



## **Epidemiology, Clinical Presentation and Outcome of Neonatal Convulsion at Tobruck Medical Center - Libya**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

Neonatal seizures are the most prominent feature of neurological dysfunction during neonatal period. Seizures in the neonatal population often present differently than in other age groups due to brain immaturity. However, in neonates there may be no clinical movement abnormality either because the seizures are subclinical or because they cannot be noticed. This study aimed to determine the natural history, the time of onset, the etiological factors, the clinical types, the treatment, and the short-term outcomes of neonatal convulsion. This cross sectional descriptive study was conducted in The Neonatal Intensive Care Unit at Tobruck Medical Centre from the 1st of January 2017 to the end of January 2018. During this, 642 neonates were admitted to NICU, out of which 27 had seizures. 17 (62.7%) of the babies were males and 10 (37%) were females. All of them were Libyans; 70.3% were from Tobruck city.

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## 1. INTRODUCTION

A seizure or convulsion is a paroxysmal, time-restrained alternate in motor interest and/or conduct that are consequences of bizarre electric pastime in the neonatal brain. Seizures by definition occur in the first 4 weeks of life in a complete-time neonatal period and as much as forty four weeks from idea for premature infants. They are common in the course of the first days of life [1].

Seizures during the neonatal period are a considerable problem, not only because they are symptoms of neurologic or metabolic disorder, but also because there is a strong association between them and permanent handicaps in the survivors. The neonatal brain is susceptible to permanent damage as a consequence of the seizures (Wasterlain CG., 1979).

Seizures are more usual among neonates than in other age groups, and they influence about 1% of all neonates, with greater frequency in untimely or low birthweight newborns compared to term babies. In the neonatal extensive care gadgets, the prevalence is going as excessive as 10-25% out of which approximately 15% will die and 35-40% could have principal neurological squeal [2].

Most of neonatal seizures remain complicated, mainly when clinicians depend best on clinical criteria. The medical manifestations of seizures in new-born vary from those visible features in older children and adults. The trouble is in electro-clinical dissociation, in which there's no temporal correspondence between electric paroxysms and repetitive stereotyped motor phenomena. There are few records that clinicians can base rational decisions about the appropriate remedies. Such remedies, unfortunately, are usually useless and cannot adjust neurodevelopmental results.

Seizures in a new-born are one of the few neonatal neurological emergencies wherein set off prognosis, investigation and treatment are vital; as, behind schedule popularity of a treatable motive will have a sizeable effect on child's subsequent neurological results

Seizures represent the mind's final common response to insult. The preliminary damage may be quick; however, membrane harm releases

excitotoxic substances such as glutamate, which cause similarly epileptic interest. Magnetic resonance imaging of the brain has shown markedly decreased myelination in youngsters who had suffered from neonatal convulsions [3].

## 2. MATERIALS AND METHODS

This comparative study was conducted in Neonatal Department at Tobruck Medical Centre from 1st of January 2017 up to the end of January 2018. The study population consisted of neonates admitted to The Neonatal Intensive Care Unit (NICU). During study period, all neonates developing clinically identifiable seizures before 28 days of life were enrolled in the study.

Personal information and a detailed history of all mothers including gender, nationality residence, gestational age, age at onset, mode of delivery, and obstetrical and antenatal history of maternal diseases were recorded.

All newborns' weight, and head circumference were recorded. The etiology of neonatal seizures were identified from imaging techniques such as ultrasound results as well as from the initial relevant investigations which included blood glucose levels, serum calcium, serum electrolytes, and cerebrospinal fluid examination for evidence of infection. Treatments received, as well as causes of deaths were also included within the records.

Seizure type was diagnosed by clinical observations made by the authors and the resident doctors. The etiology was based on laboratory findings, and /or imaging studies of the brain (ultrasonography, CT scan). The criteria for diagnosing various biochemical disorders were as follows: hypocalcaemia ( $Ca^{++}<7.0$  mg/dl), hypomagnesaemia ( $Mg^{++}<1.5$  mg/dl) hypernatremia ( $Na^{+}<135$  mEq/L). Hypoglycemia was diagnosed if blood glucose levels were less than 45 mg/dl in term infants, and less than 40 mg/dl in preterm infants. CSF examination was considered abnormal when there were elevated CSF leukocytes, low CSF sugar, elevated CSF protein and/or positive culture [4,5]. Other non-seizures movements were differentiated from seizures and excluded; exclusion criteria included those with jitteriness or sleep-related muscular activities.

Limitations: There were limitations in some diagnostic investigations in the hospital like investigations for IEM (Inborn Error of Metabolism) as well as, MRI (Magnetic Resonance Imaging) and Arterial Blood Gases (ABG).

### 3. RESULTS

Among the 642 neonates admitted to the neonatal care unit, during the study period, 27 (2.3% neonates (term and preterm) developed clinically identifiable seizures and were found eligible for the study.

Male gender dominated the admissions with (62.7%) giving male to female ratio 1.7:1 as showed in Table 1. According to maternal disease 3 babies out of the 27 delivered to

mothers with chronic diseases: Two with maternal hypertension and preeclampsia, and one with gestational diabetes mellitus.

Out of the 27 babies, 23 (85%) had normal birth weight of the rest three babies (11.1%) were LBW (<2.5 kg) and one baby (3.7%) was large for gestational age (>4.5 kg).

Regarding head circumference the vast majority of the babies 22 (81.4%) lay within normal range whereas 4 babies (14.8%) were less than 33 cm, among these 4 babies 3 were preterm ones. On the other hand, 1 baby (3.7%) was above 37 cm.

Regarding causes of fits, birth asphyxia was considered as a leading cause of convulsions 23 babies (85.1%); 9 of them had an isolated asphyxia. The other 14 babies had additional

**Table 1. Demographic data of newborns**

		Number	%
Onset of seizure	Early onset 1st 72 hrs	25	92.5%
	Late onset>72 hrs	2	7.4%
Gestational age	Term	24	88.8 %
	Preterm	3	11.1 %
Gender	Male	17	62.7 %
	Female	10	37 %
Nationality	Libyan	27	100%
Residence	Tobruck	19	70.3%
	Periphery	8	29.6%
Place and transfer	Delivery room	22	81.4%
	Private clinic	5	18.5%

**Table 2. Mode of delivery and resuscitation**

	Number	%
NVD	12	44.4%
CS	51	55.5 %
Need resuscitation	17	62.9%

**Table 3. Time of onset of seizure in studied newborn**

Day of onset	Number	%
First day	17	62.9%
Second day	5	18.5 %
Third day	3	11.1%
More	2	7.4%

**Table 4. Type of seizure**

Type of seizure	Number	%
Tonic and clonic	20	74%
Subtle	7	25.9 %
Total	27	100%

**Table 5. Data of laboratory and Imaging**

		Number	%
CSF	Done	18	66.6%
	Not Done	9	33.3 %
USG	Done	22	81.4%
	Not Done	5	18.5%
Ca	Low	9	33.3 %
	Normal	18	66.6%
Bl. Sugar	Hypoglycemia	2	7.4 %
	Normal	25	92.5 %
Na	Low	5	18.5%
	Normal	22	81.4%

**Table 6. Distribution of babies according to imaging**

Type of imaging	No.
Brain USG	22/27
CT Scan	2/22
EEG	1/22
MRI	0

**Table 7. Distribution of babies according to place of transfer (n = 27)**

Place of transfer	Tobruck		Outside tobruck	
	NO.	%	NO.	%
Direct from home	16	84.2%	6	75%
Private clinic	3	15.7%	2	25%
Total	19	100%	8	100%

problems: 9 babies had hypocalcaemia, 5 babies had electrolyte disturbances, and 2 babies had hypoglycaemia. In addition, it was noticed that there were some infections namely sepsis within 2 babies (7.4%) and meningitis within 1 baby (3.7%).

The commonest biochemical abnormality demonstrated in our study was hypocalcaemia 9 babies (33.3%), then electrolyte disturbance 5 babies (18.5%), hypomagnesaemia 2 (7.4) babies, and hypoglycemia 2 babies (7.4%) where one of them was an IDM.

Inborn error of metabolism was in the form of maple syrup urine disease in 1 baby (3.7%) Intracranial hemorrhage (IVH) was established in 3 babies (11.1%); two of them were preterm. 3 babies (11.1%) were diagnosed of CNS structural defects: one hydrocephalus, one meningocele and one holoprosencephaly.

All babies received one or more types of treatment during their admission. 26 babies (96.2% received intravenous Phenytoin as first line of treatment where as 19 babies (70.3%)

received oral phenobarbitone. Dextrose 10% was empirically given to most of the babies, and calcium gluconate was given to 9 babies (33.3%); 3 resistant cases for treatment received Pyridoxine (11%). 6 babies (22.2%) discharged on one anticonvulsant drug).

### 3.1 Correlation between Main Causes and the Outcome

Prognosis was poor in babies with IEM 1/1 died followed by CNS structural defects 3/3 died and ICH 2/3 died. Babies with birth asphyxia 5/23 (21.7%) of them died. There is a significance association between main causes of neonatal convulsions and the outcome with  $p = 0.025$ . (Chi-Square Tests:  $\chi^2 = 31.652$ ,  $df = 20$ ,  $p = .025$ ).

## 4. DISCUSSION

It is well known that seizures are of greater commonplace within the neonatal length than any other stage of existence. Its prevalence, as reported by various research, varied from 0.1 - 0.5% in time period neonates and from 10 - 22% in preterm neonates [6-8] reported a higher

**Table 8. Out come**

	Number	%
Discharged without treatment	8	%29.6
Discharged with treatment	6	22.2%
Died	11	40.7 %
Transferred	2	7.4%

**Table 9. Correlation between babies' sex and the outcome**

Outcome	Sex				Total	P-value
	Male		Female			
	No.	%	No.	%		
Discharged without treatment	5		3		8	0.113
Discharged with treatment	4		2		6	
Died	0		11		11	
Transferred	1		1		2	

Chi-Square Tests:  $\chi^2 = 1.551$ ,  $df = 20$ ,  $p = 0.113$

**Table 10. Correlation between gestational age and the outcome**

Outcome	GA		Total	P-value
	Term	Preterm		
	No.	No.		
Discharged	2	12	14	0.534
Died	1	10	11	
Transferred	0	2	2	

Chi-Square Tests:  $\chi^2 = 3.651$ ,  $df = 4$ ,  $p = 0.534$

**Table 11. Correlation between mode of delivery and the outcome**

Outcome	Mode of delivery		Total	P-value
	NVD	C/S		
	No.	No.		
Discharged	7	7	14	0.695
Died	6	5	11	
Transferred	2	0	2	

Chi-Square Tests:  $\chi^2 = 2.641$ ,  $df = 4$ ,  $p = 0.695$

**Table 12. Correlation between time of onset and the outcome**

Outcome	Time of onset				Total	P-value
	1st 24 Hrs	>24-48 Hrs	>48-72 Hrs	>72 Hrs		
	No	No	No	No		
Discharged	9	1	2	2	14	.4550
Died	6	4	1	0	11	
Transferred	2	0	0	0	2	
Total	17	5	3	2		

Chi-Square Tests:  $\chi^2 = 3.651$ ,  $df = 4$ ,  $p = 0.455$

incidence figure with 3.9% which is almost similar to the one mentioned by Mosley M [8]. Which is 3.4%. Our examination shows that out of 642 neonates admitted during the examination duration 27 have been found with exclusive clinical troubles, (time period and preterm) neonates advanced seizures; this number gives

an incidence of 2.3%. There is also a consistence male predominance of all kinds of seizures. This occurrence of seizures in adult males is described in many previous studies such as Mary Jo Lanska, Douglas J. Lanska et al. [9], Anand et al. [10], Alcover-Bloch E, Campistol J et al. [11], Sabzehei M. et al. [12].

They mentioned that neonatal seizures are better known in males. In the current study, male subjects are dominant; they constitute 62.7%. Concerning the subjects from Tobruck, the ratio of males to females' is 1.7:1.19 respectively. 81.4% of the whole babies were admitted immediately from transport whereas the other 18.5% of the infants were transferred from other hospitals. Most of the neonates 24 (88.8%) who developed seizures, in our take a look at, were complete term ones. Males and full term dominance results are similar to previous ones reported by Yaser S. Abd. [13] and Al. Marzoki. M. Jasim [14]. They concluded that full term babies were affected more than those who were preterm: 93.1%, 95.4% respectively and the majority of them have been males. Prevalence of fits during the first week of life and during the first seventy two hours were reported by other researchers such as Najeeb S, Qureshi AM et al. [15] and Malik BA, Butt MA, et al. [16]. Most of neonatal seizures passed off in 1st day or at time of delivery even as in second and third days were 29.6% infants, and > 3 - 7 days were 7.4% neonates. This was explained by using birth asphyxia as a main motive of fits, which appeared to be the strongest predictors of early onset seizure.

However, in a study by Kumar Ashok [17] it was found that within most neonatal seizures of late onset, metabolic abnormalities was the most common dominant factor contributing to neonatal seizures. Najeeb S, Qureshi AM et al. [15] mentioned that mode of transport in 67% of babies with seizures was vaginal shipping and in 17% by cesarean segment and assisted in 17%. In our examination, vaginal deliveries were conducted in 12 (44.4%) whereas cesarean sections were executed to 15 (55.5%) mothers. Al. Yasiri. A. Adeebah [7] reported comparable determine to us: in 66% normal deliveries and 34% c/s.

Out of the 27 neonates in our study, 23 (85%) had everyday beginning weight, 3 infants (11.1%) were LBW, and only 1 baby (3.7%) was large for gestational age (> 4. five kg). The head circumference of 22 neonates (81. four %) lay in normal range and of 4 babies (14.8%) was less than 33cm. The above effects are similar to Al. Yasiri. A. Adeebah [7] where 87% of babies birth weight was above 2500 gm with mean of 3148 + 717 and 12% was under 2500 gm. However, this was barely first rate than that found by Najeeb S, Qureshi AM et al. [15].

They announced lower birth weight; out of 100 neonates with seizures, 35% of them had LBW with mean 2.56 + 0.57 kg.

Sambhaji S et al. [18] found that the most common type of seizure was subtle 40.1% followed by clonic 24.2%. Najeeb S, Qureshi AM, et al. [15] described tonic clonic seizure 28% as widespread accompanied through multi focal clonic, and focal tonic seizures (25% every), diffused 21%, focal clonic 20%, myoclonic and focal tonic three% each. Our results show that 20 infants (74%) had tonic-clonic convulsion and diffused in 7 babies (25.9%) and tonic 11 infants (7%).

In a study by Lopes A, Vilan A et al. [19] anomalies within the cranial ultrasound were correlated with clinical evolution, and still the primary line exam in the initial method to underlying pathology. We have executed cranial ultrasound in 22 infants (81.4%) in step with clinical assessment and development of the disease; different neuroimaging (CT) have been performed to 2/22; they have reviled three neonates with ICH. This goes with Lopes A Vilan A et al. [19] study where cranial ultrasound performed in 86.8%. However in Alcover Bloch E, Campistol J et al. [20] head ultrasound was odd in forty four/seventy seven of newborns ct test and/or mri were unusual in 31/77 new child.

Beginning asphyxia is the most common reason for neonatal seizures found globally [21]. It is considered the predominant etiology in both premature and full term neonates, occurring in the first 72 hours of life [22]. Our findings are in settlement with that, with predominance in full time period babies. They also show that delivery asphyxia was the main reason of convulsions in 23 infants (85%), nine of them were an isolated asphyxia and the remaining 14 neonates had extra issues which coexisted with birth asphyxia such as hypocalcaemia (33%), the electrolyte disturbances, hypoglycaemia, hypomagnesaemia, hyponatremia (15.8%).

Contamination, ICH and CNS structural defects (11%). These findings are similar to a study by Najeeb S, Qureshi AM et al. [15] where 46% of the neonates were with birth asphyxia.

Hypoglycemia, hypocalcaemia, and hypo/hyponatremia are crucial biochemical abnormalities causing neonatal seizures with hypocalcaemia as the main biochemical abnormalities [6]. This goes with our commentary in which an expansion of biochemical

abnormalities was verified in our infants as a number one cause of seizures. It included hypocalcaemia in 9 (33.3%), electrolyte disturbances 5 neonates (15.8%), hypoglycemia in 2 (7.4%) and 2 babies (7.4%) with hypomagnesaemia.

Another crucial etiological elements of neonatal seizure encompassed intracranial haemorrhage; its occurrence ranged from 6% [23] to 6.9% [14]. However, in Bushra AM, Butt MA, et al. [24], and Alcover et al. [20] found with a higher rate 9.5% and 13% respectively where the majority of these babies were less than 36 weeks. In contrast to previous studies, we had only 3 babies (11%) with ICH.

Treatment for neonatal seizures includes specific remedy for the underlying cause and the use of antiepileptic capsules. Antiepileptic drugs are used to forestall all electrographic seizure pastimes. The remedy needs to be tailored to the particular situation Wong Michael [25]. In Alcover-Bloch E, Campistol J. et al. [20], phenobarbital was the preliminary remedy in 81.8%, and 55.7% needed the remedy at discharge. In the current study, we used phenytoin as the first line of remedy in (96%) accompanied via oral phenobarbitone (70%). Because IV is not available in our clinic, pyridoxine is used for 11% of the patients. 22.2% of the babies discharged on anticonvulsant therapy whilst 29.6% of them recovered and discharged home without extra therapy. Unfortunately, 40.7% of the neonates died.

This is comparable to the findings reported by Sahana et al. G. Sahana, B. Anjaiah [26] and Al. Yasiri. A. Adeebah [7] in which respectively, 49.54%, 56.6% neonates recovered without any remedies where as 32.11%, 26.2% of the neonates recovered with remedies and unfortunately, 18.35%-17.2%, of the neonates died.

There was no obvious connection between the results and gender, early or past due onset of neonatal convulsion, gestational age, or vaginally or with the aid of c/s delivery [27]. Statistical evaluation confirmed an important affiliation among foremost reasons of neonatal convulsions and the final results with  $p = 0.025$ .

## 5. CONCLUSIONS

- Most of the neonates who had seizures were males and were full time period.

- The most common etiology of seizure was beginning asphyxia.
- Hypocalcaemia was the maximum commonplace biochemical abnormality observed by using hyponatremia.
- Tonic and clonic seizure represented the commonest sort of seizure.
- Phenytoin through oral phenobarbitone was the most prescribed anticonvulsant.
- Inborn errors of metabolism, cans structural defects and ICH constituted the highest mortality rate.
- There is a good sized affiliation between foremost reasons of neonatal convulsions and the final results with  $p = 0.025$ .

## 6. RECOMMENDATIONS

We propose the development of antenatal offerings and obstetrical care with ordinary Monitoring of fetal coronary heart rate to ensure secure transport and suitable neonatal resuscitation to avoid birth asphyxia. We also propose the development of the laboratory offerings and supplying it with extra advanced techniques for discovering and diagnosing inborn errors of metabolism. More research needs to be conducted about a large sample that includes a large scale of other hospitals.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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