

## Profile of children with new-born brachial plexus palsy managed in a tertiary hospital in Ibadan, Nigeria

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**Summary:** New-born Brachial Plexus Palsy (NBPP) is birth injury resulting from traction to the brachial plexus at birth. It is an injury to two or more cervical or thoracic nerve roots. It has been reported to be one of the most common birth injuries of the new-born. Persistent presentation of children with NBPP in Nigeria paediatric practice necessitates the need to examine prevalence, patterns and possible predisposing factors. This study therefore investigated retrospectively, profiles of children who presented with NBPP over a ten year period and were managed at the Physiotherapy department of the University College Hospital, Ibadan Nigeria. A retrospective cross-sectional survey, in which files of children with NBPP located from the database of the Physiotherapy department were retrieved in order to assess infant and maternal information. One hundred and seventy children, 93 (54.7%) males and 77 (45.3%) females were studied. Their mean birth weight was  $4.21 \pm 0.54$  kg, 99 (58.2%) were delivered in private (non-government) hospitals, majority 163 (95.9%) presented with Erb's Palsy. Mothers, 54 (31.8%) were mostly primiparous and a seemingly persistent elevation in two-yearly incidence of NBPP was observed. Improved healthcare policy in child delivery is encouraged in non-government hospitals in Nigeria to provide preventive measures toward incidence of NBPP. Documentation of physiotherapy management of children with NBPP should include outcomes from admission through to discharge.

**Keywords:** New-born, Brachial plexus Palsy, Incidence, Physiotherapy, Nigeria

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### INTRODUCTION

New-born brachial plexus palsy (NBPP) also known as neonatal brachial plexus palsy results from injury to two or more cervical and thoracic nerve roots (C5-T1) that occurs before, during or after the birth process (Foad et al, 2008). Waters (2005) defined NBPP as paralysis of the upper extremity secondary to a traction or compression injury to the brachial plexus sustained at birth.

The brachial plexus forms a network of nerves that conduct nerve impulses that control the muscles of the shoulder, arm, wrist, hand and fingers. The mechanism of NBPP is attributed to severe lateral flexion of the neonate's neck when the shoulder is stopped most often at the pubic bone during delivery. The extent of the traction on the brachial plexus therefore result in various injury types to the nerves ranging from a simple mild stretch up to an avulsion of the nerve roots from the spinal cord (Sutcliffe, 2007).

Incidence of NBPP as reported by Hoeksma et al, (2004) ranged from 0.38 to 5.1 per 1000 live births in Amsterdam, Netherlands. Waters (2005) also reported a frequency of 0.38 to 1.56 per 1000

deliveries. In the United States, a 3 year study of NBPP by Foad et al, (2008) reported an incidence of  $1.51 \pm 0.02$  per 1000 live births with the rate decreasing over the study time period.

In the developing countries of the world, particularly in the sub-Saharan Africa investigating the incidence of NBPP is essential in view of persistent occurrence of this problem. In addition, few studies have been conducted in Nigeria on NBPP. Ogunlade et al (2005) in a study of skeletal birth injuries reported prevalence of NBPP to be 66.7% within a four year study period, Oluwadiya et al, (2005) reported 43.8% and Hamzat et al (2008) in a study of prevalence of NBPP in Accra Ghana over a five year period reported 27.2% prevalence. Various clinical factors have been proposed to be associated with occurrence of NBPP including prolonged labour, maternal diabetes, assisted delivery, breech presentation, macrosomia and high maternal body mass, high birth weight, place of birth, antenatal practices and a host of others (Narchi et al, 1996; Berard et al, 1998; Raio et al, 2003; Pondaag et al, 2004; Hamzat et al, 2008; Onalo et al, 2011).

This present study was undertaken to retrospectively investigate profiles of children who

presented with NBPP in a tertiary hospital in Ibadan Nigeria and examine prevalence in incidence, patterns and factors associated with occurrence of NBPP.

## **MATERIALS AND METHODS**

Ethical approval for this study was obtained from the University of Ibadan/University College research ethics committee (UI/EC/12/0116). The study was a retrospective cross-sectional study. It involved cases of children with NBPP managed at the physiotherapy department of the University College hospital, Ibadan Nigeria over a ten year period (January 2002 to December 2011). The University College hospital, Ibadan Nigeria is a specialist tertiary hospital which is a major referral centre in the South-West sub-region of Nigeria from different parts of the country particularly from primary healthcare centres, non-government/private healthcare facilities, and secondary healthcare facilities in various wards, local government areas and states of the Nigerian federation.

Children with NBPP diagnosed by paediatricians, paediatric neurologists or orthopaedic surgeons are usually referred to the paediatric section of the physiotherapy department for further assessment and physiotherapy management. For the purpose of this study, the database of the department of physiotherapy was searched to identify cases of paediatric conditions including NBPP managed over the above-mentioned years in order to locate the files. The files of children managed for NBPP were identified and separated to assess relevant information on child and maternal characteristics. These include age of child, age at presentation for physiotherapy management, year of presentation, place of delivery of child, type of delivery, birth presentation, type of NBPP, events at delivery, maternal occupation, parity of mother, outcomes of physiotherapy management of child and discharge. Classification of the type of NBPP is usually done using the Narakas system (Narakas, 1987) in which injury to C5 and C6 plus or minus C7 is described as upper brachial plexus injury or Erb's palsy, injury to the above roots along with C8 and T1 is referred to as total palsy with no Horner's syndrome-here a functional hand may be seen in many patients, an injury to C5, C6, C7, C8 and T1 with Horner's syndrome is described as complete flaccid paralysis or flail arm (Narakas, 1987).

Physiotherapy management usually begins after a careful history taking and detailed clinical examination, checking for possible associated injuries like fractures of the clavicle or humerus (Thatte and Mehta, 2011). The treatment plan is usually aimed at maintaining the physiological state of the affected upper limb by prevention of muscle shortening and stiffness of the affected joints, restoration of motor

function and prevention of muscle atrophy. The above are achieved by gentle passive mobilisation of all joints of the affected limb along with soft tissue mobilization. Mothers are taught how to carry out these movements to the affected upper limb of the child to make for continuity of treatment and adequate frequency as required in the home (Sutcliffe, 2007). In cases of severe forms of NBPP, mild intensity of neuromuscular electrical stimulation (NMES) usually accompanies the above protocol and this help to prevent muscle atrophy while the nerves regain their function (Nath et al, 2010).

A limitation in this study however, was that some variables were missing from some files. This therefore reduced the available information on some child and maternal characteristics and this were noted as not recorded.

### **Statistical analysis:**

The data obtained were entered into a spread sheet after which it was analysed using descriptive statistics of mean, percentages and charts.

## **RESULTS**

### *Characteristics of Children with New-born Brachial Plexus Palsy*

One hundred and seventy cases of NBPP were identified within the study period (Jan 2002 to Dec 2011). Over half 93 (54.7%) were males while 77 (45.3%) were females. The greatest percentage of patients 87 (51.2%) were presented for physiotherapy management within the first four weeks of life. Of the 158 (92.9%) of children who had their birth weights recorded, 102 (60%) were within the range (4.0-6.5) kg. Least birth weight was 2.5 kg and the overall mean birth weight of infants was  $4.21 \pm 0.54$  kg. Majority of the children 99 (58.2%) were delivered in non-government hospitals (private hospital facilities). Table 1 shows the socio-demographic profile of these children.

Out of 135 (79.4%) children with NBPP, who had their mode of delivery recorded, 91 (53.5%) were delivered with assistance while 21 (12.4%) were through spontaneous vertex delivery. In terms of types of NBPP, Erb's palsy was the most presented by 164 (96.5%) of the patients while complications such as birth asphyxia 11 (6.4%) and humeral and clavicular fractures 1 (0.6%) and 2 (1.2 %) respectively were associated problems in some of the children.

Outcome of physiotherapy management was not readily available as only 2 (1.2 %) of the patients had records of being formally discharged in their case files. This can be observed in Table 2.

### *Maternal Characteristics of Children with New-born Brachial Plexus Palsy*

In 166 (97.6%) cases maternal age was not recorded, majority of the mothers 156 (91.7%) were married,

and employed 131 (77.1%) and mostly primiparous 54 (31.8%). The commonest event at delivery for most of them 95 (55.8%) is prolonged labour. This is as seen in Table 3.

**Table 1.** Socio-demographic Profile of Children with Newborn Brachial Plexus Palsy

Variables	N	%
<b>Sex</b>		
Male	93	54.7
Female	77	45.3
<b>Age at presentation for Physiotherapy (weeks)</b>		
0.0-4.00	87	51.2
4.10-8.00	31	18.2
8.10-12.00	17	10
12.10-16.00	2	1.2
>16.00	18	10.6
Not recorded	15	8.8
<b>Birth weight</b>		
2.50-2.99	4	2.4
3.00-3.49	8	4.7
3.50-3.99	44	25.9
4.00-4.49	64	37.6
4.50-4.99	30	17.6
>5.0-6.50	8	4.7
Not recorded	12	7.1
<b>Place of birth</b>		
Private Hospitals	99	58.2
Government hospitals	17	10.0
Mosques/Churches/Mission	12	7.1
Homes	3	1.8
Not recorded	39	22.9

**Table 2:** Clinical Profile of Children with Newborn Brachial Plexus Palsy

Variables	N	%
<b>Mode of delivery</b>		
Spontaneous vertex	21	12.4
Assisted (forceps, vacuum extraction)	91	53.5
Cesarean section	23	13.5
Not recorded	35	20.6
<b>Type of NBPP</b>		
Erb's palsy	164	96.5
Total BPP	6	3.5
<b>Associated problems</b>		
Birth asphyxia	11	6.4
Humeral fracture	1	0.6
Clavicular fracture	2	1.2
Shoulder dislocation	1	0.6
None	155	91.2
<b>Discharge/Outcome of physiotherapy</b>		
Discharged	2	1.2
Being considered for discharge	2	1.2
Referred	4	2.4
Nil record of discharge	162	95.2

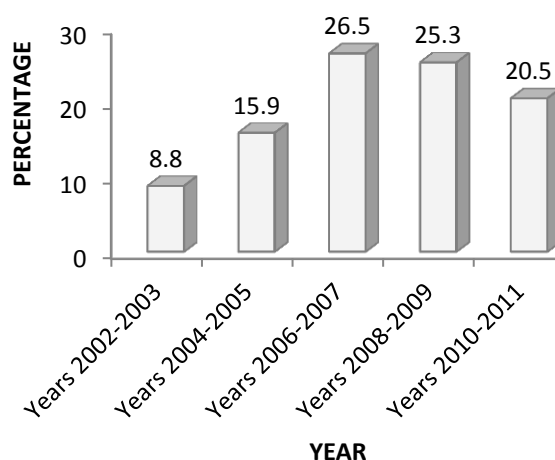
Key: NBPP- Newborn brachial plexus palsy.

**Prevalence and Incidence of NBPP over the ten year study period**

Prevalence of children with NBPP over the ten year study period shows a persistent high prevalence in the years 2007, 2008 and 2009 (17.1%, 18.1% and 15.3%) respectively. The least prevalence (5.4%) was observed in year 2002. In figure 1, a two-yearly incidence of NBPP is illustrated. Persistent high incidences (26.5%, 25.3% and 20.5%) occurred in years 2006-2007, 2008-2009 and 2010-2011 respectively, while the least (8.8%) occurred in years 2002-2003.

**Table 3:** Maternal Characteristics of Children with Newborn Brachial Plexus Palsy

Variables	N	%
<b>Age of Mother (yrs)</b>		
28-35	4	2.4
Not recorded	166	97.6
<b>Marital Status</b>		
Married	156	91.7
Not Married	3	1.8
Not recorded	11	6.5
<b>Occupation</b>		
Unemployed	24	14.1
Employed	131	77.1
Not recorded	15	8.8
<b>Parity</b>		
1	54	31.8
2	40	23.5
3	34	20
4	17	10
>5	11	6.5
Not recorded	14	8.2
<b>Events at delivery</b>		
Prolonged labour	95	55.9
Caesarean section	23	13.5
Episiotomy, perineal tears	17	10.0
Not recorded	35	20.6



**Figure 1:** Two-yearly incidence of Newborn Brachial Plexus Palsy in the University College Hospital Ibadan over a ten year period

## **DISCUSSION**

This study investigated profiles of children with NBPP managed in the physiotherapy department of the University College Hospital Ibadan, Nigeria. The age at presentation was mostly in the range (0-4) weeks, revealing early presentation for physiotherapy treatment. Indeed it has been observed that early initiation of physiotherapy for children with NBPP after birth is essential for early functional recovery in the upper limb. Others who presented later, (>4-12) weeks after birth could have done so due to a delay in diagnosis of NBPP and subsequent delay in referral for physiotherapy (Oluwadiya et al, 2005). Notable in this instance, particularly are children with NBPP who were delivered in some private hospital facilities. These hospitals may sometimes lack adequate experienced manpower and diagnostic skills. Such practices therefore may be unable to explain the cause of occurrence of NBPP to the mother of the affected child. The consequent inability to make early referral may cause a delay in the much needed and appropriate intervention for the child.

Mode of delivery of most of the children with NBPP was through assisted means (forceps, vacuum extraction). These are usually difficult deliveries and even those children who were delivered through Caesarean section in this study could also have had NBPP due to hard labour and attempted delivery before Caesarean section proved to be necessary.

High birth weights have been observed to be a remarkable etiologic factor for NBPP (Piatt, 2004; Sutcliffe, 2007; Ruchelsman et al, 2009). In this study, children with high birth weights formed the highest percentage of those with NBPP. It is noteworthy that maternal gestational diabetes has been attributed to high birth weights (Piatt, 2004) even though in this study, no record of maternal gestational diabetes was made probably because the assessment in the case files were essentially that of the child with NBPP.

Of the different forms of NBPP, Erb's palsy was mostly observed. This observation is similar to that of Ruchelsman et al, (2009). A probable explanation for this has been attributed to the upper trunk roots of the brachial plexus (C5 and C6) being more susceptible to traction force compared to the lower trunk roots (C8 and T1).

Of the few associated injuries or problems with NBPP in this study, birth asphyxia had highest frequency of observation. This probably was due to prolonged labour, which in turn could have been responsible for oxygen deprivation of the infant. Protracted labour especially at the second stage of labour has been observed as a risk factor for NBPP (Sutcliffe, 2007).

A consideration of outcomes in physiotherapy management of children with NBPP revealed that largest percentage had no discharge records while

only 1.2% was reported discharged. This inadequate documentation of treatment outcome could be due to a variety of reasons: firstly as management of this condition is a relatively long term procedure, parents could easily default from coming for treatment on observation of a measurable functional recovery in the upper limb of their children. Secondly distractions due to day to day stress of making a living coupled with economic hardship could have discouraged the parents from bringing the children for treatment until full recovery is achievable. Thirdly the attending physiotherapist could have overlooked the importance of periodic review of the patient management and documenting recommendations for discharge when necessary ultimately resulting in omission of documentation of discharge when there is complete functional recovery of the upper limb of the patient.

In this study, primiparous women had the highest frequency of children with NBPP. This observation is in agreement with that of Tandon and Tandon, (2005) in which the observation was made that brachial plexus injury is more likely to occur in neonates from primiparous women especially in the presence of shoulder dystocia. Mothers who had prolonged labour before birth were also more likely to have a child with NBPP. In fact the observation made in a study by Al-Rekabi (2011) in Bint Al-Huda Teaching Hospital, Thi-Qar revealed that prolonged labour is a risk factor for NBPP.

Findings in this study show that prevalence of NBPP among the paediatric population who presented at the physiotherapy department, University College Hospital constituted a significant proportion of cases seen. There also appeared to be a persistent elevation in two-yearly incidence as well as prevalence of NBPP within the ten-year study period.

### **Conclusion**

Erb's palsy is one form of NBPP most frequently managed in the paediatric unit of the physiotherapy department, University College Hospital Ibadan. Improved healthcare policy in child delivery should be encouraged, particularly in non-government facilities where most children with NBPP are reportedly delivered. During management of patients with NBPP, adequate documentation by attending physiotherapists is recommended in order to provide records on outcome/discharge; this may in turn provide essential data to estimate prognostication of NBPP.

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