Factors associated with mortality and neurodevelopmental impairment at 12 months in asphyxiated newborns: a retrospective cohort study in rural Tanzania from January 2019 to June 2022.

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Background Worldwide about 2.3 million newborns still die in the neonatal period and the majority occurs in low and middle-income countries (LMICs). Intrapartum-related events account for 24% of neonatal mortality. Of theseevents, intrapartum birth asphyxia with subsequent neonatal encephalopathy is the main cause of child disabilities in LMICs. Data on neurodevelopmental outcome and early risk factors are still missing in LMICs. This study aimed at investigating the factors associated with mortality, risk of neurodevelopmental impairment and adherence to follow-up among asphyxiated newborns in rural Tanzania.

Methods This retrospective observational cohort study investigated mortality, neurodevelopmental risk and adherence to follow-up among asphyxiated newborns who were admitted to Tosamaganga Hospital (Tanzania) from January 2019 to June 2022. Neurodevelopmental impairment was assessed using standardized Hammersmith neurologic examination. Admission criteria were Apgar score<7 at 5 min of life and birth weight>1500 g. Babies with clinically visible congenital malformations were excluded. Comparisons between groups were performed using the Mann-Whitney test, the Chi-square test, and the Fisher test.

Results Mortality was 19.1% (57/298 newborns) and was associated with outborn (p<0.0001), age at admission (p=0.02), lower Apgar score at 5 min (p=0.003), convulsions (p<0.0001) and intravenous fluids (IV) (p=0.003). Most patients (85.6%) were lost to follow-up after a median of 1 visit (IQR 0–2). Low adherence to follow-up was associated with female sex (p=0.005). The risk of neurodevelopmental impairment at the last visit was associated with longer travel time between household and hospital (p=0.03), female sex (p=0.04), convulsions (p=0.007), respiratory distress (p=0.01), administration of IV fluids (p=0.04), prolonged oxygen therapy (p=0.004), prolonged hospital stay (p=0.0007) and inappropriate growth during follow-up (p=0.0002).

Conclusions Our findings demonstrated that mortality among asphyxiated newborns in a rural hospital in Tanzania remains high. Additionally, distance from home to hospital and sex of the newborn correlated to higher risks of neurodevelopmental impairment. Educational interventions among the population about the importance of regular health assessment are needed to improve adherence to follow-up and for preventive purposes. Future studies should investigate the role of factors affecting the adherence to follow-up.

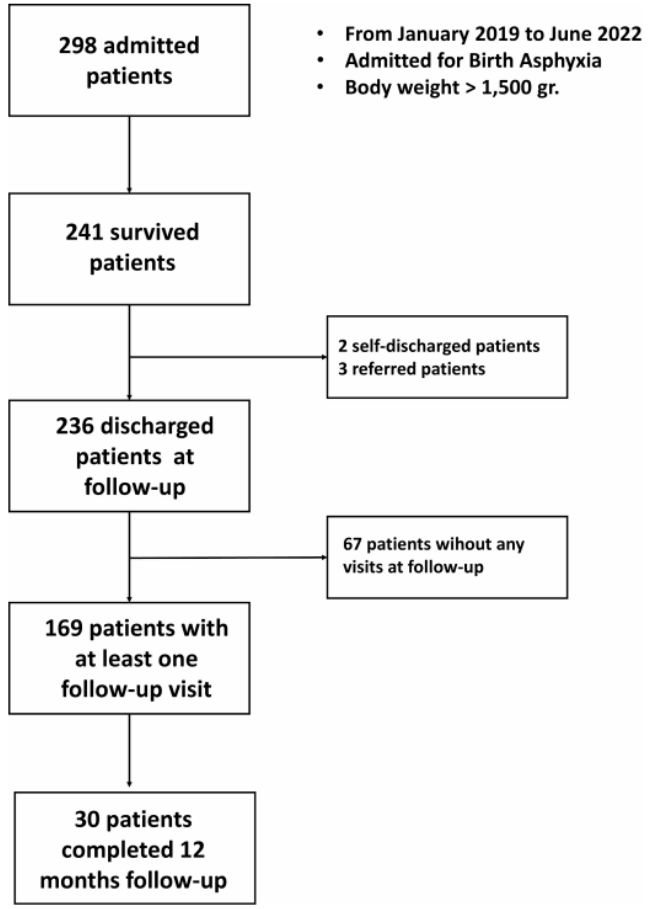

Table 1 Patient characteristics in the whole sample and stratified by mortality outcome

	All patients (*n* = 298)	Discharged/transferred (*n* = 241)	Deceased (*n* = 57)	*p*-value
Delivery: Spontaneous vaginal Assisted vaginal C-section	124/275 (45.1%) 44/275 (16.0%) 107/275 (38.9%)	105/223 (47.1%) 33/223 (14.8%) 85/223 (38.1%)	19/52 (36.5%) 11/52 (21.2%) 22/52 (42.3%)	0.32
Outborn	17/297 (5.7%)	7/240 (2.9%)	10 (17.5%)	< 0.0001
Age at admission, days	1 (1–1)	1 (1–1)	1 (1–2)	0.02
Males	179/297 (60.3%)	143/240 (59.6%)	36 (63.2%)	0.73
Twins	8 (2.7%)	8 (3.3%)	0 (0.0%)	0.36
Apgar score at 5 min	5 (4–6)	5 (4–6)	5 (3–5)	0.003
Birth weight, gr	2995 (1670–3290)	3000 (2660–3300)	2950 (2670–3270)	0.75
Temperature at admission, °C	35.4 (34.7–36.0)	35.4 (34.7–36.0)	35.3 (34.7–36.2)	0.87
Convulsions	96 (32.2%)	64 (26.6%)	32 (56.1%)	< 0.0001
Meconium-stained amniotic fluid (not available in 2019)	89/187 (47.6%)	74/151 (49.0%)	25/36 (41.7%)	0.54
IV fluids	192 (64.4%)	145 (60.2%)	47 (82.5%)	0.003
Antibiotic therapy	283 (95.0%)	228 (94.6%)	55 (96.5%)	0.74
Respiratory distress	202 (67.8%)	160 (66.4%)	42 (73.7%)	0.35
Oxygen therapy, days	2 (1–5)	2 (1–7)	2 (1–3)	0.87

Data summarized as n/N (%) or median (IQR)

Table 3 Factors associated with adherence to follow-up

	Discharged patients:		
	Closed patients* (*n* = 30)	Defaulted patients** (*n* = 202)	*p*-value
Distance between household and hospital, km	22 (14–36)	35 (20–54)	0.07
Distance between household and hospital, min	34 (20–53)	46 (30–69)	0.07
Males	20 (66.7%)	76/201 (37.8%)	0.005
Birth weight < 2500 gr	6 (16.7%)	32 (15.8%)	0.99

Data summarised as n (%) or median (IQR)

*Closed = patients who completed 12 months' follow-up

** Defaulted = patients lost to follow-up

Table 2 Factors associated with the risk of neurodevelopmental impairment at the last visit

	Patients without neurodevelopmental risk at the last visit (*n* = 122)	Patients with neurodevelopmental risk at the last visit (*n* = 45)	*p*-value
Distance between household and hospital, km	29 (12–40)	35 (20–52)	0.07
Travel time between household and hospital, min	41 (20–55)	46 (31–72)	0.03
Delivery: Spontaneous vaginal Assisted vaginal C-section	48/112 (42.9%) 20/112 (17.8%) 44/112 (39.3%)	26 (57.8%) 3 (6.7%) 16 (35.5%)	0.11
Outborn	3/121 (2.5%)	3 (6.7%)	0.35
Age at admission, days	1 (1–1)	1 (1–1)	0.82
Males	69/121 (43.0%)	11 (24.4%)	0.04
Twins	5 (4.1%)	0 (0.0%)	0.33
Apgar score at 5 min	5 (4–6)	5 (4–6)	0.24
Birth weight, gr	2995 (2662–3308)	3100 (2730–3300)	0.47
Body temperature at admission, °C	35.4 (34.7–36.0)	35.3 (34.8–35.9)	0.85
Convulsions	29 (23.8%)	21 (46.7%)	0.007
Meconium (not available in 2019)	37/82 (45.1%)	16/28 (57.1%)	0.38
IV fluids	70 (57.4%)	34 (75.6%)	0.04
Antibiotic therapy	117 (95.9%)	42 (93.3%)	0.78
Respiratory distress	80 (65.6%)	39 (86.7%)	0.01
Oxygen therapy, days	2 (1–6)	5 (2–13)	0.004
Length of hospital stay, days	8 (7–11)	12 (8–17)	0.0007
Inappropriate growth	35 (28.7%)	28 (62.2%)	0.0002

Data summarised as n (%) or median (IQR)

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