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*Journal homepage: medlabtechojournal.com***Ophthalmological Findings in Paediatric Non-Traumatic Coma in Enugu State University Teaching Hospital, Parklane, Enugu, Nigeria****Ikenna Kingsley Ndu¹, Ifeoma N Asimadu², *Benedict Onyeka Edelu³, Obinna Chukwuebuka Nduagubam¹, Ogechukwu F Amadi¹, Isaac Nwabueze Asinobi¹, Uchenna Ekwochi¹**¹Department of Paediatrics, Enugu State University Teaching Hospital, Enugu, Nigeria.²Department of Ophthalmology, Enugu State University Teaching Hospital, Enugu, Nigeria. ³Department of Paediatrics, University of Nigeria teaching Hospital, Enugu, Nigeria. *E-mail: onyedelu@yahoo.com

Abstract: The ophthalmological examination is a vital aspect of the central nervous system examination in comatose children. Several authors have documented different findings with disparities in their recommendations about making ophthalmological examination a routine in the management of the unconscious child. This study sought to evaluate the relevance of routine ophthalmological examination in the management of unconscious children admitted into the paediatric emergency room of Enugu State University Teaching Hospital, Parklane, Enugu, Nigeria. This was a prospective longitudinal study conducted from April 2018 to March 2019. Unconscious patients whose caregivers gave consent were recruited into the study. Traumatic causes of coma were excluded. Demographic features of the patients were obtained. The ophthalmologic examination and diagnoses were made by an ophthalmologist, while the emergency room pediatrician made clinical assessment and diagnoses. Sixteen unconscious children had ophthalmologic examinations done. The Glasgow coma scale scores ranged from 3 to 11, with a mean of 6.6 ± 2.2 . Thirteen (81.3%) of the children were classified as severe unconsciousness while the rest were moderate. The degree of unconsciousness was significantly associated with the outcome ($\chi^2 = 16.0$, $P = 0.03$). A total of six (37.5%) ophthalmologic diagnoses were made, which included cerebral malaria, degenerative myopia, orbital cellulitis, and exposure keratopathy. The presence of an abnormal ophthalmologic finding was not significantly associated with outcome ($\chi^2 = 0.36$, $P = 0.55$). Routine ophthalmologic examination may not be justified as a management protocol in unconscious children but may be considered in selected cases.

Keywords: ophthalmological; non-traumatic; coma, paediatric; Nigeria

INTRODUCTION

Critical illness is a life-threatening multisystem process that can result in significant morbidity or mortality. Often depressed consciousness is one of its early warning signs^{1,2}. Ophthalmological examination is a vital aspect of the central nervous system examination more so in the critically ill³. Abnormal ophthalmological findings have been documented commonly in traumatic and non-traumatic coma in children. Purtscher as early as 1910 described retinal lesions associated with head injuries⁴. Others have reported

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subconjunctival hemorrhage, traumatic hyphaema, traumatic cataract, periorbital ecchymosis and various degrees of retinal hemorrhage⁵⁻⁸. Interestingly, several authors have reported diverse ocular findings in non-traumatic clinical conditions in children including periorbital hematoma, retinal hemorrhages, subconjunctival hemorrhage, subluxated or dislocated lens, cataracts, glaucoma, anterior chamber angle regression, and papilloedema⁹⁻¹². This result may seem to suggest the need for routine ophthalmological examinations in critically ill children. However, in a study of ophthalmological findings in children with encephalitis by Hellgren et al.¹², only 3 of 36 children were found to have ophthalmological abnormalities due to encephalitis and they all improved with time. They suggested that ophthalmological consultation does not seem to fit into a routine screening program for childhood encephalitis.

Several authors⁵⁻¹² have documented different findings with disparities in their recommendations about making ophthalmological examination a routine in the unconscious children. This study, therefore, sought to evaluate the relevance of routine ophthalmological examination in the management of the unconscious children admitted into the pediatric emergency room of Enugu State University Teaching Hospital, Parklane, Enugu, Nigeria.

MATERIALS AND METHODS

This was a prospective longitudinal study conducted at the Children's Emergency Room of Enugu State University Teaching Hospital, Parklane, Enugu, Nigeria, from April 2018 to March 2019. Unconscious patients whose caregivers gave consent were recruited into the study. Traumatic causes of coma were excluded. Data was collected with questionnaires designed for the study. Demographic features of the patients were obtained. Other information that were retrieved included the presenting complaints, the relevant physical examination findings, laboratory results, the ophthalmologic examination findings, and both the clinical and ophthalmologic diagnoses. The ophthalmologic examination and diagnoses were done by an ophthalmologist, while the emergency room pediatrician made clinical assessment and diagnosis. Data was analyzed with the Statistical Package for Social Sciences (SPSS) version 19 (Chicago IL). Chi-square was used to test the association between the degree of unconsciousness, abnormal ophthalmologic findings, and outcome. A p-value of 0.05 was regarded as significant. Ethical approval obtained from the Ethics and Research Committee of the ESUTH, Parklane, Enugu, Nigeria.

RESULT AND DISCUSSION

A total of 1,236 children were admitted over the one year period of the study, of which 58 (4.7%) presented with loss of consciousness. Sixteen (27.6%) caregivers gave consent for ophthalmologic examination. There were nine males, giving a male to female ratio of 1.3:1. Their ages ranged between 3 to 192 months with a mean age of 31.9 ± 50.4 . In addition to the loss of consciousness, other presenting complaints are listed in table 1.

The Glasgow coma scale scores ranged from 3 to 11, with a mean of 6.6 ± 2.2 . Thirteen of the children were classified as severe unconsciousness while the rest were moderate. The degree of unconsciousness was significantly associated with the outcome ($\chi^2 = 16.0$, $P = 0.03$). Other examination findings and results of laboratory investigations are shown in table 2.

Table 1: Additional Presenting Symptoms and Clinical Diagnoses in The Unconscious Children

Symptom	Frequency (%)	Clinical Diagnosis	Frequency (%)
Fever	14 (87.5)	Severe malaria	4 (25.0)
Convulsion	14 (87.5)	Meningitis	3 (18.8)
Vomiting	8 (50.0)	Sepsis	11 (68.8)
Diarrhea	7 (43.8)	Encephalitis	1 (6.3)
Cough	7 (43.8)		
Headache	2 (12.5)		
Abdominal distension	2 (12.5)		
Dyspnea	1 (6.25)		
Hematuria	1 (6.25)		

Table 2: Association Between GCS and Outcome

GCS*	OUTCOME		
	Discharged	Died	Total
3 – 4	0	3 (100.0%)	3 (100.0%)
5 – 6	3 (75.0%)	1 (25.0%)	4 (100.0%)
7 – 8	6 (100.0%)	0	6 (100.0%)
9 – 10	2 (100.0%)	0	2 (100.0%)
≥11	1 (100.0%)	0	1 (100.0%)
Total	12 (75.0%)		

*Glasgow Coma Score $\chi^2=16.0$, P = 0.03

Table 3: Association Between Ophthalmologic Finding and Outcome

Ophthalmologic Finding	Outcome		
	Discharged	Died	Total
Normal	7 (70.0%)	3 (30.0%)	10 (100.0%)
Abnormal	5 (83.3%)	1 (16.7%)	6 (100.0%)
Total	12 (75.0%)	4 (25.0%)	16 (100.0%)

$\chi^2=0.36$, P = 0.55

The clinical diagnoses made in the children included malaria, meningitis, encephalitis, and sepsis, as shown in table 1. There was associated hypoglycemia in four (25%) of the cases. A total of six (37.5%) ophthalmologic diagnoses were made, which included cerebral malaria, degenerative myopia, orbital cellulitis, and exposure keratopathy. The presence of an abnormal ophthalmologic finding was not significantly associated with outcome ($\chi^2 =0.36$, P = 0.55), table 3. Details of the abnormal ophthalmologic results are as shown in table 4. There was a total of four deaths giving a mortality rate of 25.0%

Non-traumatic coma is a common presentation in pediatric patients accounting for an estimated 10-15% of all hospital admissions¹⁴. In this study, 4.7% of the total admissions presented with loss of consciousness, which is a small but substantial portion

of hospitalized children. Ibekwe et al. in Nigeria and Ali et al. in Saudi Arabia also reported similar incidence rates^{15,16}. The mean age in months was 31.9 ± 50.4 , which was identical to the mean age reported by Ahmed et al. in Pakistan¹⁷. In the current study, a male to female ratio of 1.3:1 was noted, which is similar to findings in other studies that have reported that a higher proportion of the unconscious patients coming to the hospital belong to the male gender^{17,18}.

Infections were the predominant causes of non-traumatic coma in the present study. The pattern of diseases that caused unconsciousness among the children in our study is similar to those found in previous studies in Nigeria and other developing countries¹⁵⁻¹⁷. Infective pathologies remain the prime reason for comatose pediatric patients in developing countries in comparison with western countries where metabolic causes feature more frequently¹⁹⁻²¹.

Table 4: Summary of Abnormal Ophthalmologic Findings in The Six Patients

Clinical Diagnosis	Ophthalmologic findings (anterior segment)	Ophthalmologic findings (posterior segment)	Ophthalmologic diagnosis
Cerebral malaria	Pupillary response: 2+ Pupillary size: normal	Hemorrhages: flame shaped, blot, Cotton wool spots Normal disc color, normal macula	Cerebral malaria
Sepsis, Malaria	NAD	Disc: large, unmasking of choroidal vessels	Degenerative myopia both eyes
Meningitis, Malaria	Pupillary response: 2+ Pupillary size: small	Crowded disc both eyes with temporal disc pallor	Disc edema (at risk of non arteritic ischemic optic neuropathy)
Sepsis, Orbital cellulitis	Pupillary response: 2+ Pupillary size: normal	Retinal edema	Orbital cellulitis
Sepsis, Orbital cellulitis	Lid edema, chemosis, Pupillary response: 2+ Pupillary size: normal Lid edema, chemosis,	Disc edema	1. Right orbital cellulitis 2. Retrobulbar mass
Sepsis	Chemosis, corneal abrasion	NAD	Early exposure kertopathy with chemosis

Children with more severe degrees of coma had worse outcome in the present study. This result is consistent with observations from other studies^{15-17,19}. Irrespective of

the etiology, the essential pathophysiology of coma involves substrate disruption with diffuse central nervous system (CNS) dysfunction²².

Abnormal ophthalmologic findings among our patients were few. There were two clinical diagnoses of cerebral malaria. However, only one had ophthalmologic results that were in keeping with cerebral malaria. Retinal abnormalities in children with cerebral malaria have been widely reported and have higher predictive value compared to patients diagnosed clinically without a funduscopic exam²³⁻²⁵. The absence of abnormal retinal findings, therefore, should prompt the clinician to consider other causes of coma²⁶.

Ophthalmological complications have been reported in association with CNS infections and often seem to be agent-specific¹². Some of the ocular complications reported include conjunctivitis, dacryoadenitis, episcleritis, keratitis, iritis, and optic neuritis in herpetic viral infections^{27,28}. Ophthalmoplegia and cranial nerve palsies, abnormal ocular movements, nystagmus, anisocoria, ptosis, jerky movements, and oscillopsia have also documented an association with encephalitis²⁹⁻³². However, there is a scarcity of studies that describe ophthalmological findings in a pediatric population with non-traumatic coma. The few ophthalmologic findings in this study did not significantly influence the management of our patients. Some of the ophthalmologic findings, such as degenerative myopia, were incidental findings and unrelated to the clinical diagnosis in the patients. Limitation of the study: The refusal of many caregivers to give consent for ophthalmologic examination was a limiting factor to the small number of cases

CONCLUSION

In conclusion, therefore, routine ophthalmologic examination may not be justified as a management protocol in unconscious children but may be considered in selected cases.

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CONFLICT OF INTEREST

The authors wish to declare that they have no conflict of interest and did not receive any funding for this study.

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