NEO FOR NAMIBIA
HELPING BABIES SURVIVE

MISSION REPORT

Mission 2022 – 1

March 27, 2022 to April 30, 2022

AUTHORS
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www.neo-for-namibia.org

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1. INTRODUCTION

The 14th mission of NEO FOR NAMIBIA – Helping Babies Survive took place at the end of the rainy season in Namibia and lasted from March 27 to April 30, 2022 (Fig. 1). Together with Brenton Titus, their driver and assistant, Prof. Thomas M. Berger and his wife, Sabine Berger, had planned to travel to Rundu and Katima.

Fig. 1. Flying over the Etosha pan at the end of the rainy season.

Unfortunately, the old 2000 model Toyota HILUX 2.7 no longer seemed stable and reliable enough to cover the almost 3'500 km of the planned trip. The car had been driven for 360'000 km, half of which by Brenton Titus and NEO FOR NAMIBIA – Helping Babies Survive mission teams. The current team only had a day and a half to find a solution. With the recovery of the tourist business, prices for car rentals had gone up (it would have cost more than CHF 4'000.00 for the planned trip). The team therefore chose to buy a second-hand car (2013 model Toyota HILUX 3-liter D4D (150'000 km) at a cost of CHF 23'000.00) and to try to sell the old car (eventually recovering half of the money paid 4 years ago, i.e., CHF 6'000.00).

In Namibia, all Corona-related travel restrictions had been lifted for fully vaccinated people by the end of March 2022. Yet, many traces of the pandemic were still visible (Fig. 2 – 4). At the time of this writing (April 2023), the Johns Hopkins University website (coronavirus.jhu.edu/map) indicated that there had been 171'156 confirmed Covid-19 cases (6.7 % of the population) and 4'090 Covid-19 related deaths (case fatality rate 2.4 %) in Namibia (Fig. 5). This compares to Switzerland as follows: 4'413'911 confirmed Covid-19 cases (51 % of the population), 14'210 deaths (case fatality rate 0.3 %). The pandemic illustrated what could be achieved on a global scale if a certain problem would be given a high priority. Unfortunately, problems that do not threaten people in high income countries (such as preventable deaths in neonates) are not given the same attention.

Fig. 2. Most Corona-related restrictions had been lifted for fully vaccinated travelers; however, signs of the past pandemic were still prevalent.

Fig. 3. Old posters and hand hygiene devices at a border station to Botswana.

Fig. 4. Roll-up with Coronavirus-related information and seating restrictions at Eros Airport, Windhoek.

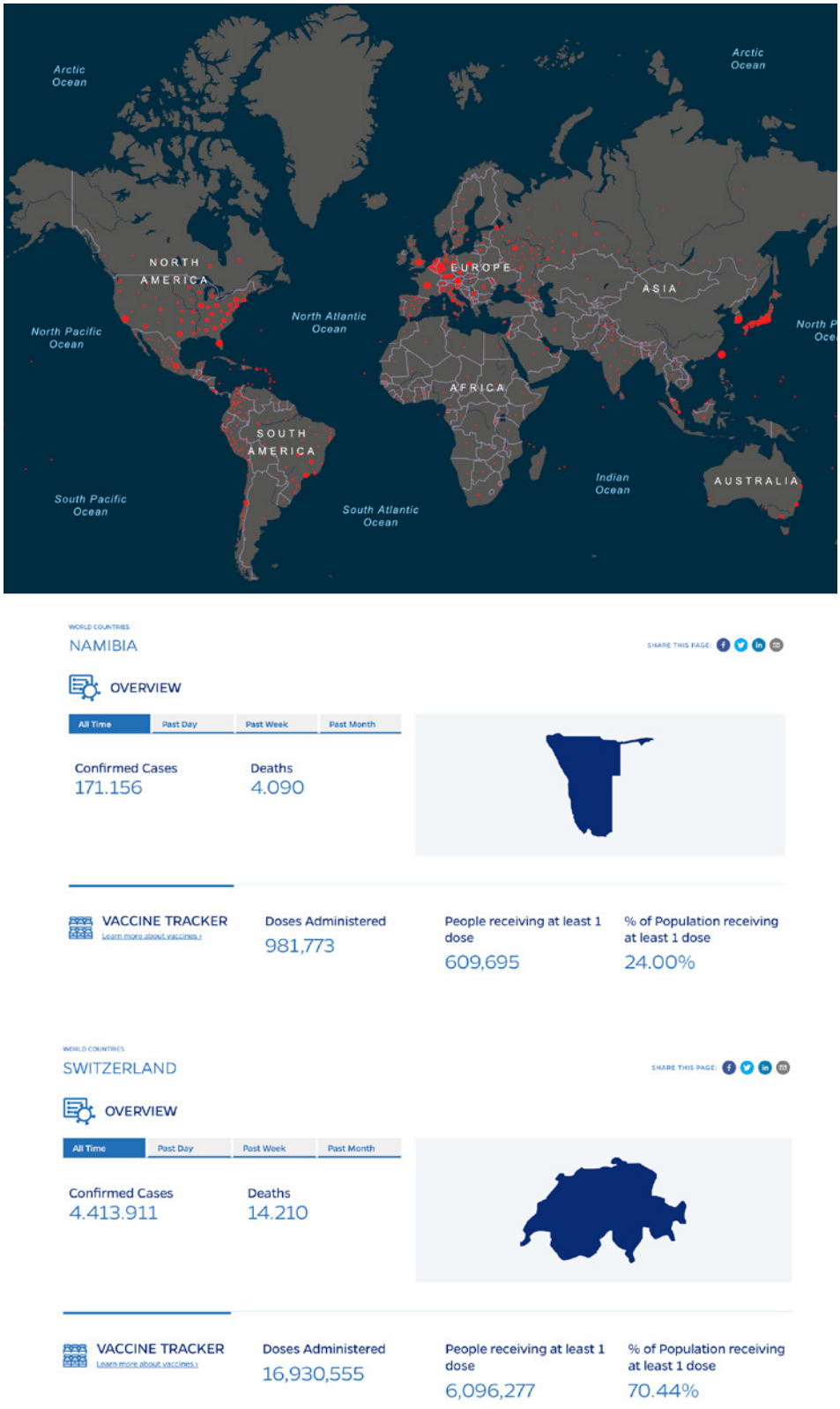


Fig. 5. Johns Hopkins University Coronavirus Resource Center: comparison of confirmed cases and deaths between Switzerland and Namibia (accessed: April 4, 2023).

Before leaving Windhoek, a meeting with Dr. Ben Nangombe, the Executive Director (ED) of the Ministry of Health and Social Services (MHSS), proved to be very pleasant and valuable (see below). Feedback was provided during a second meeting with representatives of the MHSS before returning to Switzerland.

2. MAIN MISSION GOALS

The goals of the 14th mission were:

1. To support local health care professionals at Rundu State Hospital by helping with daily ward rounds in the new Prem Unit

2. To update the inventory of all equipment and consumables provided by NEO FOR NAMIBIA – Helping Babies Survive since 2016 and to improve stock management at Rundu State Hospital and Katima Hospital

3. To test the two new incubators from Phoenix Medical Systems that had finally arrived in Rundu after a more than 6-month-delay

4. To evaluate the quality of care at Katima Hospital after moving into the new neonatology unit

5. Finally, to review annual statistics for 2021 at both Rundu State Hospital and Katima Hospital

3. HOSPITALS VISITED

As planned, Prof. Berger and Sabine Berger spent 16 and 6 days working at Rundu State Hospital and Katima Hospital, respectively. Given the high caseloads at both hospitals, work was intense but nevertheless rewarding. Neonatal patients aside, local doctors were busy with high numbers of pediatric inpatients because of viral cases of bronchiolitis, bronchitis, and gastroenteritis at unprecedented rates.

3.1 Rundu State Hospital

3.1.1 Overall impression

The Prem Unit continued to function well despite high numbers of admissions over the past three months (January: 124, February 101, March: 115). We were impressed that the nurses never complained or argued when yet another admission was announced; they simply moved the most stable babies to adjacent rooms, Block B or added a bed between the existing ones.

The pediatric physician team now consisted of 5 pediatricians and 1 physician "borrowed" from the Department of Anesthesia. The group is led by Dr. Isha Kamara (expat from Sierra Leone) and Dr. Geraldine Beukes (Namibia); apart from Dr. Katamba Banza (expat from DRC), two new Namibian physicians with less experience have joined the team. The contracts of Dr. Chantal Nyembo (expat from DRC) and Dr. Odalys Alfonso (expat from Cuba) have not been renewed. Unfortunately, as of April 30, 2022, no interns have been appointed to the hospital.

3.1.2 High case load

In 2021, 1004 neonates were admitted to the Prem Unit. Of these 808 were inborn,

corresponding to 11 % of all babies born alive at Rundu State Hospital. The remaining 196 babies admitted were either born at home, in another health facility or during transport to the hospital (often labeled as BBA: born before arrival).

When extrapolating the admissions from the first three months of 2022 (admissions total/inborn: January 124/93; February 101/81; March 115/94), the total number of admissions in 2022 will very likely exceed the 2021 admission number by 35 %. The immediate obvious consequences are that more staff and more equipment/consumables will be required to maintain the same level of quality of care.

During the doctors' meeting on Monday, April 11, 2022, the following figures were presented:

- Patient census for the whole Pediatric Department — 147 patients
- IV Unit — 57 patients
- General Pediatric Ward — 42 patients
- High Care Unit — 11 patients
- Prem Unit (Block A and Block B) — 37 patients

On weekends, there is only one doctor on call to look after the hospitalized patients; this doctor is also responsible for pediatric patients in casualty, the delivery room (should a baby require more advanced support) and babies in the maternity ward: mission impossible!

3.1.3 Inventories and definition of vital supply chains

Sabine Berger compiled a comprehensive stock list of equipment donated by NEO FOR NAMIBIA – Helping Babies Survive (including information on its functionality), as well as consumables required to use the devices.

Some critical issues were discovered:

- Only 4 of 5 MTTS Dolphin® bubbleCPAP machines are still functional (nurses admit that this device is their first choice now, and Pumani® bubbleCPAP machines are only used when more than 4 patients require CPAP support):
  - 1 unit is with the medical engineer John Namwira (to be used as a potential source of spare parts)
  - internal oxygen sensors are not functioning properly in 2 units (replacement and spares were arranged by John Namwira)
- None of the integrated Masimo® pulse oximeters of the MTTS Dolphin® bubbleCPAP machines is being used because the compatible patient cables are broken
  - new patient cables will be ordered
  - if possible, adapters will be purchased to allow the use of the neonatal sensors used with the Masimo Rad-8, Rad-97, and Rad-G pulse oximeters

  - the total number of pulse oximeters at the Prem Unit at Rundu State Hospital can thus be increased to 21 devices

- The 2 EVE® TR neo ventilators cannot be used if the internal battery malfunctions (even if the external battery is fully charged)
  - back-up internal batteries have been ordered
- The POCT Bilimeter® 3D intermittently displays "lamp dead"
  - an additional device will have to be purchased, and servicing of the current device should be arranged with Pfaff Medical in Germany

As mentioned in previous Mission Reports, stock management of consumables is challenging and remains unsatisfactory. Sabine Berger counted and organized all relevant items, and, together with the head nurse, Cecilia Ndepavali, defined minimum numbers that must trigger the ordering process. These numbers were chosen to be high given the delays that occur in the delivery process. For items that cannot be obtained trough the MHSS central stores, precise delivery addresses and consignment agents (with personal contact information) must be defined.

3.1.4 New incubators

The two incubators that had been ordered more than 9 months earlier, had finally arrived in Rundu. Unfortunately, they had been damaged during transport (Fig. 6, 7). In addition, the more sophisticated unit (Phoenix INC 200) indicated a water pump failure and was therefore not able to adequately humidify the air inside the incubator.

Ultimately, help was promised after several shaky video calls moderated by Reza Garda of VIA Global Health. If the incubators cannot be repaired, a refund will be requested from the manufacturer in India.

Fig. 6. The new incubators (left: image of the INC 2000 from Phoenix Medical Systems, India) arrived in damaged condition and could unfortunately not be used.

Fig. 7. The new incubators from Phoenix Medical systems arrived after more than 9 months: they were damaged and non-functional.

3.1.5 Introduction of a new POCT CPR measuring device

Rule out early- or late-onset neonatal sepsis (r/o EOS or r/o LOS) remains one of the most common admission diagnoses of Prem Unit patients. The previously suggested management of such patients was almost never followed. The reasons are likely multi-factorial: non-adherence to our recommendations (not all patients got the recommended admission laboratory examinations, i.e., full blood count (FBC) and C-reactive protein (CRP) level), follow-up CRP levels were not ordered, blood samples were lost, or samples were judged insufficient by the NIP lab (National Institute of Pathology); in addition, results were often reported with great delays.

The consequences are numerous:

- Many (up to 95 %) of babies do not have EOS and unnecessarily are exposed to prolonged courses of antibiotics with a negative impact on their intestinal microbiome
- Babies with prolonged antibiotic exposure are at higher risk for late-onset sepsis (LOS) and necrotizing enterocolitis (NEC)
- Massive overuse of antibiotics likely leads to selection of multi-resistant bacteria, potentially rendering first and even second line antibiotics ineffective
- Prolonged courses of antibiotics generate significant costs (IV access, drugs)

It was therefore decided to introduce a point of care testing (POCT) device (AIDIAN QuikRead go®) (Fig. 8). The machine is very easy to use and requires only a very small sample volume (10 µl of blood). The result is available within 2 minutes.

Fig. 8. Introduction of point of care testing (POCT) for the measurement of C-reactive protein (CRP) concentrations at Rundu State Hospital.

To ensure proper functioning, testing with a specific control solution must be done and recorded every two weeks (responsible nurse: Cecilia Ndepavali). The potentially biggest obstacle: an individual test costs CHF 3.50 (given the current case load and an estimated number of 2 tests per patient, this would translate into annual costs of CHF 7000.00). However, if the test performs as expected, the savings (IV access, antibiotics) will easily exceed these costs (Fig. 9). To evaluate the usefulness and cost effectiveness of the device and its reagents, data will be collected prospectively and analyzed regularly.

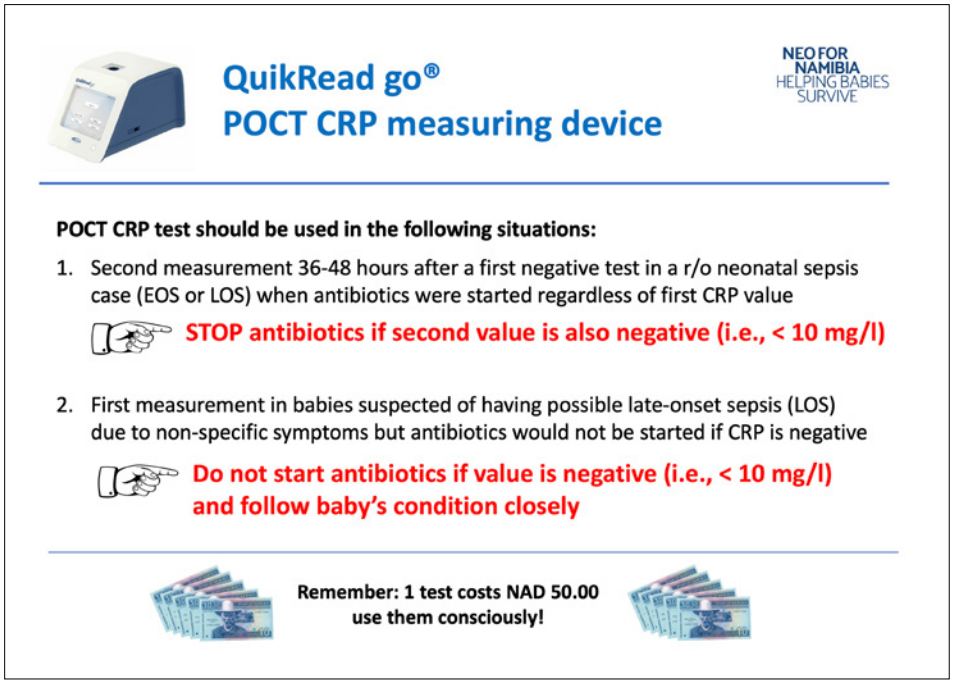


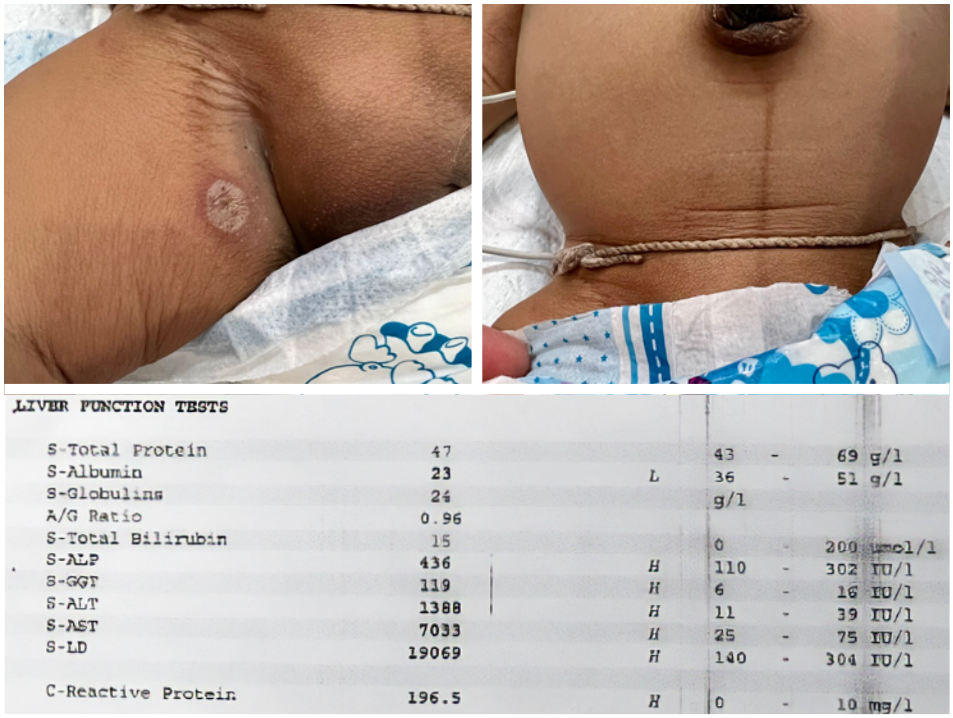
Fig. 9. Main indications for POCT of CRP concentrations (introduced at Rundu State Hospital in April 2022).

3.1.6 Challenging cases

3.1.6.1 Traditional medicine intoxication

We encountered several cases of traditional medicine intoxication (TMI). Babies receive unknown mixtures of plants or roots, either orally or as enemas, often for minor ailments (e.g., constipation). Undefined toxins contained in these preparations then lead to severe and even life-threatening multiorgan system failure (MOSF). The mortality rate of severely affected patients is very high (approximately 50 %) (Fig. 10, 11).

Fig. 10. Patients with traditional medicine intoxication (TMI) often present with multiorgan system failure (MOSF): neurological symptoms, respiratory distress, liver and renal failure.



LIVER FUNCTION TESTS

S-Total Protein	47		43 -	69 g/l
S-Albumin	23	L	36 -	51 g/l
S-Globulins	24		g/l	
A/G Ratio	0.96			
S-Total Bilirubin	15		0 -	200 µmol/l
S-ALP	436	H	110 -	302 IU/l
S-GGT	119	H	6 -	16 IU/l
S-ALT	1388	H	11 -	39 IU/l
S-AST	7033	H	25 -	75 IU/l
S-LD	19069	H	140 -	304 IU/l
C-Reactive Protein	196.5	H	0 -	10 mg/l

Fig. 11. 11. Patients with traditional medicine intoxication (TMI): ribbons tied around wrists, ankles and abdomen are a tell-tale sign (left); elevated liver enzymes are very typical (right).

3.1.6.2 Occipital omphalocele

Encephalocele is a rare type of birth defect of the neural tube that affects the brain. The neural tube is a narrow channel that folds and closes during the third and fourth weeks of pregnancy to form the brain and spinal cord.

Over the past seven years, mission teams of NEO FOR NAMIBIA – Helping Babies Survive have encountered multiple cases of neural tube defects. Whether this represents an increased prevalence among the local population is unclear. Clearly, folic acid supplementation in women of childbearing age (known to decrease the risk of neural tube defects) is not a routine practice.

Surgical therapy of affected patients (Fig. 12) is only available in Windhoek. Referral is often complicated by poor communication. Immediate and long-term outcome of transferred patients is frequently unknown.

Fig. 12. Term infant with a large occipital omphalocele, awaiting transfer to Windhoek

3.1.6.3 Posthemorrhagic hydrocephalus

There is no radiologist at Rundu State Hospital. Ultrasound examination of the brain, a simple and non-invasive procedure in newborn infants, is never performed. On several occasions, team members of NEO FOR NAMIBIA – Helping Babies Survive have diagnosed posthemorrhagic hydrocephalus in preterm infants using an old ultrasound machine from the Department of Obstetrics (Fig. 13). Such patients require close monitoring and many of them would ultimately need a neurosurgical procedure (such as a ventriculoperitoneal shunt). It is unclear how often this is available in Namibia.

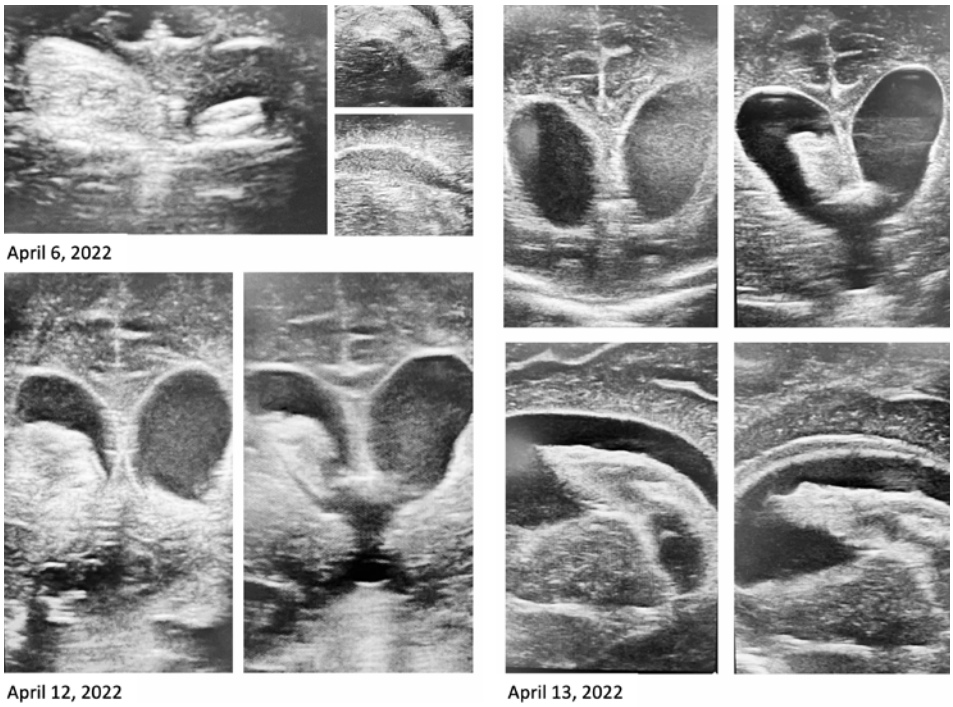


Fig. 13. Ultrasound examination of a preterm infant with bulging anterior fontanel: there is clear evidence of posthemorrhagic hydrocephalus.

3.1.6.4 Pneumoperitoneum

This infant was admitted from home with a very tense abdomen and recurrent episodes of vomiting. On X-ray, there was evidence of pneumoperitoneum, indicating that the bowel had ruptured (Fig. 14). The general surgeon on call decided to start broad spectrum antibiotics, to insert a peritoneal drain and to transfer the infant to Windhoek. Again, no follow-up information became available (the possibility of Hirschsprung's disease seemed high).

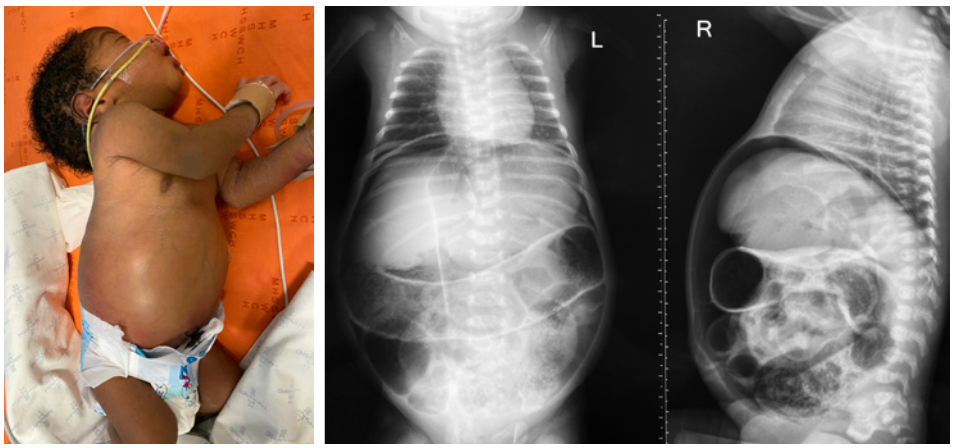


Fig. 14. Term infant with distended abdomen and obvious pneumoperitoneum on X-ray.; the ultimate diagnosis remained unknown.

3.1.6.5 Born before arrival (BBA)

Due to poor antenatal care, unplanned deliveries continue to occur quite frequently; such infants are labeled in the Prem Unit's admission book as "BBA", meaning "born before arrival". Such deliveries may be attended by women in the village, or, occasionally, mothers deliver their babies on their own. Such babies are wrapped into several layers of blankets or, as in this case, cotton (Fig. 15). Nevertheless, they often arrive with severe hypothermia. Limited umbilical cord care in such settings (Fig. 16) can lead to severe infections, including neonatal tetanus.

Fig. 15. Preterm infant (birth weight 1400 g) born in a village arrived with severe hypothermia (32.2 °C) despite having been wrapped in cotton; the baby survived.

Fig. 16. Umbilical cord care in a baby BBA (born before arrival): the use of ashes is quite common and can lead to neonatal tetanus.

3.1.6.6 Genetic disorders

For babies with multiple congenital abnormalities only limited diagnostic investigations are available. Blood for genetic analyses must be sent to Windhoek, and sometimes

even to South Africa. Not infrequently, results do not become available for weeks (if at all) (Fig. 17). One such baby we encountered at Rundu State Hospital had the following features: coarse facial appearance, bilateral microphthalmia, clenched fists, overlapping fingers, and hexadactyly. He was later – after his death – diagnosed with trisomy 13 (Patau syndrome).

Fig. 17. Term infant with multiple congenital abnormalities, later diagnosed with trisomy 13 (the baby died at 6 weeks of life).

3.1.7 Visit by a team of the Namibian Broadcasting Corporation

As suggested by the Executive Director (ED) of the Ministry of Health and Social Services (MHSS), Dr. Ben Nangombe, a PR specialist and a team from the Namibian Broadcasting Corporation (NBC) visited Rundu State Hospital. Within a couple of hours, they produced a short report that was later broadcast on national TV (Fig. 18). The clip can still be accessed on YouTube.

Fig. 18. A team from the Namibian Broadcasting Corporation (NBC) portrayed the work of NEO FOR NAMIBIA – Helping Babies Survive in a short report (YouTube).

3.1.8 Statistics

During our 2-week-stay in Rundu, there were 46 admissions (an average of 3 admissions per day). Two babies died during the same time period: one baby with traditional medicine intoxication (rather unexpectedly after initial clinical improvement), and one very low birth weight infant (birth weight of 1200 g) following fulminant necrotizing enterocolitis and intraventricular hemorrhage.

In 2021, there had been 7'252 deliveries resulting in 7'213 live births and 126 stillbirths at Rundu State Hospital. The Cesarean section rate was 16.0 %. A total of 1004 infants were admitted to the Prem Unit (808 (80 %) inborn babies, 196 (20 %) outborn babies. 100 babies died (mortality rate 10.0 %). The mortality rate for inborn babies stabilized at 8.0 %, whereas the mortality rate for outborn babies remained more than twice as high (17.9 %).

Birthweight-specific mortality rates continued to improve even for the most immature babies (Fig. 19).

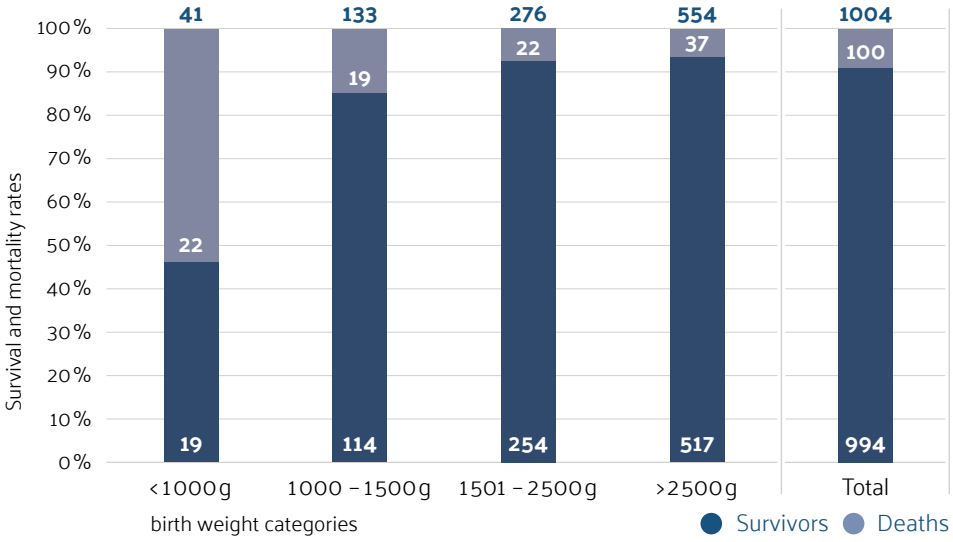


Fig. 19. Birthweight-specific mortality rates for the year 2021 at Rundu State Hospital.

3.2 Katima Hospital

3.2.1 Overall impression

This was our 6th visit of Katima Hospital. Under the guidance of Dr. Cristy Victor, the neonatal unit continued to evolve in a very positive way. Many of our suggestions had been followed and even become routine (Fig. 20, 21).

Fig. 20. The neonatal unit at Katima Hospital continued to evolve in a very positive way (left: Kangaroo Mother Care (KMC); right: use of open warming tables).

Fig. 21. The neonatal unit at Katima Hospital continued to evolve in a very positive way (left: use of CPAP; right: baby ready to be discharged).

Every day, Prof. Thomas M. Berger and Sabine Berger worked once again together with the local health care professionals. This allowed them to recognize several critical issues:

- Nurses were often too passive: they should take a more active role during work rounds, check on critically ill patients more regularly, respond to alarms reliably, and intensify teaching efforts for nursing students
- The provision of critical supplies (e.g., IVAC infusion pump sets) still could not been guaranteed
- Physician availability in cases of emergencies was highly variable: in part, this was due to high caseloads, however, it also appeared to depend on individual physician's willingness to readily respond to urgent calls from the delivery room or the neonatal unit

3.2.2 Portable X-ray unit

We were told that the only portable X-ray machine could no longer be used because the mechanism that holds the extension column in its proper position above the patient was malfunctioning. A new machine would cost more than NAD 1'000'000.00.

We assisted in taking several X-rays during our stay, wearing lead gowns for our own protection (Fig. 22). The image quality was excellent. We therefore suggested that a technician from the company representing Siemens in Namibia should examine the problem in more detail and send a quotation for repair rather than replacement.

Fig. 22. The mechanism that should hold the extension column of the mobile X-ray unit in its proper position above the patient was malfunctioning; the device could easily be stabilized manually.

3.2.3 Statistics

During our 6-day-stay in Katima, there were two deaths. One baby died in the early morning hours following a 2-hour-period of bag and mask ventilation by the night shift nurses; the baby had not been seen by the doctor on call. Dr. Victor certified the baby's death. Another baby very likely succumbed to multiple organ failure due to traditional medicine intoxication (TMI): the death was very sudden with asystole not responding to resuscitative efforts.

In 2021, there had been 4'711 deliveries resulting in 4'810 live births and 97 stillbirths at Katima Hospital. The Cesarean section rate was 5.1 %. A total of 343 infants were admitted to the neonatal unit, and 64 babies died (mortality rate 18.7 %). Analysis of birthweight-specific mortality rates showed poor survival chances for extremely low birth weight infants (20 %), and still high mortality rates for babies with a birth weight between 1000 – 1500 g (Fig. 23).

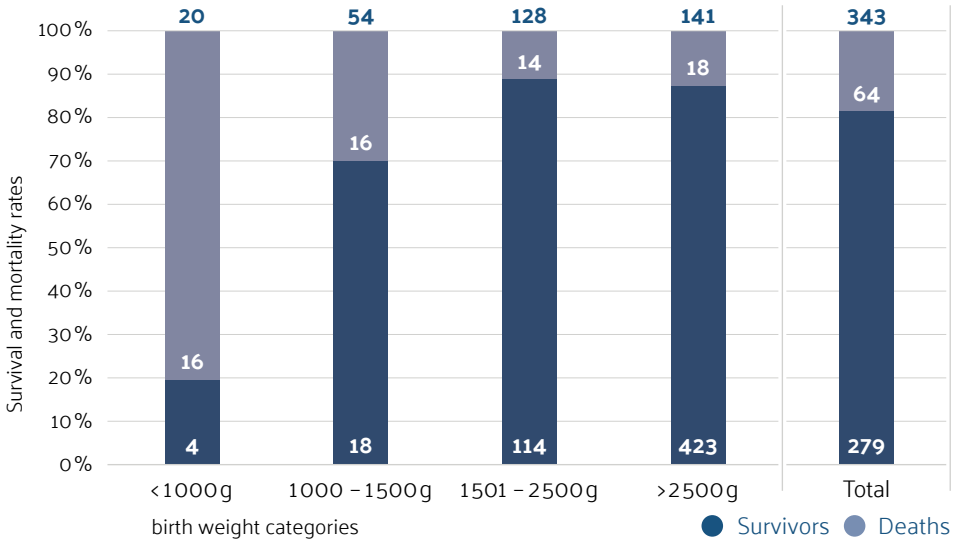


Fig. 23. Birthweight-specific mortality rates for the year 2021 at Katima Hospital.

3.2.4 Feed-back session

Before leaving Katima, we were able to provide feedback to the hospital leadership (Dr. Noel Siame, Mrs. Agnes Mwilima, Dr. Cristy Victor, two additional medical officers and two senior nurses).

It was emphasized that progress was clearly recognizable and, among other factors, mostly due to Dr. Victor's activities. Fluid and nutrition management, as well as recognition and treatment of hyperbilirubinemia had greatly improved. On the other hand, better adherence to the suggested CPAP strategies, to the principles of antibiotic stewardship and to improving infant positioning would still require more attention. The malfunctioning mobile X-ray machine and the lack of infusion pump sets for the IVAC infusion pumps were highlighted as critical deficiencies.

4. FUTURE DIRECTIONS

4.1 Mission 2022-2

The 15th mission of NEO FOR NAMIBIA – Helping Babies Survive will take place in August 2022. Prof. Berger will carry out that mission alone and visit both Rundu State Hospital and Katima Hospital.

4.2 Sustainability and scalability

After more than 5 years of support in Rundu and more than 2 years in Katima, it was gratifying to see that what had started as a pilot project in 2016, had since been proven to be effective and sustainable. This motivates NEO FOR NAMIBIA – Helping Babies Survive to continue and expand their efforts.

Comparison of the statistics from the two hospitals (Fig. 24) indicates that survival of babies cared for at Katima Hospital could be further improved with more sophisticated equipment: acquisition of CPAP machines with the ability to heat and humidify the inspired gas mixture, introduction of surfactant replacement therapy, and, at later time point, invasive mechanical ventilation.

Statistics 2021
Neonatal Unit - Katima Hospital

	Admissions	Deaths	Mortality rate
Total	**343**	**64**	**18.7%**

Note: no separate analyses of inborn and outborn infants

	Admissions	Deaths	Mortality rate
< 1000 g	20	16	80.0%%
1000 - 1500 g	54	16	29.6%
1501 - 2500 g	128	14	10.9%
> 2500 g	141	18	12.8%
Total	**343**	**64**	**18.7%**

Note: all deaths included (in local statistics, deaths of infants with a birthweight < 1000 g were recorded as "abortions"

Statistics 2021
Prem Unit - Rundu State Hospital

	Admissions	Deaths	Mortality rate
Inborn infants	808	65	8.0%
Outborn infants	196	35	17.9%
Total	**1004**	**100**	**10.0%**

	Admissions	Deaths	Mortality rate
< 1000 g	41	22	53.7%%
1000 - 1500 g	133	19	14.3%
1501 - 2500 g	276	22	8.0%
> 2500 g	554	37	6.7%
Total	**1004**	**100**	**10.0%**

Fig. 24. Comparison of mortality rates of infants admitted to Katima Hospital (left) and Rundu State Hospital (right).

In the future, other similarly structured hospitals in Namibia might benefit from the interventions of NEO FOR NAMIBIA – Helping Babies Survive. This would require increased funding and additional team members.

5. IMAGES FROM AFRICA

To conclude this report, we take the liberty to show some images of the wonderful people and the dramatic sceneries we have encountered (Fig. 24 – 28).

Fig. 25. Women carrying firewood to their villages: a little (motorized) help is very welcome!

Fig. 26. Women of all ages carry their heavy loads of firewood with amazing grace.

Fig. 27. Little kids in the villages: shy, yet curious.

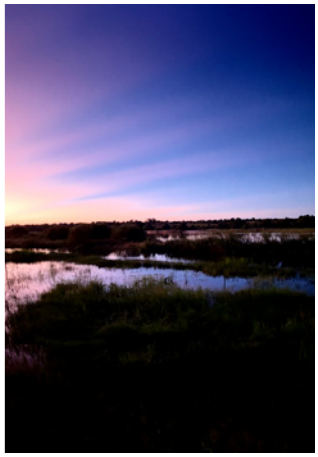


Fig. 28. At the end of the rainy season, the Kavango river is large, and Angola seems to have moved further away.

Fig. 29. Amazing scenery from the Victoria Falls (just a little over 200 km east of Katima).

Fig. 30. The western end of the Victoria Falls, as seen from the Zimbabwe side.

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