থ্য অধিদপ্তর, মহাখালী, ঢাকা।
৯. ডা. আবু আহম্মাদ আল মামুন, পরিচালক (এমআইএস), স্বাস্থ্য অধিদপ্তর
১০. ডা. মোঃ আক্তার হোসেন, পরিচালক (ফার্মাকোডিজিটাল), ঔষধ প্রশাসন অধিদপ্তর
১১. ইঞ্জি. মোঃ মঈনুল ইসলাম, টেকনিক্যাল ম্যানেজার (রিপেয়ার), ন্যাশনাল ইলেকট্রো-মেডিক্যাল ইকুইপমেন্ট মেইনটেন্যান্স ওয়ার্কশপ এন্ড ট্রেনিং সেন্টার
১২. ডা. কে. এম. হুমায়ুন কবির, উপপরিচালক, কেন্দ্রীয় ঔষধাগার, স্বাস্থ্য অধিদপ্তর।
১৩. কান্দি ডিরেক্টর, বিশ্বব্যাংক বাংলাদেশ অফিস, ঢাকা।
১৪. কান্দি ডিরেক্টর, এশিয়ান ডেভেলপমেন্ট ব্যাংক (এডিবি) বাংলাদেশ অফিস, ঢাকা।
১৫. পোর্টফোলিও ম্যানেজার, গ্লোবাল ফান্ড বাংলাদেশ অফিস, ঢাকা।
১৬. রিপ্রেজেন্টেটিভ (হেড অব কান্দি অফিস), বিশ্ব স্বাস্থ্য সংস্থা বাংলাদেশ অফিস, ঢাকা।
১৭. কান্দি রিপ্রেজেন্টেটিভ, ইউএনএফপিএ বাংলাদেশ অফিস, ঢাকা।
১৮. কান্দি ম্যানেজার, ইউএনওপিএস বাংলাদেশ অফিস, ঢাকা।
১৯. ইউনিসেফ রিপ্রেজেন্টেটিভ টু বাংলাদেশ, ইউনিসেফ বাংলাদেশ অফিস, ঢাকা।

উপযুক্ত প্রতিনিধি
 মনোনয়নের
 অনুরোধসহ

পৃষ্ঠা নং-২/৯

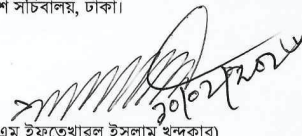
২০. ডা. মোহাম্মদ জাকারিয়া-আল-আজিজ, সেক্রেটারি, বাংলাদেশ সোসাইটি অব মেডিসিন
২১. অধ্যাপক ডা. রফিকুস সালেহিন, সেক্রেটারি, সোসাইটি অব সার্জনস অব বাংলাদেশ
২২. অধ্যাপক ডা. মুসাররাত সুলতানা সুমি, সেক্রেটারি, অবস্টেট্রিক্যাল অ্যান্ড গাইনোকোলজিক্যাল সোসাইটি অব বাংলাদেশ।
২৩. ডা. কাজী সাইফউদ্দিন বেননুর, পরিচালক, বাংলাদেশ চিকিৎসা গবেষণা পরিষদ
২৪. ডা. মুহাম্মদ তারিক আরাফাত, অধ্যাপক, বায়োমেডিক্যাল ইঞ্জিনিয়ারিং, বাংলাদেশ প্রকৌশল বিশ্ববিদ্যালয়
২৫. ডা. শামস এল আরিফীন, সিনিয়র সায়েন্টিস্ট (এমেরিটাস); কমিশনার, ল্যানসেট গ্লোবাল হেলথ কমিশন অন মেডিক্যাল অসিজেন সিকিউরিটি, আইসিডিডিআর,বি
২৬. ডা. আহমদ এহসানুর রহমান, সায়েন্টিস্ট; এক্সিকিউটিভ কমিটি সদস্য, ল্যানসেট গ্লোবাল হেলথ কমিশন অন মেডিক্যাল অসিজেন সিকিউরিটি, আইসিডিডিআর,বি

নং-৪৫.০০.০০০০.০০০.১৯২.১৯২.৭৪.০০০১.২৬-১৭

তারিখ: ২৭ মাঘ ১৪৩২
১০ ফেব্রুয়ারি ২০২৬

সদয় অবগতি/অবগতি ও প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য অনুলিপি প্রেরণ করা হলো (জ্যেষ্ঠতার ক্রমানুসারে নয়):

১. মহাপরিচালক, স্বাস্থ্য অধিদপ্তর, মহাখালী, ঢাকা।
২. মাননীয় উপদেষ্টার একান্ত সচিব, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয় (মাননীয় উপদেষ্টার সদয় অবগতির জন্য)।
৩. মাননীয় বিশেষ সহকারীর একান্ত সচিব, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয় (মাননীয় বিশেষ সহকারীর সদয় অবগতির জন্য)।
৪. সচিব মহোদয়ের একান্ত সচিব, স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয় (সচিব মহোদয়ের সদয় অবগতির জন্য)।
৫. অতিরিক্ত সচিব (পরিকল্পনা) মহোদয়ের ব্যক্তিগত কর্মকর্তা, স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়।
৬. যুগ্মসচিব (পরিকল্পনা) মহোদয়ের ব্যক্তিগত কর্মকর্তা, স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়।
৭. সিস্টেম এনালিস্ট, স্বাস্থ্য সেবা বিভাগ, স্বাস্থ্য ও পরিবার কল্যাণ মন্ত্রণালয়, বাংলাদেশ সচিবালয়, ঢাকা।
৮. অফিস কপি।


(এবিএম ইফতেখারুল ইসলাম খন্দকার)
উপসচিব
মোবাইল ফোন: ০১৯২৩৮৮৮৪৫
e-mail: health2@hds.gov.bd

The memorandum translated in English.

Government of the People's Republic of Bangladesh

Ministry of Health and Family Welfare

Health Services Division
Administration Branch
Bangladesh Secretariat, Dhaka
www.hsd.gov.bd

Memo No: 45.00.0000.019.12.74.000.26-97

Date: 27 Magh 1430 / 10 February 2024

Subject: Formation of a Technical Working Group for the formulation of the “Bangladesh National Medical Oxygen Roadmap (2026–2030)”

In order to formulate the “Bangladesh National Medical Oxygen Roadmap (2026–2030)”, the following Technical Working Group is hereby formed:

Sl. No.	Name, Designation & Office	Role in Working Group
1	Additional Secretary (Planning), Health Services Division	Chairperson
2	Shereen Akhter, Joint Secretary (Health-5), Health Services Division	Member
3	Dr. Mohammad Mustafizur Rahman, Joint Secretary (Hospital Wing), Health Services Division	Member
4	Mr. Md. Golam Kibria, Deputy Secretary (Public Health Wing-2), Health Services Division	Member
5	Mr. Md. Mohiuddin Al Helal, Senior Assistant Secretary (World Health-2), Health Services Division	Member
6	Dr. Md. Moinul Ahsan, Director (Hospital & Clinics), DGHS	Member
7	Dr. Syed Kamrul Islam, Director (Primary Health Care), DGHS	Member
8	Professor. Dr. Md. Halimur Rashid, Director (Disease Control), DGHS	Member
9	Dr. Abu Ahammad Al Mamun, Director (MIS), DGHS	Member
10	Dr. Md. Akter Hossen, Director (Pharmaco Visilence), Directorate General of Drug Administration (DGDA)	Member
11	Dr. K. M. Humayun Kabir, Deputy Director, Central Medical Stores Depot (CMSD)	Member
12	Engr. Md. Moinul Islam, Technical Manager (Repair), National Electro-Medical Equipment Maintenance Workshop & Training Center (NEMEMW&TC)	Member
13	Representative, World Bank	Member
14	Representative, Asian Development Bank (ADB)	Member
15	Representative, Global Fund	Member
16	Representative, World Health Organization (WHO)	Member
17	Representative, UNFPA	Member
18	Representative, UNOPS	Member
19	Representative, UNICEF	Member
20	Dr. Mohammad Zakaria-Al-Aziz, Secretary, Society of Medicine Bangladesh	Member
21	Professor Dr. Rafiqes Salehin, Secretary, Society of Surgeons of Bangladesh	Member
22	Professor Dr. Musarrat Sultana Sumi, Secretary, Obstetrical & Gynaecological Society of Bangladesh	Member
23	Dr. Kazi Saifuddin Benoor, Director, Bangladesh Medical Research Council (BMRC)	Member
24	Dr. Muhammad Tarik Arafat, Professor, Biomedical Engineering, Bangladesh University of Engineering & Technology (BUET)	Member
25	Dr. Shams El Arifeen, Senior Scientist (Emeritus), Commissioner, Lancet Global Health Commission on Medical Oxygen Security, icddr,b	Member
26	Dr. Ahmed Ehsanur Rahman, Scientist; Executive Committee Member, Lancet Global Health Commission on Medical Oxygen Security, icddr,b	Member

02. Functions of the Technical Working Group:

- a. To provide guidance and recommendations to ensure the production, management, and sustainable use of medical oxygen in Bangladesh's health system.
- b. The Technical Working Group may co-opt additional members as necessary.

Distribution *(Not in order of seniority)*

1. Additional Secretary (Planning), Health Services Division, Ministry of Health and Family Welfare, Dhaka.
2. Shereen Akhter, Joint Secretary (Health-5), Health Services Division, Ministry of Health and Family Welfare, Dhaka.
3. Dr. Mohammad Mustafizur Rahman, Joint Secretary (Hospital Wing), Health Services Division, Ministry of Health and Family Welfare, Dhaka.
4. Mr. Md. Golam Kibria, Deputy Secretary (Public Health Wing-2), Health Services Division, Ministry of Health and Family Welfare, Dhaka.
5. Mr. Md. Mohiuddin Al Helal, Senior Assistant Secretary (World Health-2), Health Services Division, Ministry of Health and Family Welfare, Dhaka.
6. Dr. Md. Moinul Ahsan, Director (Hospital & Clinics), Directorate General of Health Services (DGHS), Mohakhali, Dhaka.
7. Dr. Syed Kamrul Islam, Director (Primary Health Care), Directorate General of Health Services (DGHS), Mohakhali, Dhaka.
8. Professor Dr. Md. Halimur Rashid, Director (Disease Control), Directorate General of Health Services (DGHS), Mohakhali, Dhaka.
9. Dr. Abu Ahammad Al Mamun, Director (MIS), Directorate General of Health Services (DGHS), Mohakhali, Dhaka.
10. Dr. Md. Akter Hossen, Director (Pharmaco Visilence), Directorate General of Drug Administration (DGDA), Mohakhali, Dhaka.
11. Engr. Md. Moinul Islam, Technical Manager (Repair), National Electro-Medical Equipment Maintenance Workshop & Training Center (NEMEMW&TC), Mohakhali, Dhaka.
12. Dr. K. M. Humayun Kabir, Deputy Director, Central Medical Stores Depot (CMSD), Mohakhali, Dhaka.
13. Country Director, World Bank Bangladesh office, Dhaka. Request to provide an appropriate representative
14. Country Director, Asian Development Bank (ADB), Bangladesh office, Dhaka. Request to provide an appropriate representative
15. Portfolio Manager, Global Fund Bangladesh Office, Dhaka. Request to provide an appropriate representative
16. Representative (Head of country office), World Health Organization (WHO), Bangladesh, Dhaka. Request to provide an appropriate representative
17. Representative, UNFPA Bangladesh office, Dhaka.
18. Country Manager, UNOPS Bangladesh office, Dhaka. Request to provide an appropriate representative
19. UNICEF Representative to Bangladesh, UNICEF Bangladesh office, Dhaka. Request to provide appropriate representative
20. Dr. Mohammad Zakaria-Al-Aziz, Secretary, Society of Medicine Bangladesh.
21. Professor Dr. Rafiqes Salehin, Secretary, Society of Surgeons of Bangladesh.
22. Professor Dr. Musarrat Sultana Sumi, Secretary, Obstetrical & Gynaecological Society of Bangladesh.
23. Dr. Kazi Saifuddin Benoor, Director, Bangladesh Medical Research Council (BMRC).
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Copies forwarded for kind information and necessary action (not according to seniority):

1. Director General, Directorate General of Health Services (DGHS), Mohakhali, Dhaka.
2. Private Secretary to the Hon'ble Advisor, Ministry of Health and Family Welfare (for the kind information of the Hon'ble Advisor).
3. Private Secretary to the Special Assistant to the Adviser, Ministry of Health and Family Welfare (for the kind information of the Special Assistant to the Adviser).
4. Private Secretary to the Secretary, Health Services Division, Ministry of Health and Family Welfare (for the kind information of the Secretary).
5. Personal Officer to the Additional Secretary (Planning), Health Services Division, Ministry of Health and Family Welfare.
6. Personal Officer to the Joint Secretary (Planning), Health Services Division, Ministry of Health and Family Welfare.
7. System Analyst, Health Services Division, Ministry of Health and Family Welfare, Bangladesh Secretariat, Dhaka.
8. Office Copy.

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