Prevalence and associated morbidities of preterm neonatal admissions at the University of Maiduguri Teaching Hospital, North-Eastern Nigeria

Abstract: Introduction: Preterm delivery is of considerable concern to clinicians and researchers because it is the leading cause of infant morbidity and mortality in the industrialized countries and also contributes to substantial complications among survivors. Sub-Saharan Africa, including Nigeria accounts for significant proportion of preterm births, with over million deaths due to complication of prematurity.

Objectives: The study aimed to determine the prevalence and associated morbidities of preterm deliveries at the University of Maiduguri Teaching Hospital, Maiduguri, North-Eastern Nigeria.

Patients and methods: This is a retrospective review of neonates delivered before 37 completed weeks of gestation and admitted into the Special Care Baby Unit (SCBU) of the University of Maiduguri Teaching Hospital, from 1st January 2008 to 31st December 2015.

Results: There were 3435 admissions into the Special Care Baby Unit (SCBU) during the 8 year period. Out of these 1129 were preterm babies giving a prevalence of 32.9%. Of the 1129 preterm babies managed in SCBU, 714 case records were retrieved and analyzed giving a retrieval rate of 63%. There were 372 (52.1%) males and 342 (47.9%) females; with the male to female ratio of 1:1.08. There were 17(2.3%) extreme low birth weight (<1000g), 288 (40.3%) very low birth weight (1000-1499 g), 406 (56.9%) low birth weight (1500-2499 g) babies. The range of admission weights was 700-2500g with mean of 1600±900g.

Conclusion: The burden, complications and mortality from preterm newborns remain significant public health challenges to care givers in Nigeria.

Key words: Prevalence, preterm babies, associated morbidities, Maiduguri

Introduction

The World Health Organization (WHO) defines preterm birth as babies delivered at gestational age of less than 37 completed weeks. Preterm delivery is recognized as a major public health problem by both clinicians and researchers because it is the leading cause of infant mortality and also contribute to substantial complications among survivors. Each year 15 million newborns are delivered before 37 completed weeks and their chances of survival vary dramatically between developed and developing world. Of this high population of preterm babies, Sub-Saharan Africa including Nigeria, accounts for up to 60%, with over one million deaths due to complications of prematurity. According to Lawn et al, Low- and Middle-income countries (LMC) of the world are responsible for 92% of preterm birth and 99% of these preterm babies die. Yet little or no effort has been made in reducing this high mortality rate. The global concern about the burden of preterm birth led the WHO to designate November 7th the World Prematurity Day. Reports from some African countries shows that preterm birth rate range from 11.1% to 57%, and prevalence of pregnancies that result in spontaneous preterm labour accounting for up to 68.2%.
Subjects and methods

Study centre

The study was conducted at the special care baby unit (SCBU) of the University of Maiduguri Teaching Hospital, Maiduguri. Our SCBU is 36-bed unit with eight incubators, two warm cots, 20 neonatal beds and four resuscitaires/radiant warmers with central oxygen supply. University of Maiduguri Teaching Hospital is a tertiary institution that serves as referral hospital for the six states in the North-east sub-region of Nigeria. It also receives referral from neighbouring countries of Niger, Chad, Cameroon and Central African Republic. The SCBU caters to term and preterm babies delivered in the institution’s labour ward, those referred from other health facilities and self-referrals.

Study design

This is a retrospective review of data of all neonates delivered before 37 completed weeks of gestation in UMTH labour ward and those referred to the unit from other health facilities. The data spans over an eight year period from 1st January 2008 to 31st December 2015.

Study population

Gestational age was calculated from the mother’s last menstrual period or first trimester antenatal ultrasound scan, where neither information was available, gestational age was estimated using modified Ballard score.

Data collection

Maternal data retrieved include mother’s age, booking status, previous preterm birth, educational and employment status, father’s age, educational status and employment status as well as place of delivery. Also extracted were history of adverse events during pregnancy such as preterm/premature rupture of amniotic membranes, antepartum haemorrhage, preeclampsia, eclampsia, pregnancy-induced hypertension, and urinary tract infection.

Data obtained on the babies were; birth order, mode of delivery, type of gestation, birth weight, apgar scores at 1, 5 and 10 minutes, difficulty in breathing, apnoea, fever and feeding problems. Ethical clearance was obtained from the institution’s Ethics and Research committee.

Data analysis

The data were entered into a spreadsheet and analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0 for Windows (SPSS Inc. Chicago, IL, USA). Frequencies, means, and proportion of variables were computed. Association between categorical variables was determined using Chi-square test or Fisher’s exact test where appropriate. The results were reported as adjusted Odds ratio and 95% confidence intervals. For analyses, p-values < 0.05 were considered statistically significant.

Results

There were 3435 admissions into the Special Care baby Unit (SCBU) during the eight year period. Out of these 1129 were preterm babies giving a prevalence of 32.9%. Of the 1129 preterm babies, case files of 714 (63%) were retrieved. There were 372 (52.1%) males and 342 (47.9%) females; with male to female ratio of 1:1.08.

Seventeen babies (2.3%) were extreme low birth weight (<1000gm), 288(40.3%) very low birth weight (1000-1499gm), while 406 (56.9%) were low birth weight (1500-2499gm). There were three preterm babies whose weights were greater than 2500 g; i.e. large for gestational age. The weight of the study population ranged from 700-2650gm with a mean of 1600(±900)gm

One hundred and nineteen babies (16.7%) were early preterm, 437(61.2%) mid preterm and 158 (22.1%) late preterm

Table 1. shows the socio-demographic characteristics of the mothers.. The mean age of mothers was 26.61 ± 6.61years. Most (52.8 %) mothers were within the age-group of 21 to 30years. Majority of mothers had no formal education and most (89.9 %) were not gainfully employed.

| Characteristics                  | Frequent | Percent |
|----------------------------------|----------|---------|
| Mother’s Age (yrs)               |          |         |
| ≤20                              | 134      | 22.0    |
| 21 – 30                          | 321      | 52.8    |
| 31 – 40                          | 143      | 23.5    |
| 41 – 50                          | 10       | 1.6     |
| Mother Educational level         |          |         |
| No formal education              | 199      | 52.6    |
| Primary education                | 73       | 19.3    |
| Secondary education              | 79       | 20.9    |
| Tertiary education               | 27       | 7.1     |
| Gainful employment (mother)      |          |         |
| Yes                              | 72       | 10.1    |
| No                               | 641      | 89.9    |
| Father age (yrs)                 |          |         |
| 21 -30                           | 22       | 11.3    |
| 31 -40                           | 106      | 54.4    |
| 41 -50                           | 56       | 28.7    |
| 51 - 60                          | 11       | 5.6     |
| Father Educational level         |          |         |
| No formal education              | 95       | 28.4    |
| Primary education                | 64       | 19.2    |
| Secondary education              | 126      | 37.7    |
| Tertiary education               | 49       | 14.7    |
| Gainful employment (Father)      |          |         |
| Yes                              | 427      | 59.1    |
| No                               | 293      | 40.6    |
| Type of father’s employment      |          |         |
| Self                             | 217      | 40.4    |
| Private                          | 82       | 15.3    |
| Public                           | 199      | 37.1    |
| Unemployed                       | 39       | 7.3     |
Table 2: presents maternal obstetric characteristics. A total of 547 (76.6 %) of the babies were delivered in the hospital but only 35.3 % (251/712) were booked for ANC. A total of 146 (25.0%) of the mothers were primiparous: overall median parity as 3.80 ± 1.15. Preterm premature rupture of foetal membranes, APH, Preeclampsia, eclampsia and PIH occurred at varying frequencies.

| Characteristics | Frequency | Percent (%) |
|----------------|-----------|-------------|
| Place of delivery | | |
| Home | 167 | 23.4 |
| Hospital | 547 | 76.6 |
| UMTH birth/Referred | | |
| UMTH | 481 | 67.4 |
| Referred | 254 | 35.6 |
| Parity | | |
| 1 (Primaparous) | 146 | 25.0 |
| 2 - 4 (Multiparous) | 254 | 43.4 |
| ≥5 (Grand multiparous) | 185 | 31.6 |
| ANC | | |
| Unbooked | 461 | 64.7 |
| Booked | 251 | 35.3 |
| Previous premature birth | | |
| YES | 75 | 10.5 |
| NO | 639 | 89.5 |
| PrePROM | | |
| YES | 115 | 16.1 |
| NO | 599 | 83.9 |
| APH | | |
| NO | 608 | 85.2 |
| YES | 106 | 14.8 |
| Preeclampsia | | |
| NO | 665 | 93.1 |
| YES | 49 | 6.9 |
| Eclampsia | | |
| NO | 679 | 95.1 |
| YES | 35 | 4.9 |
| PIH | | |
| NO | 688 | 96.4 |
| YES | 26 | 3.6 |

It was apparent from the figure below (figure 1), which shows the increasing trend in prevalence of preterm neonates.

**Fig 1:** Annual prevalence of preterm babies admitted into SCBU from 2008 to 2015

Table 3: Characteristics of preterm babies admitted at UMTH Maiduguri from 2008 to 2015

| Characteristics | Frequency | Percent (%) |
|----------------|-----------|-------------|
| Sex | | |
| Male | 372 | 52.1 |
| Female | 342 | 47.9 |
| Gestational age (GA) [Weeks] | | |
| 25 – 31 | 119 | 16.7 |
| 32 – 34 | 437 | 61.2 |
| 35 - ≥37 | 158 | 22.1 |
| Birth weight (gram) | | |
| < 1000 (ELBW) | 17 | 2.4 |
| 1000 – 1499 (VLBW) | 288 | 40.3 |
| 1500 – 2499 (LBW) | 406 | 56.9 |
| ≥2500 (NBW) | 3 | .4 |
| Weight class for gestational age | | |
| Appropriate-for-gestational age | 563 | 78.9 |
| Small-for-gestational age | 105 | 14.7 |
| Large-for-gestational age | 46 | 6.4 |
| Birth order | | |
| 1 | 215 | 30.1 |
| 2 - 4 | 356 | 49.9 |
| ≥5 | 143 | 20.0 |
| Mode of delivery | | |
| Spontaneous vaginal delivery | 488 | 68.3 |
| Forceps delivery | 16 | 2.2 |
| Cesarean section | 208 | 29.2 |
| Breech delivery | 2 | .3 |
| Gestation type | | |
| Singleton | 504 | 70.6 |
| Twin | 186 | 26.1 |
| Triplets | 24 | 3.4 |
| APGAR score at 1 minute | | |
| < 7 | 483 | 67.6 |
| ≥7 | 231 | 32.4 |
| APGAR score at 5 minutes | | |
| < 7 | 177 | 24.7 |
| ≥7 | 537 | 75.3 |
| APGAR score at 10 minutes | | |
| < 7 | 121 | 16.9 |
| ≥7 | 593 | 83.1 |
Preterm delivery is a major clinical problem worldwide and more so in the developing countries of Africa, Asia and Latin America. It is associated with significant morbidity and mortality in the perinatal, neonatal and childhood periods as it leads to long-term loss of human potential among survivors. Contrary to some reports from Nigeria, the current figure of 32.9% is higher than the range of 8.5% to 23.7% previously reported.

The prevalence of preterm babies in this study is 32.9% higher than the 12% reported by Mokuolu et al in Ilorin, 8.5% by Etuk et al in Calabar, 16.9% by Iyoke et al in Enugu, Nigeria higher than the rate observed by Ambe et al in our centre a decade ago and higher than the prevalence rate of 23.7% observed in a tertiary health facility in Sokoto North western Nigeria. It is also higher than the overall national prevalence of preterm birth estimates of 15% by World Health Organisation.

The observed higher rate in our study could be explained by the sample size and duration of study. Our study had a larger sample size and covered a period of eight years as against the studies of Iyoke and Ambe. We observed a rising trend of preterm delivery as predicted by WHO on preterm deliveries in Africa. Our observed trend could be explained by the increase in admission capacity of our SCBU facilities as well as skilled power.

Maternal socio-demographic indices such as antenatal care, booking status, obstetric and medical variables like, maternal age, maternal/paternal educational levels, employment status, parity, history of previous preterm delivery have been implicated as associated factors of preterm deliveries as in other studies.

Premature rupture of membrane (PrePROM) accounted for 16.1% of preterm deliveries which was lower than the figures observed in other reports.

We observed more male than female preterm deliveries as Kunle-Olouwu et al reported as against female preponderance reported by McGil Ugwu et al in Warri South-south Nigeria and Zeleke et al in Ethiopia.

The most common morbidity identified in this study were difficulty in breathing, jaundice and fever (sepsis). Similar observations have been reported in Nigeria and Pakistan. Though Onalo et al in Abuja Nigeria reported Neonatal Jaundice as the most common morbidity, this study. If not checked, it may likely reverse the few gains achieved under millennium development goals and to extent 5. Maternal factors such as pregnancy induced hypertension, eclampsia, multiple gestation and poor antenatal care has remained factors associated with preterm babies in our settings.

However, this was in contrast to the report by Onwuanaku et al from Jos North-central Nigeria who reported neonatal sepsis as the commonest morbidity closely followed by jaundice. The respiratory system related diseases like respiratory distress syndrome especially among the moderate to severe preterm babies and neonatal sepsis were common.

**Table 4: Associated maternal and neonatal morbidities in preterm babies**

| Associated Maternal Morbidities | Number | percent |
|--------------------------------|--------|---------|
| APH*                           | 99     | 15.4    |
| Previous preterm delivery       | 75     | 11.6    |
| Multiple gestation              | 210    | 32.6    |
| UTI*                           | 34     | 5.3     |
| Fever                          | 53     | 8.2     |
| Preterm premature rupture of foetal membrane | 115 | 17.8 |
| Preeclampsia                    | 49     | 7.6     |
| Other (goitre & chest infection)| 79     | 11.1    |
| Neonatal Morbidities            |        |         |
| Difficulty in breathing         | 311    | 47.1    |
| Jaundice                        | 146    | 22.1    |
| Apnoea                          | 40     | 6.1     |
| Fever                           | 94     | 14.2    |
| Early anaemia                   | 39     | 5.9     |
| Late anaemia                    | 25     | 3.8     |
| Others (convulsion and bleeding)| 50     | 7.0     |

*APH=antepartum haemorrhage, *UTI=urinary tract infections

**Discussion**

Preterm delivery is a major clinical problem worldwide and more so in the developing countries of Africa, Asia and Latin America. It is associated with significant morbidity and mortality in the perinatal, neonatal and childhood periods as it leads to long-term loss of human potential among survivors. Contrary to some reports from Nigeria, the current figure of 32.9% is higher than the range of 8.5% to 23.7% previously reported.

The prevalence of preterm babies in this study is 32.9% higher than the 12% reported by Mokuolu et al in Ilorin, 8.5% by Etuk et al in Calabar, 16.9% by Iyoke et al in Enugu, Nigeria higher than the rate observed by Ambe et al in our centre a decade ago and higher than the prevalence rate of 23.7% observed in a tertiary health facility in Sokoto North western Nigeria. It is also higher than the overall national prevalence of preterm birth estimates of 15% by World Health Organisation.

The observed higher rate in our study could be explained by the sample size and duration of study. Our study had a larger sample size and covered a period of eight years as against the studies of Iyoke and Ambe. We observed a rising trend of preterm delivery as predicted by WHO on preterm deliveries in Africa. Our observed trend could be explained by the increase in admission capacity of our SCBU facilities as well as skilled power.

Maternal socio-demographic indices such as antenatal care, booking status, obstetric and medical variables like, maternal age, maternal/paternal educational levels, employment status, parity, history of previous preterm delivery have been implicated as associated factors of preterm deliveries as in other studies.

Other observed variables associated with preterm deliveries include un-booked pregnancy (64.6%), very low birth weight (42.7%) and multiple gestations (64.6%). Similar observations were made in some reports.

Premature rupture of membrane (PrePROM) accounted for 16.1% of preterm deliveries which was lower than the figures observed in other reports.

We observed more male than female preterm deliveries as Kunle-Olouwu et al reported as against female preponderance reported by McGil Ugwu et al in Warri South-south Nigeria and Zeleke et al in Ethiopia.

The most common morbidity identified in this study were difficulty in breathing, jaundice and fever (sepsis). Similar observations have been reported in Nigeria and Pakistan. Though Onalo et al in Abuja Nigeria reported Neonatal Jaundice as the most common morbidity, this study. If not checked, it may likely reverse the few gains achieved under millennium development goals and to extent 5. Maternal factors such as pregnancy induced hypertension, eclampsia, multiple gestation and poor antenatal care has remained factors associated with preterm babies in our settings.

However, this was in contrast to the report by Onwuanaku et al from Jos North-central Nigeria who reported neonatal sepsis as the most common morbidity closely followed by jaundice. The respiratory system related diseases like respiratory distress syndrome especially among the moderate to severe preterm babies and neonatal sepsis were common.

**Conclusion**

Preterm deliveries constitute a significant percentage of neonatal admissions in our Special Care Baby Unit, especially in recent years. There has been sustained increase in the prevalence of preterm babies as shown in this study. Maternal factors such as pregnancy induced hypertension, eclampsia, multiple gestation and poor antenatal care have remained factors associated with preterm babies in our settings.

**Conflict of Interest:** None

**Funding:** None

**Limitation**

This is a retrospective analysis of preterm babies admitted and managed in our neonatal facility. The results in this study may not be a holistic representation of the management and outcome of all the preterm babies managed in the unit. We therefore recommend future prospective study.
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