**What is the secret behind deaths due to lack of oxygen in many government health facilities and why are leaders ignoring such a vital, yet seemingly easily solvable problem? GLORIA NAKAJUBI sets out to answer these questions and more**



The new oxygen plant at Mulago Hospital can supply enough oxygen to meet the demand, but is limited by few cylinders

# Who is to blame for lack of oxygen in health units?

When she walked into the emergency section at Mulago National Referral Hospital, Louis (second name concealed on request) from Kiruhura district in western Uganda was shocked at the state of the emergency section.

"My child had been on oxygen at the previous health facility, but reaching Mulago, it took us several hours before we could get to the intensive care unit. The children had to share the oxygen and, sometimes the tubes," she says.

She says some of the health workers would bluntly tell them that if the child was destined to die, it would die anyway.

"There are many children that died at the emergency unit that night," she said, adding: "because of lack of oxygen. But I held on to hope that mine would die. And she almost did, until she had to be moved for a scan. There were very limited mobile cylinders and because of that, they kept postponing the scan procedure. However, when they finally decided to do the scan, she passed on."

Government officials insist there is enough oxygen in medical facilities. Yet every day, hundreds of Ugandans continue to die due to lack of the life giving gas, which is freely available in the air.

What is really happening? What is the secret behind these deaths? Why are leaders ignoring such a vital yet seemingly easily solvable problem? Don't they know that no one is safe? They, you or your beloved could easily be a victim anytime!

### MINISTER'S STORY

In 2015, Butebo Health Centre IV in Pallisa district was in the news when former health minister and later disaster preparedness minister Stephen Mallinga collapsed and was rushed to the health centre, only to find they had no oxygen. He died before he could be referred to Mbale. However, a health worker at the facility insisted that Mallinga was dead on arrival. Still, one of the nursing officers on call that day admitted that the health facility did not have oxygen. Whether or not the lack of oxygen contributed to Mallinga's demise remains an unanswered question even to the family.

"I cannot comment whether the death of my husband was caused by the lack of supply of oxygen machines to rural health centres, but I argued with the doctor at the time to refer us to Mbale Hospital, but he told me it was of no value," Beatrice Kainga, the widow, said.

The World Health Organisation has been on the essential medicines list. And the government invested heavily in the development of the oxygen capacity in all hospitals. However, many continue to grapple with ensuring a stable and sustainable supply. And that means you could easily die over lack of oxygen.

Many health centres IV and district hospitals have to work with less than five cylinders that are usually shared around the wards. This has not only made it hard to store oxygen for emergencies, but also makes picking free oxygen from regional referral hospitals quite costly.

The private health facilities are not a safe haven either, as the cost tends to be quite unbearable for the majority of the population. For instance, when Haspha Nassolo's four-month-old baby was diagnosed with bronchiolitis and secondary anaemia at one of the private hospitals in the city and oxygen therapy prescribed, the family had to part with sh150,000 per day for not more than three litres of the gas a day. Discharged on April 12 after four days, their bill was at sh600,000 for oxygen therapy only.

### BERNARD JOHN WINYI FROM MASINDI

In 2014, when my wife was seven months pregnant, she developed high blood pressure. She went for a checkup at Hoima Regional Referral Hospital and was advised to go to Kampala if the baby was to survive. The doctor on duty told us that they could deliver the baby prematurely, but it would not survive because the hospital usually ran out of oxygen. So we drove to Nsambya Hospital that night and the following day, the baby was delivered by C-section. We spent almost two months in hospital and the cost of oxygen alone was sh3.5m. We are lucky our baby did not die.

**OXYGEN THERAPY CONDITIONS**
- Severe pneumonia
- Asthmatic attacks
- Respiratory distress
- Anaemia with cardiac failure
- Paraffin inhalation
- Carbon monoxide poisoning
- Birth asphyxia
- Metabolic acidosis
- Head injury

**PRICE OF CYLINDERS**
- 47-litre (biggest size on the market) cylinder with oxygen sh750,000-sh800,000.
- concentrator costs between sh3.5m and sh5m.

## ALL HOSPITALS AFFECTED: Oxygen

*Sunday Vision* team scanned different health centres to ascertain the availability of oxygen against the claimed status:

**FORT PORTAL REGIONAL REFERRAL HOSPITAL**
According to the Kabarole district health officer (DHO), Richard Mugahi, an oxygen plant was installed six months ago. This is supposed to supply the districts of Bundibugyo, Kabarole, Kyenjojo, Kasese, Kamwenge, Kyegegwa and Ntoroko. Other 24 health facilities in the region are also supposed to get oxygen from here, but Mugahi says many of these do not have enough cylinders. On average, there are usually two cylinders at a hospital shared around the different wards.

"Most facilities rely on oxygen concentrators. However, these do not produce oxygen in its recommended purest form," he says.

**IGANGA HOSPITAL**
The district hospital in Iganga and the health centres IV are supposed to get their oxygen from the Jinja Regional Referral Hospital. However, lack of cylinders makes it quite unsustainable, according to the DHO, David Muwanguzi.

"Unlike the other essential medicines that have a clearly spelt out system for delivery to health facilities, oxygen supply relies on the availability of funds at the facility to pick it from Jinja. This makes it prone to shortages," he says.

**GULU REGIONAL REFERRAL HOSPITAL**
The hospital is meant to supply the districts of Amuru, Kitgum, Lamwo and Pader. But a source at the facility intimated that they are usually unable to do so, given the high cost of running the plant.

"The plant consumes a lot of electricity. So, sometimes, the administration chooses to just produce for only Gulu Hospital," the source, who asked not to be identified, said.

**MBARARA REGIONAL REFERRAL HOSPITAL**
The sh600m oxygen plant launched in February 2016 was supposed to supply the districts of Bushenyi, Sheema, Ntungamo, Kiruhura, Ibanda, Buhweju, Rubirizi, Mitooma and Isingiro. However, as Dr Celestine Barigye, the hospital administrator, explained, they have since stopped the supplies to the other districts.

"We realised that we actually needed a lot more oxygen than earlier anticipated could be produced by the plant. So, we use the plant to produce for our own use," he said.

Mitooma, one of the districts that are supposed to be supplied by the Mbarara plant, only has a health centre IV as its highest medical facility. According to the DHO, Dr Christopher Matene, the facility does not have skilled clinicians who can handle the cases that require oxygen therapy.

"Oxygen therapy comes and goes with other advanced forms of care, which may not necessarily be offered at a health centre IV. So, when we get patients who need oxygen, we refer them to Mbarara or the other areas with district hospitals," he says.

**ARUA REGIONAL REFERRAL HOSPITAL**
The oxygen plant was established last year, but suffers from continued power outages. This has since pushed the operational costs at the hospital to unsustainable levels because they have to rely on a generator most of the time.

According to the hospital director, Dr Alex Adaku, operating the oxygen plant alone requires fuel worth sh42m from the hospital budget per quarter. The human resource capacity at the plant is also lacking with just three people attached to it.

"We need two more support staff because carrying the cylinders to the different wards alone is not easy as they are heavy. One person cannot carry them alone. So, oxygen may be available, but nobody to carry it to you," he said.

The hospital has 25 cylinders and, on average, handles 50-70 patients that need oxygen.

Adaku says despite the persistent power outages, the hospital's electricity bill shot up since the installation of the plant.

"Before, the hospital would spend sh20m on electricity per quarter. It is now sh28m," he said.

So, the hospital suggested a cost-sharing intervention with the other health facilities it is meant to supply. But





Jennifer Namulwa, the nursing assistant at Butebo Health Centre IV in Pallisa district with the general ward oxygen concentrator



A technician filling cylinders at the oxygen plant of Arua Hospital

## Children most affected by lack of oxygen, study finds

Only two of the 11(18%) district hospitals sampled in Eastern Uganda had a functional oxygen delivery at the paediatric wards according to a study published in the *Journal of Tropical Paediatrics* (2018) by Juliet Nabwire and others.

Oxygen, according to the researchers is only available at a minority of hospitals with inpatient paediatric services in eastern Uganda.

The study, covered 11 of the 12 district hospitals in the region. These include Atutur, Bududa, Bugiri, Busolwe, Iganga, Kamuli, Kapchorwa, Katakwi, Masafu, Pallisa and Tororo. According to the Uganda Demographic Health and Information Survey (2015) these places register a high number of deaths caused by pneumonia.

The study found only two facilities had a functional oxygen delivery, which were nevertheless not capable of reliable oxygen delivery in case of power failure. This, as stated in the findings, was because they relied on oxygen concentrators, had no cylinder oxygen backup and did not turn on the fuel powered hospital generator for patients needing oxygen.

The other nine facilities had no oxygen concentrator available for child patients, had a completely defective oxygen concentrator, or had an oxygen concentrator that produced oxygen at less than 80% pure.

"Although cylinders of oxygen were available at all hospitals, they were not available on the children's wards at any of the sites," reads the study.

The study also revealed that 92% of the nurses had never received training in oxygen therapy. 76% of them were "completely unfamiliar and did not attempt the task" of operating a device used to measure the level of oxygen in the blood (pulse oximetry, which was only available at Tororo Hospital). Although many nurses were able to operate oxygen concentrators, they lacked skills in the use of oxygen cylinders.

## plants have high running costs

this attracted resistance. Dr Santos Kenyi, the DHO of Koboko, one of the districts in the catchment area of Arua Regional Referral Hospital, said the health facilities in the area are instead using oxygen concentrators.

**KIGOROBYA HEALTH CENTRE IV**
It is supposed to be supplied by Hoima Regional Referral Hospital. The doctor in charge, Nicholas Kwikiriza, says the facility still relies on oxygen concentrators because it does not have oxygen cylinders to pick oxygen from Hoima.

**MULAGO NATIONAL REFERRAL HOSPITAL**
Mulago has two oxygen plants, which have the capacity to fully supply the three facilities: Mulago, Kiruddu and Kawempe (the latter two ideally Kampala Capital City Authority hospitals, which are being used due to the on-going renovations and reconstruction at Mulago). The first plant, installed in 2012, could produce up to 1,000 litres per minute. This was boosted by a new plant installed last year.

The only problem is lack of enough cylinders.

"If we had at least 500 cylinders, we would not be struggling. But we have much less than that," the source revealed.

According to the hospital spokesperson, Enock Kusasira, they have a total of 80 cylinders. That means a short fall of 420 cylinders.

"We also have a power supply problem. Unfortunately, the plant is not connected to the hospital's main generator. So, in case of a power outage, production is interrupted," the source says.

The source further revealed that the reservoir attached to the plant can only store enough oxygen for a maximum of eight hours.

"We are always praying that electricity never goes off for long or there will be a meltdown," the source says.

Another senior physician at the facility revealed that the oxygen plant quite often breaks down. This, the source argued, is the source of all the oxygen troubles at the hospital.

According to Kusasira, some of the critical units at the facility have piped oxygen and cylinders are only required as back up. They include the acute care, paediatric special care, intensive care and all theatres. The cylinders are only used at the other centres of Kawempe and Kiruddu.

"When the renovations and reconstruction of Mulago is complete, we shall have all the wards connected to the piped oxygen and other necessary gases," he said.

According to health ministry data, Mulago delivers over 35,000 mothers annually, handles the most complex surgeries. It has one of the biggest child special care units in the country at their Kawempe facility, with sometimes over 30 oxygen dependent newborns admitted.

**AMBULANCES**
Ideally, all ambulances should have an oxygen cylinder, always full and ready. However, many in the country do not have cylinders.

A driver at one of the upcountry facilities said there was a small cylinder in his ambulance, but he did not remember the last time it was refilled.

"Usually, we are told to drive with windows open so the patient can get oxygen directly from the atmosphere," he said.

Dr Lawrence Oonyu, the Pallisa district health officer, said the ambulance they use was donated by the area MP and it has neither first aid equipment nor oxygen.

## Stakeholders speak out on way forward

**HEALTH MINISTRY'S TAKE**
The commissioner in charge of curative services at the health ministry, Dr Jackson Amone (pictured), says the Government installed plants at 14 different regional referral hospitals to improve oxygen availability. But, he admits, oxygen availability is still a challenge.

"It is true health facilities do not have cylinders, but also the transport to keep going to the referral hospital may not be readily available. We had not fully appreciated the overhead costs," he said.

As a way forward, Amone says health facilities need to come up with sustainable mechanisms to ensure that their health facilities are well-served with oxygen.

Oxygen is also listed on the Essential Medicines and Health Supplies List for Uganda (2016) and should be 99.8% pure.

**NATIONAL MEDICAL STORES SPEAKS OUT**
The National Medical Stores (NMS) is charged with supplying oxygen to the health facilities as it does with other medicines and supplies. According to the general manager, Moses Kamabare, the agency provides oxygen if the health facility includes it in its procurement plans.

"As NMS, we cannot know why some facilities may prefer oxygen concentrators," he said.

**WAY FORWARD**
Amone proposes that each facility gets its own oxygen supply, directly connected to the wards. Dr Stephen Ttendo, the former president of the Association of Anaesthesiologists of Uganda, said a full scale plant costs $130,000 (about sh480m) and a mini-plant, which can generate oxygen for seven cylinders a day, costs between sh35m-sh50m.

Ttendo, however, notes that installing such machines should come with training operation skills, regular maintenance and supportive budgets.

Dr Byarugaba Baterana, the executive director of Mulago Hospital, says, sometimes, outsourcing oxygen services can be cheaper than owning plants.

"Paying for what you have used is cheaper. Private players tend to be more efficient than people in public installations. We would not be having any issues with oxygen," he says. He, however, warns that for instance moving oxygen from Mulago to Kiruddu is quite costly and also hard to get there on time.

**TRAINING NEEDED**
Ttendo says the Government has invested in hospital equipment, including oxygen infrastructure, but needs to consider such issues as maintenance, fuel and attitude.

"There is almost an oxygen plant at every regional referral hospital in the country, but the plants cannot run without maintenance. We have just started training biomedical engineers locally and this cadre is not in the structure of the health ministry. They need to be incorporated into the public health care system," he says.

There are about 81 physician anaesthesiologists (the doctors with the expertise to use oxygen).

Ttendo says recently, Mbarara Hospital had to fly in a specialist to work on their oxygen plant after it developed some technical problems. This increases the cost of maintenance, which would have otherwise been low, if the expert was to be sourced locally.

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