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MORBIDITY PATTERNS AND RISK FACTORS ASSOCIATED WITH NEONATAL MORTALITY IN ABS GENERAL HOSPITAL, YEMEN

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BACKGROUND AND AIMS

MSF-OCBA, alongside the Ministry of Public Health and Population (MoPHP), has been supporting Abs General Hospital (GH), including the neonatal unit (NNU), since 2015. Abs GH is the main referral facility functioning in western Hajjah Governorate, Yemen, with a catchment population of >1 million people. The NNU is a Level I facility (standard level of care): able to provide neonatal resuscitation at delivery and stabilize ill and premature neonates, but unable to provide support for mechanical ventilation or continuous positive airway pressure (CPAP). In 2021, the NNU had a reported capacity between 55 and 107 cots, distributed across seven wards based on the neonate's condition (stable/unstable, term/preterm) and admission source (Emergency Room (ER)/Maternity department).

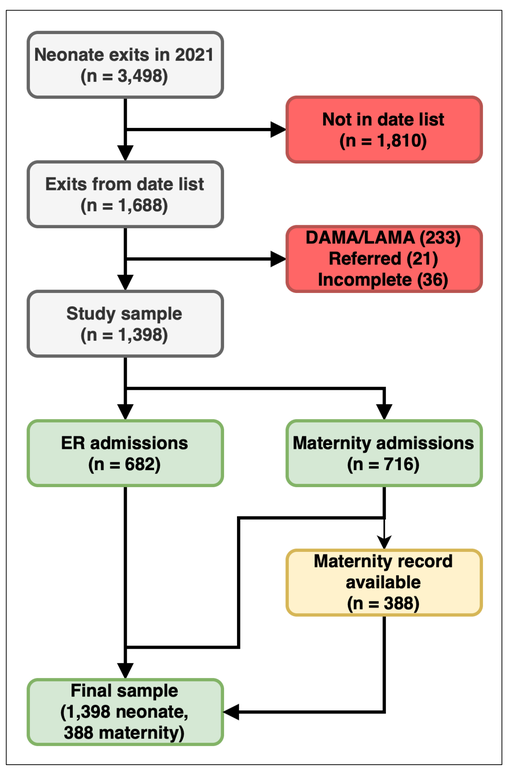
HMIS data from 2021 indicated that the average mortality rate was 24.2% – 6 percentage points higher than average mortality rates recorded in preceding years, since HMIS data was collected in 2017 – which has triggered efforts to understand factors associated with neonatal mortality at the hospital and its catchment communities.

The primary aim of this study is to assess the presence of maternal and neonatal risk factors and their associations with clinical outcomes. Secondary aims include describing the clinical characteristics of neonates hospitalized in the NNU of Abs GH, and providing recommendations for clinical management in Abs GH, MSF's operations in Abs GH and its catchment area, and continued advocacy.

METHOD

This was a facility-based retrospective study using clinical records of neonates admitted to the NNU and were discharged or died between 1 January and 31 December 2021 (the study period). Neonates who were "discharged or left against medical advice" (DAMA/LAMA) or "referred" to a different health facility were excluded from this study due to the inability to verify clinical outcomes.

A list of 180 random dates in 2021 was generated electronically. These dates were selected according to probability proportional to size (PPS) sampling (i.e., the list contained more dates from months with more eligible neonates). Records corresponding to these dates were selected for inclusion into the study sample; matching records of mothers of included neonates admitted from the Maternity department were also extracted (see flowchart).



Data was extracted from specific documents and transcribed into a structured data collection form, developed using REDCap. Data analysis included a descriptive analysis by admission source, and multivariate regression analysis to estimate odds ratios (OR) of the association between specific risk factors and clinical outcome (death) adjusting for confounding and exploring effect modification. A *p*-value of <0.05 was used to determine statistical significance in all tests.

RESULTS

A total of 1,398 neonate records were included in the final study sample: 48.8% were admitted from the ER, 51.2% were transferred directly from the Maternity department (388 Maternity records were found and included).

Neonates – demographics

- 57.4% neonates were males, 42.6% were females
- 56.4% were admitted within 24 hours of birth, and the average admission age was 3.8 days

Neonates – birth

- 78.9% were born at/post-term, 21.1% were preterm
- 61.4% were delivered at Abs GH (10.8% were discharged and then readmitted). 29.4% were delivered at home.
- 84.5% were delivered normally, 14.0% by C-Section, and 1.5% assisted by forceps/vacuum
- Admission weights were analysed in place of birth weights: 44.5% weighed <2,500 grams on admission. Mean admission weight: 2,439 grams

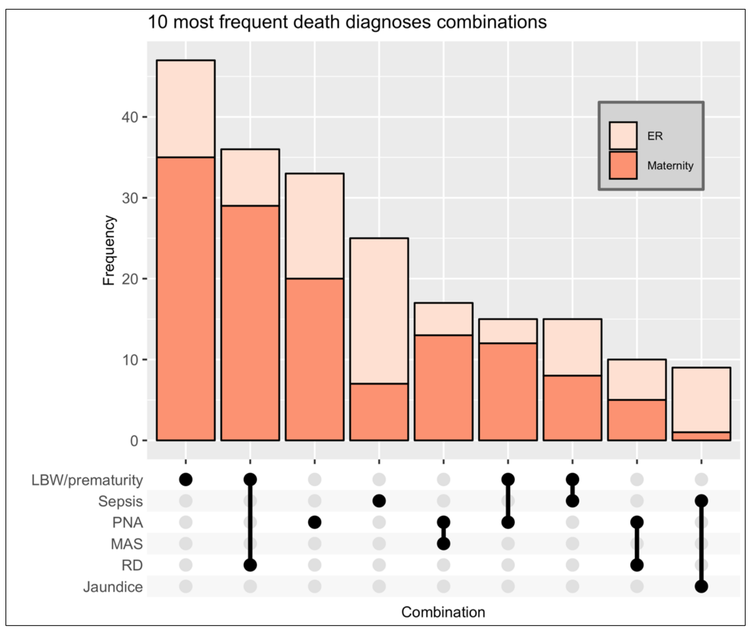
Neonates – admission

Primary (taken as the first-documented diagnosis) and secondary admission diagnoses were extracted and analysed:

- Sepsis was the most documented admission diagnosis, observed in 37.1% of records, the majority of which were among ER admissions
- Perinatal asphyxia (PNA) was the most common reason for admission among Maternity admissions (36.3%), followed by LBW/prematurity (26.5%), and asymptomatic neonates with risk factors (21.2%)

Neonates – hospitalization and outcome

- 70.4% of neonates were discharged, while 29.6% died during hospitalization
- The average length of stay (LoS) was 6.9 days
- Diagnoses on death were extracted; the 10 most frequent combinations are illustrated below:



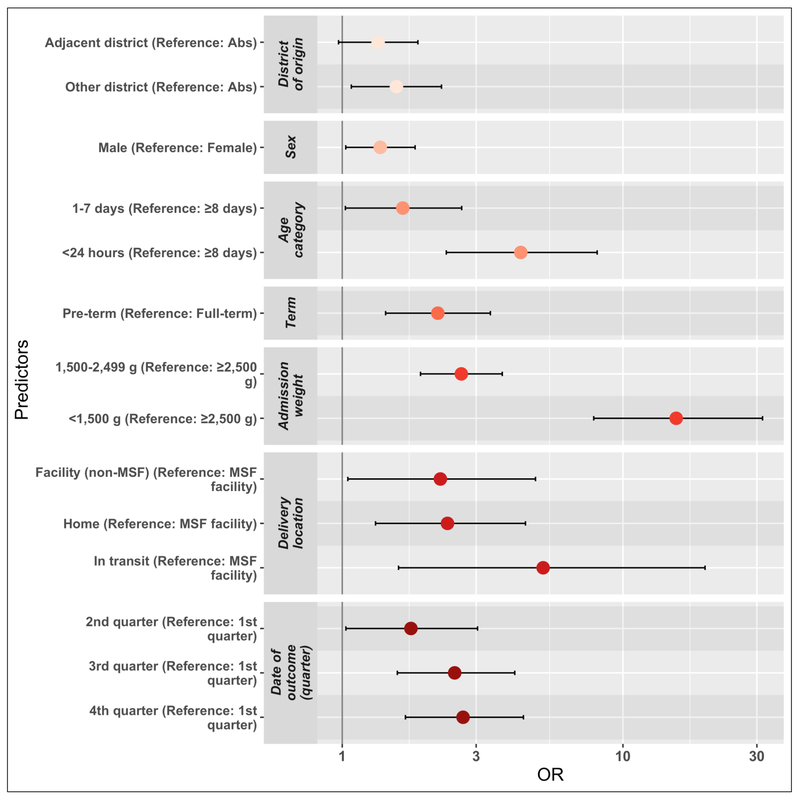
- Antibiotics were administered to 92.8% of neonates, all empirically prescribed. Ampicillin-Gentamicin were the "first-line" option among 94.8% of neonates that received ≥1 antibiotic. 29.4% proceeded to receive additional "second-line" antibiotics, with Cefotaxime being the most common choice.

Maternity – demographics and admission

- Mean age: 28.8 years
- 3.6% attended ANC
- 26.0% were referred from another facility/source to seek care at Abs GH
- Mid-upper arm circumference (MUAC): 54.9% <230 mm (malnutrition cut-off). Mean MUAC: 227.5 mm
- Haemoglobin (Hb): 51.0% <11.0 g/dL (anaemia cut-off). Mean Hb: 10.8 g/dL
- 93.3% of women arrived in labour; the remaining women presented with a complication or had already delivered enroute to Abs GH
- 71.1% had ≥1 pregnancy/labour-related complication

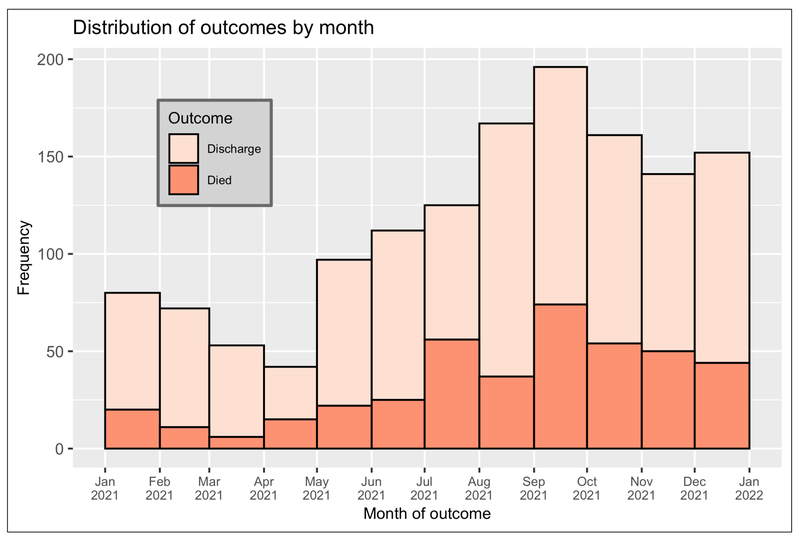
Regression analysis of risk factors

- Findings from the multivariate logistic regression analysis are summarised by (i) all neonates, and (ii) complete maternal-neonatal pairs.



i. Significant predictors include: geographical distance to Abs GH, being male, being <24 hours of age on admission, preterm birth, low weight on admission, delivery outside of Abs GH, and being hospitalized in latter parts of the year.

ii. Among maternal-neonatal pairs (not visualised here), neonates referred in for care at Abs GH and presence of pregnancy/labour-related complication were the most notable predictors.



- Of these various predictors, the date of outcome being a significant risk factor is striking. Demand for healthcare in Abs GH is typically higher from July to October, and the distribution of neonates in the sample mirrors this. The possibility that this abrupt doubling of bed capacity and patient volume – without a proportionate increase in human and material resources – may have contributed to poorer staff-to-patient ratio, compromised quality of care, increase in nosocomial infections, and ultimately mortality, warrants further examination.

CONCLUSION

Limitations include the reliance on clinical documentation of varying quality, attrition rate of maternity records, and the lack of capacity for confirming diagnoses like sepsis.

Overall, this study highlights the difficulties in delivering quality neonatal care in a context where access to basic health services, such as ANC, is severely impaired, and where almost no complementary community-based interventions are available. The seasonal peaks in demand imposes a severe strain on already-limited staff capacity and material resources of the NNU, which inadvertently impacts service delivery and by extension, neonatal survival.