

**NEO FOR
NAMIBIA**
HELPING BABIES
SURVIVE



AUTHORS

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Lucerne, 31.01.2022

MISSION REPORT

Mission 2021–2

July 9, 2021 to August 8, 2021

NEO FOR NAMIBIA
HELPING BABIES SURVIVE

www.neo-for-namibia.org

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1. INTRODUCTION

The 12th mission of NEO FOR NAMIBIA – Helping Babies Survive lasted from July 9 to August 8, 2021.

Prof. Berger was accompanied by his wife, Sabines Berger, a pediatric nurse. In addition, a neonatology fellow (Salome Waldvogel) and a neonatology nurse (Katharina Mäder) from the University Children's Hospital in Basel reinforced the team. They were later joined by Sarah Knoll, another neonatology fellow, on her second mission with NEO FOR NAMIBIA – Helping Babies Survive. Our Namibian friend, Brenton Titus, one more time proved to be a reliable driver and assistant.

With a larger team than usual, it was possible to visit three hospitals (Rundu, Katima, Katutura) during the one-month-mission. The new team members rapidly acquainted themselves with the local circumstances and were flexible and hard working.

Finally, Prof. Berger and his wife met with representatives of the Ministry of Health and Social Services in Windhoek. The purpose of the meeting was to provide feed-back and strengthen our collaboration with the key stake holders at the ministry.

2. MAIN MISSION GOALS

The goals of the 12th mission were:

- To introduce the next neonatology fellow (Salome Waldvogel, MD) and a neonatology nurse (Katharina Mäder, RN) from the University Children's Hospital in Basel, Switzerland, to neonatal care in a resource-limited setting
- To better understand the challenges caused by the Covid-19 pandemic
- To define the final obstacles that needed to be overcome before opening the new Maternity Ward and Prem Unit at Rundu State Hospital
- To review progress made at Katima Hospital following our first three visits in December 2019, December 2020, and May 2021
- To train physicians and nurses at Katutura Hospital in the proper use of new equipment donated by NEO FOR NAMIBIA – Helping Babies Survive
- To meet with government officials to discuss future directions for NEO FOR NAMIBIA – Helping Babies Survive

3. HOSPITALS VISITED

Prof. Berger and Sabine Berger rented a car (Namibia2Go) in Windhoek and drove up to Rundu in two days, stopping overnight in Otjiwarongo. They arrived in Rundu on Sunday, July 11, 2021, and spent the next 20 days working in the hospital's Prem Unit.

On July 17, 2021, they welcomed Salome Waldvogel, MD, and Katharina Mäder, RN, at the Kaisosi River Lodge (8 km outside of Rundu). They had been picked up by Brenton Titus at Hosea Kutako International Airport the previous day and covered the more than 700 km to Rundu in two days. A few days later, on July 20, 2021, Sarah Knoll, MD, completed the mission team.

After working together with Prof. Berger and his wife for one week at Rundu State Hospital, the two fellows and Katharina Mäder traveled on to Katima Mulilo to continue support and training at Katima Hospital. Finally, after a weekend at Okonjima Plains and following the departure of Prof. Berger, Sabine Berger and Sarah Knoll, Salome Waldvogel and Katharina Mäder were able to return to Rundu State Hospital for two more weeks.

3.1 Rundu State Hospital

3.1.1 Overall impression

The Prem Unit was once again very busy, and the support provided by the three Swiss doctors and two nurses was more than welcome.

Over the past three years, admission routines have improved for several reasons. First, patients who obviously need Prem Unit admission are no longer kept in the delivery room for prolonged periods of time. Following initial stabilization in the delivery room (or casualty if they arrive from another facility), they are transferred immediately to the admission room in the Prem Unit where all necessary additional steps are taken by skilled staff. This includes continuous monitoring, getting IV access and blood samples for admission labs, as well as providing the necessary level of respiratory support (Fig. 1-3).



Fig. 1. Outborn twins wrapped tightly into several layers of blankets and towels to prevent heat loss arrive in the Prem Unit at Rundu State Hospital.

Fig. 2. Stabilization of a near term infant shortly after arriving in the Prem Unit at Rundu State Hospital (left: i.v. access and blow-by oxygen; right: auscultation to verify bilateral breath sounds).



Fig. 3. Early CPAP is essential when treating preterm infants with surfactant deficiency (i.e., hyaline membrane disease).

3.1.2 Surfactant replacement therapy

Introduced at Rundu State Hospital by Dr. Isha Kamara almost two years ago, many preterm babies now benefit from surfactant replacement therapy (Survanta®). In most cases, this drug is delivered by the so-called INSURE method. This abbreviation stands for INTubate – SURfactant – Extubate (Fig. 4): following sedation with midazolam (100 µg/kg/dose), the vocal cords are visualized with either a classical laryngoscope or with a handheld video laryngoscope (Guangzhou Leyte Medical Equipment Company) (Fig. 5), and the patient is intubated with a regular endotracheal tube. Then, an appropriately shortened nasogastric tube is inserted, and 4 ml/kg of surfactant are instilled in 2-4 aliquots (depending on the size of the baby).



Fig. 4. INSURE (INTubate SURfactant Extubate) is teamwork (Dr. Isha Kamara, Prof. Thomas M. Berger).



Fig. 5. Intubation using an affordable video laryngoscope (Prof. Thomas M. Berger).

This invasive form of therapy is always followed by CPAP support. Occasionally, smaller or sicker babies may be kept on a ventilator for a period of 1–2 days (rarely longer). In such cases, sedation is provided by boluses or even continuous infusion of midazolam (Fig. 6, 7). Opiates (e.g., morphine or fentanyl) are not readily available.



Fig. 6. Manual ventilation through an endotracheal tube until the ventilator can be connected (Sabine Berger).

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Premedication for intubation
Midazolam



Midazolam ampule
standard solution 15 mg/3 ml (i.e., 5 mg/ml)

The standard solution must be diluted to allow for proper dosing in neonates:
Draw up 1 ml (5 mg) of the standard solution (5 mg/ml) and add 49 ml of normal saline, resulting in a diluted solution that contains 5 mg/50 ml or 0.1 mg/ml

Intubation dose
0.1 mg/kg = 100 µg/kg
or 1 ml/kg of the diluted solution
flush with 2 ml of normal saline

Weight	Calculated dose	Volume to be injected
1000 g	0.10 mg	1.0 ml
1500 g	0.15 mg	1.5 ml
2000 g	0.20 mg	2.0 ml
2500 g	0.25 mg	2.5 ml
3000 g	0.30 mg	3.0 ml
3500 g	0.35 mg	3.5 ml
4000 g	0.40 mg	4.0 ml
4500 g	0.45 mg	4.5 ml

Fig. 7. Laminated reminders with midazolam dosing recommendations (left: premedication for intubation; right: continuous sedation during mechanical ventilation).

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Continuous sedation
Midazolam



Midazolam ampule
standard solution 15 mg/3 ml (i.e., 5 mg/ml)

The standard solution must be diluted to allow for proper dosing in neonates:
Draw up 1 ml (5 mg) of the standard solution (5 mg/ml) and add 49 ml of normal saline, resulting in a diluted solution that contains 5 mg/50 ml or 0.1 mg/ml

Continuous sedation dose
0.06 mg/kg/hr = 60 µg/kg/hr
or 0.6 ml/kg/hr of the diluted solution

Weight	Calculated dose	Volume to be injected
1000 g	60 µg/hr	0.6 ml/hr
1500 g	90 µg/hr	0.9 ml/hr
2000 g	120 µg/hr	1.2 ml/hr
2500 g	150 µg/hr	1.5 ml/hr
3000 g	180 µg/hr	1.8 ml/hr
3500 g	210 µg/hr	2.1 ml/hr
4000 g	240 µg/hr	2.4 ml/hr
4500 g	270 µg/hr	2.7 ml/hr

The Prem Unit is equipped with 2 EVE TR neo mechanical ventilators. Because of equipment malfunction of the original heater and humidifier, a second Fisher Paykel M850 will have to be purchased in the near future.

3.1.3 Local leaders

We are fortunate to have reliable local leaders in the Prem Unit: among the nursing staff, Cecilia, Aila and Martha have played key roles in the development of the unit (Fig. 8). Dr. Isha Kamara and Dr. Geraldine Beukes are their physician counterparts.



Fig. 8. Local leaders: Martha Martin (left) and Cecilia Ndepavali (right) play crucial roles in the Prem Unit at Rundu State Hospital and are key to sustainability of progress made.

While direct patient care has improved enormously over the past years, two issues remain problematic: equipment maintenance and stock management. Sometimes, we can cope ourselves with some of the maintenance issues (Fig. 9), but this is more of a crisis intervention and not really what we aim for. We firmly believe that responsibilities need to be clearly defined to prevent equipment malfunction in critical situations and to avoid «out of stock» situations. Thus far, hierarchical structures have prevented the designation of suitable team members. The issues have been addressed, and we will have to follow up on it.



Fig. 9. Regular maintenance of equipment is crucial: Sabine Berger, RN, repairing patient cables for the Masimo® pulse oximeters

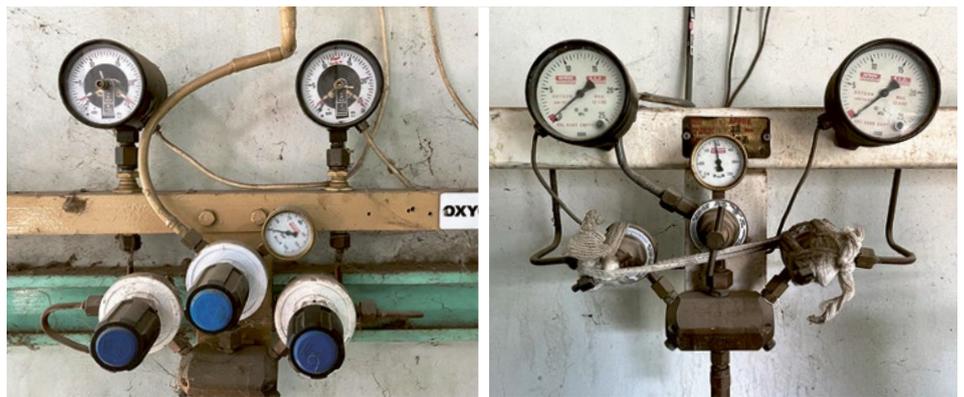
3.1.4 Corona-19 pandemic and oxygen supply crisis

Even though the published number of confirmed Covid-19 cases remained relatively low in Namibia, the Corona pandemic has had an enormous impact on the country's fragile health care system. This is perhaps best illustrated by the oxygen supply crisis we witnessed at Rundu State Hospital (Fig. 10, 11).

Fig. 10. Rundu State Hospital: central oxygen supply room with back-up oxygen cylinders.



Fig. 11. The hospital's central oxygen supply system could not cope with the increased oxygen demand during to the Covid-19 pandemic.



Due to the high use of oxygen for adult patients with Covid-19 lung disease, oxygen supply from wall outlets was no longer guaranteed. Therefore, oxygen cylinders had to be placed next to neonates requiring respiratory support (Fig. 12, 13).

Fig. 12. The wall oxygen supply could no longer cover the high requirements because of many adult Covid-19 patients admitted to the hospital; therefore, oxygen cylinders had to be placed next to each bed space in the Prem Unit.



Fig. 13. Unfortunately, the supply of fresh oxygen cylinders could not always be guaranteed.



3.1.5 Neonatal sepsis and antibiotic stewardship

One of the main admission diagnoses is «rule out early-onset neonatal sepsis». Signs and symptoms of neonatal infections are non-specific. Untreated, neonatal sepsis can rapidly become life-threatening. Therefore, antibiotic therapy must be initiated in many babies admitted to the neonatology ward. Once infection has become very unlikely, antibiotics should be stopped to avoid unnecessary exposure with negative consequences for the individual patient (disturbance of a healthy gut microbiome) and other patients (selection of resistant bacteria).

Studies from high-income countries have shown that it is safe to discontinue antibiotics when two consecutive C-reactive protein levels (measured 48 hours apart) have remained negative (<10 mg/l). Unfortunately, the hospital's laboratory facility (run by the NIP: National Institute of Pathology) often cannot provide CRP results in a timely fashion, leading to unnecessarily prolonged courses of antibiotics.

We are now exploring the feasibility of introducing point of care testing (POCT) for CRP concentrations (Fig. 14). During our stay, we evaluated semiquantitative measurements; for one of our next missions, it might be possible to introduce a device that quantifies CRP values more precisely. Ultimately, costs and availability of consumables will determine the feasibility of this project.

Fig. 14. Bedside C-reactive protein (CRP) determination, either semiquantitatively (left) or quantitatively (right), can provide rapid CRP results and help guide antibiotic therapy.



3.1.6 Teaching

It was a pleasure to introduce two new team members to the work of NEO FOR NAMIBIA – Helping Babies Survive. Salome Waldvogel (Fig. 15) and Katharina Mäder (Fig. 16) rapidly adapted to the local circumstances. After a period of observation, they themselves got involved in teaching activities for the local health care professionals (17).

Fig. 15. Prof. Berger explains the X-ray findings to the mother of a baby (left) with bowel obstruction; Dr. Salome Waldvogel follows closely (right).



Fig. 16. Katharina Mäder, RN, and Martha Martin, RN, discuss proper positioning of sick babies.



Fig. 17. Katharina Mäder, RN, taught the local nurses how babies can be put in prone position even when supported with the Pumani bCPAP.



3.1.7 Statistics

During our stay, statistical data was extracted from the Prem Unit admission book. From January 1 to July 31, 2021, a total of 562 babies had been cared for, with monthly numbers of admissions ranging between 70–91. Extrapolating this data, almost 1'000 admissions can be expected for the current year. This far exceeds the number of admissions in previous years (lowest (2012): 260, highest (2016): 755). Outborn infants (119) accounted for 21% of all admissions (Fig. 18).

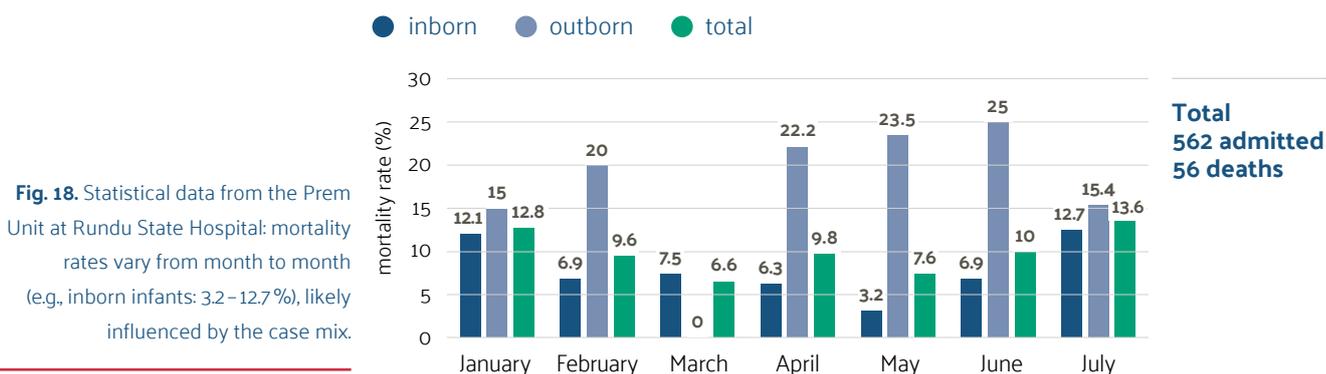


Fig. 18. Statistical data from the Prem Unit at Rundu State Hospital: mortality rates vary from month to month (e.g., inborn infants: 3.2–12.7%), likely influenced by the case mix.

Overall, there were 56 deaths (mortality rate 10.0%). Not unexpectedly, the mortality rate for outborn infants (21/119, 17.6%) was higher than for inborn infants (35/443, 7.9%). Birth weight-specific mortality rates revealed an improved but still high mortality rate of 40% for extremely low birth weight infants (birth weight < 1 000 g); the rate drops to 12.3%, 8.4% and 7.3% for infants with birth weights of 1000–1500 g, 1501–2500 g, and > 2500 g, respectively (Fig. 19). Leading causes of death were hypoxic ischemic encephalopathy, complications of prematurity (often with respiratory failure) and neonatal sepsis (Fig. 20).

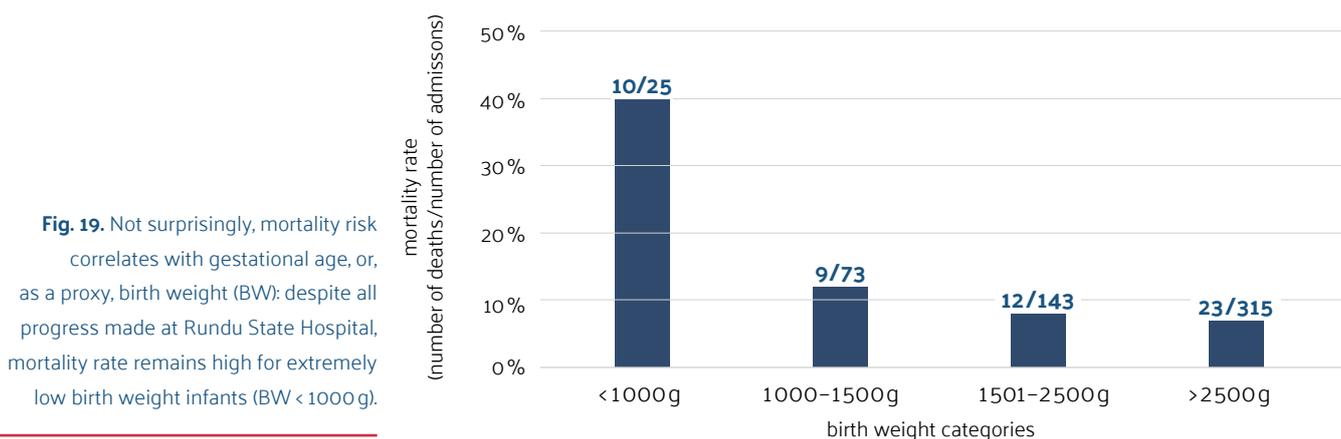


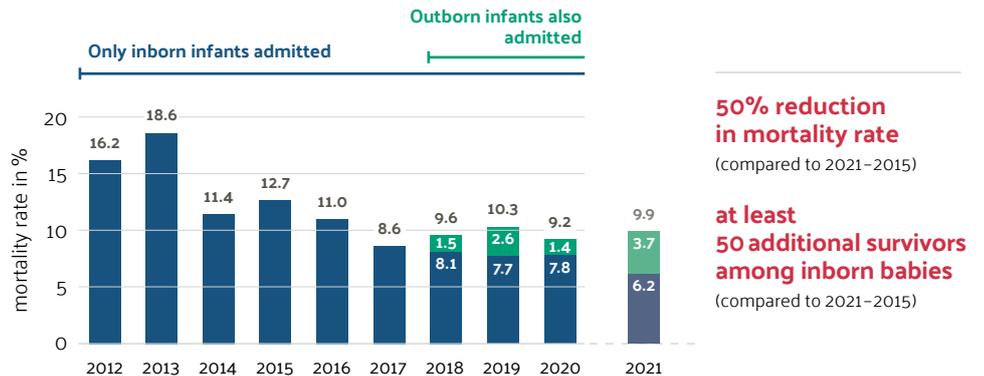
Fig. 19. Not surprisingly, mortality risk correlates with gestational age, or, as a proxy, birth weight (BW): despite all progress made at Rundu State Hospital, mortality rate remains high for extremely low birth weight infants (BW < 1000 g).

Fig. 20. Leading causes of death remain unchanged: consequences of birth asphyxia or preterm birth, followed closely by neonatal infections (data from the Prem Unit at Rundu State Hospital, January 1 to July 31, 2021).

Causes of death	N	% of all deaths
Hypoxic ischemic encephalopathy (Sarnat stages II–III)	19	35%
Complications of prematurity, respiratory failure	14	26%
Neonatal sepsis (early-onset and late-onset)	11	20%
Other causes	10	19%

In 2012 and 2013, almost 1 out of 5 babies admitted to the Prem Unit had died. From 2014–16, the mortality rate was around 12%. Over the past four years, the mortality rate of inborn infants has dropped and stabilized around 8% (Fig. 21). This reduction in mortality rate will likely result in at least 50 additional babies surviving in 2021: NEO FOR NAMIBIA – Helping Babies Survive!

Fig. 21. Encouraging results: reduced mortality rates have been sustained over the past 3 years: in 2021, improved care will likely result in one additional surviving baby every week.



3.2 Katima Hospital

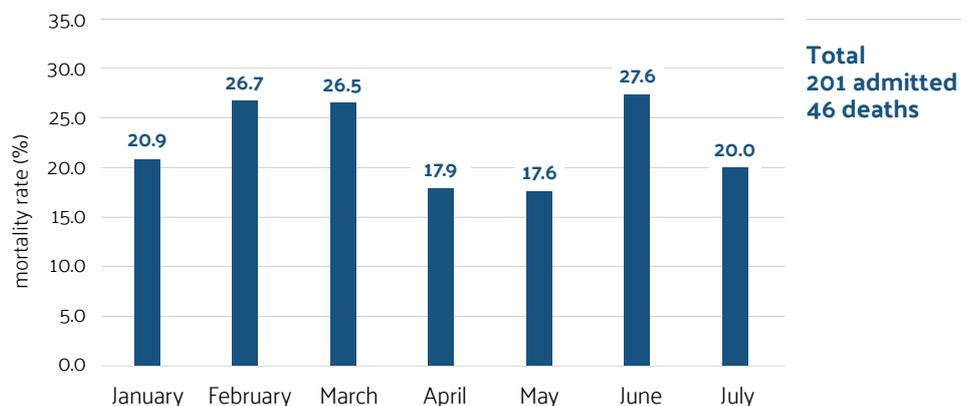
3.2.1 Overall impression

This was the 4th visit of Katima Hospital by NEO FOR NAMIBIA – Helping Babies Survive. Progress made is visible but slow. Staffing remains critically low. Dr. Cristy Victor, a promising young Namibian physician, has taken the position of Dr. Xiamara (a Cuban physician). Some of the nurses no longer rotate from the neonatology unit to other wards; this will allow to train a core group that will ultimately be responsible to improve neonatal care at Katima Hospital.

3.2.2 Statistics

Using the unit’s admission book, statistical data was analyzed. From January 1 to July 31, 2021, a total of 201 inborn babies had been cared for, with monthly numbers of admissions ranging between 17–43. Extrapolating this data, almost 350 admissions can be expected for the current year.

Fig. 22. Statistical data from the neonatal unit at Katima Hospital: mortality rates vary from month to month (17.6–27.6%): they remain much higher than those observed at Rundu State Hospital.



Over the same time period, 46 babies died (mortality rate 22.9%). When compared with the mortality rate of inborn babies at Rundu State Hospital (7.9%), it becomes obvious that there is still a long way to go. Even though surfactant replacement therapy and invasive mechanical ventilation are not available in Katima, it seems reasonable to estimate that the mortality rate could be lowered to 12% (i.e., half of what it is now).

Birth weight-specific mortality rates revealed a very high mortality rate of 91.7% for extremely low birth weight infants (birth weight < 1000g); the rate drops to 42.9%, 16.4% and 18.5% for infants with birth weights of 1000–1500g, 1501–2500g, and > 2500g, respectively (Fig. 23). These rates are more than double of the rates observed at Rundu State Hospital, again highlighting the potential for improvement (Fig. 24). Leading causes of death were complications of prematurity (often with respiratory failure), hypoxic ischemic encephalopathy, and neonatal sepsis (Fig. 25).

Fig. 23. Birth weight-specific mortality rates of infants admitted to the neonatology unit at Katima Hospital.

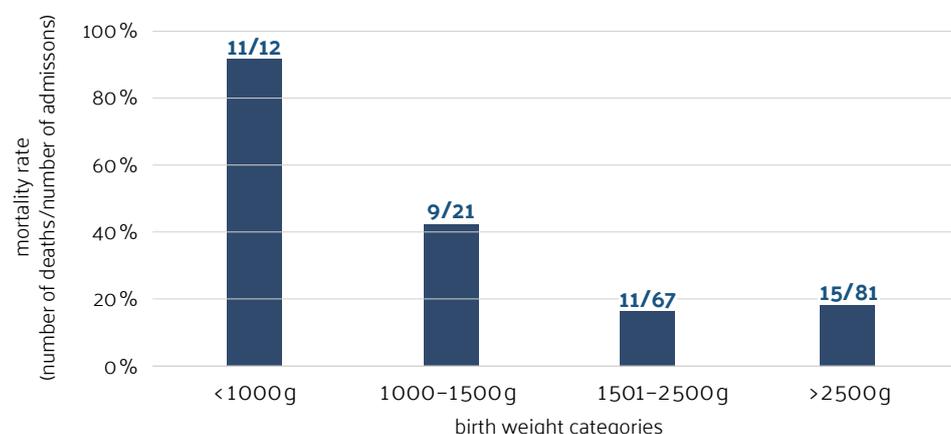


Fig. 24. Comparison of birth weight-specific mortality rates between Rundu State Hospital and Katima Hospital (January 1 to July 31, 2021): the existing gaps are obvious.

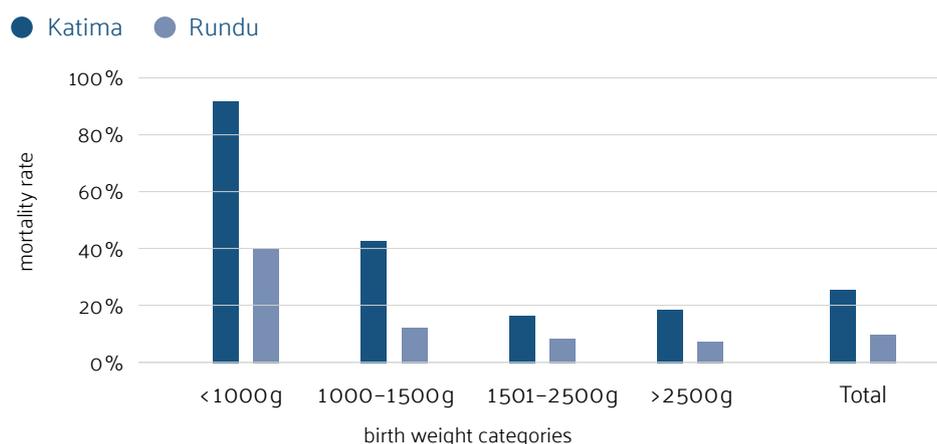


Fig. 25. Leading causes of death remain unchanged: consequences of birth asphyxia or preterm birth, followed closely by neonatal infections (data from the neonatology unit at Katima Hospital, January 1 to July 31, 2021).

Causes of death	N	% of all deaths
Complications of prematurity, respiratory failure	21	45%
Hypoxic ischemic encephalopathy (Sarnat stages II-III)	15	33%
Neonatal sepsis (early-onset and late-onset)	6	13%
Other causes	4	9%

3.2.3 New neonatal unit

Construction of the new neonatal ward had not yet been completed. Apparently, appropriate funding for the installation of gas supply still needed to be approved (as it is part of a larger tender). Once again, it was pointed out how many oxygen and compressed air wall outlets will be required, and that additional power sockets will be needed before the unit can become operational.

4.4. MEETING WITH THE VICE-PRESIDENT OF NAMIBIA

On August 3, 2021, before returning to Switzerland, Prof. Berger and his wife Sabine Berger were able to meet the Vice-President of Namibia, his excellency Nangolo Mbumba, at the Old Statehouse in Windhoek (Fig. 26). During the very friendly 45-minute-meeting, they were able to present the activities of NEO FOR NAMIBIA – Helping Babies Survive. The Vice-President was very attentive and impressed by the results achieved over a relatively short period of time. He pledged his support of our future efforts.



Fig. 26. Vice-President Nangolo Mbumba
(source: www.neweralive.na)

5. FUTURE DIRECTIONS

5.1 Mission 2021-3

The 13th mission of NEO FOR NAMIBIA – Helping Babies Survive will take place in November and December 2021. Prof. Berger, Salome Waldvogel and Katharina Mäder will carry out that mission.

5.2 Fundraising efforts

After more than 5 years, it is gratifying to see that what had started as a pilot project in 2016, has since been proven to be effective and sustainable. This motivates NEO FOR NAMIBIA – Helping Babies Survive to continue and expand its efforts. The team is growing, and hopefully, the University Children's Hospital of Basel, Switzerland, will continue to offer to its neonatology to become involved in projects that help develop neonatal care in LMICs. Such efforts, however, will depend on ongoing and hopefully increasingly successful funding.

6. VISITING OUR AFRICAN FRIENDS

It is always a pleasure to meet our African friends in their homes. We usually bring some basic foods and some treats for the kids. It never ceases to amaze us to see how they cope with their living circumstances: despite harsh conditions, they never lose their smiles (Fig. 27 – 29).



Fig. 27. At Johannes' place: it's nice to see how the kids grow!

Fig. 28. At Laurentia's place: the kids love their cookies.



Fig. 29. Kassian enjoys some warm clothes from Switzerland (left); a little girl cherishes an apple (right).



7. WILD ANIMALS

Fig. 30. Hornbill at Okonjima Plains Camp enjoying some peanuts.

The report of our 12th mission closes with some pictures of African wild life (Fig. 30 – 35). The photographs were taken at the Kavango river near Rundu and during a short stay in the Okonjima Plains Nature Reserve, 50 km south of Otjiwarongo.



Fig. 31. A jackal approaching its prey (Okonjima Plains Game Reserve).



Fig. 32. Leopard resting in a tree
(Africat Foundation).



Fig. 33. Crocodile on the banks of the
Kavango river (near Kaisosi River Lodge).

Fig. 34. Looking across the Kavango River to Angola.



Fig. 35. Sunset at the Okonjima Game Reserve.



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