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Prevalence and Outcome of Preterm Admissions at the Neonatal Unit of a Tertiary Health Centre in Southern Nigeria

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Abstract

Background: Preterm babies have increased risk of morbidity and mortality which is inversely related to both gestational age and birth weight. Most preterm births result from maternal or foetal medical conditions. Objectives: To determine the prevalence and outcome of preterm admissions at the Special Care Baby Unit of the Niger Delta University Teaching Hospital, as well as their morbidity pattern and risk factors for preterm birth. Methodology: All preterm babies admitted from January 2010 to December 2012 were retrospectively studied. Information obtained included gestational age at birth, sex, risk factors for preterm birth, duration of admission, medical problems during admission and outcome. Results: Preterm admissions constituted 24.0% of the total admissions with a male to female ratio of 1.1:1. The commonest risk factor for preterm birth was preterm rupture of foetal membranes (46.4%) followed by lack of maternal antenatal care (35.5%) and multiple pregnancy (26.8%) respectively. The commonest medical conditions were respiratory problems in 95 (68.8%) followed by jaundice in 94 (68.1%) and sepsis in 54 (39.1%) of the patients. The case fatality rate was highest in the patients with necrotizing enterocolitis and seizures (66.7%) followed by respiratory problems (63.2%) and bleeding disorders (60.0%). The overall survival rate was 65.9%. The survival rate was significantly higher in the mild preterm category compared to the very preterm and extremely preterm for birth categories $\chi^2 = 29.24$, p value = 0.000. Conclusion: Preterms constituted a significant percentage of neonatal admissions at the Niger Delta University Teaching Hospital with the case fatality being highest among those with infections and respiratory problems. There is an urgent need for the establishment of a neonatal intensive care unit with facilities for thorough evaluation and management of preterm babies in order to improve survival rate of this vulnerable group of patients.

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Keywords

Preterm; Prevalence; Outcome; Gestational Age; Risk Factors; Morbidity; Mortality

1. Introduction

Preterm birth defined as child birth occurring at less than 37 completed weeks or 259 days of gestation is a major determinant of neonatal morbidity and mortality with long term adverse health consequences [1]-[3]. Infants born preterm compared to term infants experience more difficulty with feeding, blood glucose control, jaundice, temperature instability, apnoea, respiratory distress and sepsis either singly or in combination [4]. Worldwide, preterm deaths constitute 28% of the 4 million annual new born deaths with 99% of these deaths occurring in developing countries [5]. Morbidity, mortality and prolonged hospital stay of preterm babies result in significant cost to the health sector, parents and the society [6]. In 2005, estimates done in the United States of America showed that the costs to the country in terms of medical and educational expenditure and lost productivity associated with preterm births were more than $26.2 billion [7].

With advances in Obstetric practice which have led to increased medical surveillance to identify and prevent progression of maternal and foetal complications, the incidence of preterm deliveries have also increased [8]. In 2005, the World Health Organization (WHO) estimated 9.6% of all births worldwide to be preterm [9]. Causal factors linked to preterm birth include medical conditions of the mother or foetus, genetic influences, environmental exposure, infertility treatments, behavioural and socio-economic factors as well as iatrogenic prematurity [10]. According to Pennell *et al*. [11] approximately 45% to 50% of preterm births are idiopathic, 30% are related to preterm rupture of membranes and another 15% to 20% result from medically indicated or elective preterm deliveries.

Factors that influence the success in the management of prematurity include level of prenatal care, gestational age at birth, sex, availability of resources and adequate and well trained personnel [12]. The evolution of neonatal intensive care is one of the recent advances that ensures survival of the preterm neonate but sadly this is not readily available in most developing countries [13]. This is not surprising as neonatal intensive care is expensive because of the cost of sophisticated equipment, need for constant power supply, constant use of laboratory facilities and high staff to patient ratio [14].

It is necessary to carry out neonatal audit regularly as disease patterns vary from place to place and even from time to time in the same place [15]. Though several studies [14] [16]-[18] have been done on preterm admissions in other parts of Nigeria, since the inception of the Niger Delta University Teaching Hospital (NDUTH) in 2007, there has been no study involving preterm babies. The present study was therefore carried out at the Special Care Baby Unit (SCBU) of the NDUTH, a tertiary health centre in Southern Nigeria with the aim of determining the risk factors for preterm births as well as the prevalence and outcome of preterm admissions, in order to contribute to existing data in the sub region and advise the hospital management in formulation of intervention plans to improve survival of this vulnerable group. Information derived from the study will also be used in public enlightenment campaigns on the prevention of preterm birth.

2. Methodology

2.1. Study Centre

The study was carried out at the Special Care Baby Unit (SCBU) of the Niger Delta University Teaching Hospital (NDUTH), Okolobiri, Bayelsa State. The SCBU is the neonatal unit of the hospital where children less than 28 days are admitted. The unit has 6 cots and 3 incubators and is manned by 2 Paediatricians, Residents and-Nursing staff with an average ratio of one nurse to 6 patients.

2.2. Ethical Consideration

Ethical approval for the study was obtained from the research and ethics committee of the Niger Delta University Teaching Hospital Okolobiri, Bayelsa State.

2.3. Sampling

This was a retrospective descriptive study. Using the ward registers, the folder numbers of all preterm admissions over the 3 year period (January 2010 to December 2012) were obtained and the folders subsequently retrieved from the hospital records. All preterm babies in the SCBU of the NDUTH born at gestational ages of less than 37 completed weeks of gestation were included into the study while those born at or after 37 completed weeks were excluded. Information obtained from the folders include gestational age at birth, place of birth, sex, birth weight, risk factors for preterm birth, duration of hospital stay, medical problems during the period of admission and outcome. Parental educational status and occupation were also obtained and used to derive the parental social class according to Oyedeji's [19] classification. The gestational ages at birth were calculated using the first date of the mother's last menstrual period [20] or early pregnancy ultra sound scan [21]. The birth weights were taken as the first recorded weight at birth for the in-borns or the weight on admission for those born outside the hospital and presented within the first 24 hours of life. The preterms were classified into 3 main categories according to gestational age at birth with those born from 32 to 36 weeks classified as mild preterms, 28 to 31 weeks very preterm and less than 28 weeks classified as extremely preterm for birth [22] [23].

2.4. Treatment Protocol

All preterm babies were admitted and cared for at the SCBU of the NDUTH. Those with weights less than 1800 g were nursed in the incubator, they were all given intravenous fluids, prophylactic phototherapy and intravenous antibiotics. They were fed with expressed breast milk from their mothers until they were mature enough to feed directly from their mothers breasts. Those who developed severe jaundice or bleeding disorders were managed with exchange blood transfusion in addition to phototherapy. They were weaned out of the incubator at weights equal to or greater than 1800 g if clinically stable.

2.5. Data Analysis

Data was entered onto an excel spreadsheet and presented as means and percentages in tabular form. Data was analyzed using SPSS version 15 statistical package. Test of significance between proportions was assessed using Chi-square at a 95% confidence interval with a p value of less than 0.05 considered statistically significant.

3. Results

3.1. General Characteristics

During the study period, 634 babies were admitted into the special care baby unit (SCBU) of the Niger Delta University Teaching Hospital (NDUTH) of which 152 (24.0%) were preterm. One hundred and thirty eight (90.8%) of the preterm babies were studied as the other folders were either not found or had too many missing data. There were 71 males and 67 females with a male to female ratio of 1.1:1 (**Table 1**).

Their gestational ages at birth ranged from 24 to 36 weeks (**Table 1**) with a mean gestational age of 31.43 ± 3.65 weeks. Twenty three (16.7%) of the patients were born at 32 weeks gestation followed by 18 (13.0%) born at 28 weeks gestation. Most of the patients 129 (93.5%) were born between gestational ages of 28 and 36 weeks.

Their birth weights ranged from 700 g to 3200 g with a mean weight of 1626 ± 448 g. The mean birth weight increased with increasing gestational age from 950 ± 100 g in those born at 26 weeks gestation to 2291 ± 505 g in those born at 36 weeks gestation except in the 28 weeks, 33 weeks and 35 weeks gestational age groups respectively.

Sixty nine (50.0%) of the preterm babies were from the lower social class, 25 (18.1%) from the middle social class while 2 (1.4%) were of the upper social class. The social class of 42 (30.4%) babies could not be derived as a result of incomplete information in the case notes.

Thirty two (23.2%) of the babies were the first born of their mothers, 55 (39.9) were the second to fourth, while 35 (25.4%) were the 5^{th} or more. In 16 cases (11.6%), the birth order was not stated.

3.2. Place of Delivery

Sixty six (47.8%) of the babies were inborns, while 72 (52.2%) were outborns. Over half of the outborns 42 (58.3%) were born in other health centres, followed by 15 (20.8%) whose deliveries were supervised by tradi-

Table 1. Gestational age and sex distribution.

Gestational age at birth (weeks)	Sex		Total number (%)	Mean birth weight (g)
	Male (%)	Female (%)		
24	1 (0.7)	0 (0.0)	1 (0.7)	800
25	0 (0.0)	0 (0.0)	0 (0.0)	0
26	1 (0.7)	3 (2.2)	4 (2.9)	950 ± 100
27	4 (2.9)	0 (0.0)	4 (2.9)	1320 ± 192
28	9 (6.5)	9 (6.5)	18 (13.0)	1288 ± 331
29	0 (0.0)	1 (0.7)	1 (0.7)	1400
30	7 (5.1)	5 (3.6)	12 (8.7)	1515 ± 302
31	9 (6.5)	6 (4.3)	15 (10.9)	1606 ± 284
32	11 (8.0)	12 (8.7)	23 (16.7)	1663 ± 296
33	6 (4.3)	9 (6.5)	15 (10.9)	1619 ± 361
34	6 (4.3)	8 (5.8)	14 (10.1)	1886 ± 548
35	5 (3.6)	6 (4.3)	11 (8.0)	1722 ± 342
36	7 (5.1)	4 (2.9)	11 (8.0)	2291 ± 505
Unknown	5 (3.6)	4 (2.9)	9 (6.5)	1638 ± 288
Total	**71 (51.4)**	**67 (48.6)**	**138 (100.0)**	**1626 ± 448 g**

tional birth attendants (Table 2).

3.3. Risk Factors for Preterm Birth

As shown in Table 3, the commonest risk factor for preterm birth was preterm rupture of foetal membranes in 64 (46.4%) of the patients followed by lack of maternal antenatal care in 49 (35.5%) and multiple pregnancy in 37 (26.8%) respectively.

3.4. Morbidity and Mortality Pattern

The commonest medical conditions were respiratory problems in 95 (68.8%) followed by jaundice in 94 (68.1%) and sepsis in 54 (39.1%) of the patients (Table 4).

The case fatality rate was highest in the patients with necrotizing enterocolitis and seizures (66.7%) followed by respiratory problems (63.2%) and bleeding disorders (60.0%).

3.5. Clinical Outcome and Mean Duration of Stay according to Gestational Age

The duration of stay in the hospital ranged from 1 to 72 days with a mean duration of 13.33 ± 12.05 days. The mean duration of stay reduced with increasing gestational age from 18.25 ± 27.94 days in the 26 weeks gestational age group to 10.18 ± 6.90 in the 36 weeks gestational age group (Table 5).

Of the 138 preterms, 76 (55.1%) were discharged, 47 (34.1%) died, while 15 (10.9%) were discharged against medical advice (DAMA). Twenty six of the 47 patients who died were males while 21 females with a male to female ratio of 1.3:1.

Ninety one of the patients survived with an overall survival rate of 65.9%. The survival rate was 100.0% in the patients born at 33 and 36 weeks gestation respectively followed by those born at 35 weeks gestation with survival rate of 90.9%.

3.6. Survival Rate according to Category of Prematurity

As shown in Table 6, over half 74 (56.5%) of patients were mild preterms, followed by 14 (33.3%) very preterm and 9 (6.5%) extremely preterm for birth. The survival rate was significantly higher in the mild preterm category, followed by the very preterm category. This difference was statistically significant ($\chi^2 = 29.24$, p value = 0.000).

Table 2. Place of delivery.

Place of delivery	Number	Percentage
NDUTH	66	47.8
Other health centres	42	30.4
TBA	15	10.9
Unspecified	7	5.1
Home	5	3.6
Car	2	1.4
Picked up in the bush	1	0.7
Total	**138**	**100.0**

TBA: Traditional Birth Attendant.

Table 3. Risk factors for preterm delivery.

Risk factor	Number	Percentage
Preterm rupture of membranes	64	46.4
No maternal antenatal care	49	35.5
Multiple pregnancy	37	26.8
Hypertension in pregnancy	33	23.9
Abdominal massage	18	13.0
Ante-partum haemorrhage	17	12.3
Maternal febrile illness	13	9.4
Teenage mother	9	6.5
Birth defect	8	5.8
Maternal chorioamnionitis	6	4.3
Previous preterm delivery	4	2.9
Ingestion of herbal concoctions	1	0.7
Illicit drug intake	1	0.7

Table 4. Morbidity and mortality pattern.

Problem	Number	Percentage n = 138	Number who died	Case fatality rate
Respiratory problems	95	68.8	60	63.2
Jaundice	94	68.1	31	33.0
Sepsis	54	39.1	19	35.2
Asphyxia	40	29.0	15	37.5
Anaemia	28	20.3	11	39.3
Bleeding disorder	15	10.9	9	60.0
Necrotizing enterocolitis	12	8.7	8	66.7
Acyanotic congenital heart disease	8	5.8	3	37.5
Birth defect	8	5.8	2	25.0
Birth trauma	7	5.1	2	28.6
Hypoglycemia	7	5.1	4	57.1
Seizures	3	2.2	2	66.7

Table 5. Clinical outcome and mean duration of stay according to gestational age.

Gestational age at birth (weeks)	Total number (%)	Mean duration of stay (days)	Clinical outcome			Survival rate (%)
			Discharged	Died	DAMA	
24	1	5	0	1	0	0.0
25	0	0	0	0	0	0.0
26	4	18.25 ± 27.94	1	3	0	25.0
27	4	6.25 ± 6.70	0	4	0	0.0
28	18	17.83 ± 18.46	5	12	1	33.3
29	1	28	0	1	0	0.0
30	12	15.75 ± 14.52	5	5	2	58.3
31	15	15.00 ± 11.54	7	6	2	60.0
32	23	13.04 ± 10.12	14	8	1	65.2
33	15	11.60 ± 8.01	9	0	6	100.0
34	14	11.36 ± 6.93	10	3	1	78.6
35	11	14.75 ± 11.56	10	1	0	90.9
36	11	10.18 ± 6.90	9	0	2	100.0
Unknown	9	11.43 ± 11.89	6	3	0	66.7
Total	**138**	**13.33 ± 12.05**	**76**	**47**	**15**	**65.9%**

DAMA: discharged against medical advice.

Table 6. Survival rate according to category of prematurity.

Category	Total number	Percentage of total n = 138	Number who survived	Survival rate %	χ^2 (p value)
<28 weeks	9	6.5	1	11.1	29.24 (0.000)
28 to 31 weeks	46	33.3	22	47.8	
32 to 36 weeks	74	56.5	62	83.8	

4. Discussion

In the present study preterm admissions constituted 24.0% of all admissions at the special care baby unit of the NDUTH. This is less than the 16.4% reported by McGil Ugwu [24] at the Delta State University Teaching Hospital also in Southern Nigeria, but less than the 31.3% reported by Onwuanaku *et al.* [25] in Jos University Teaching Hospital, North Central Nigeria. The reason for these differences is not clear but may be due to differences in the incidence of preterm births in the various parts of Nigeria as a result of geographical and ethnic differences in these study populations. There is need for further studies on the influence of ethnicity and place of residence on the mean gestational age at birth.

There were more preterm males than females in the present study compared to the study by McGil Ugwu [16] in Warri and Zeleke *et al.* [26] in Ethiopia who reported more preterm females. The commonest risk factor for prematurity was preterm rupture of foetal membranes followed by lack of antenatal care. This is similar to findings by Shrestha *et al.* [27] in Nepal who reported lack of antenatal care as the commonest risk factor for preterm births among their patients. Multiple pregnancy ranked third as a risk factor for preterm delivery in the present study. Other Nigerian authors [14] [18] [28] have also reported multiple pregnancy as a risk factor for preterm delivery. This is not surprising as multiple pregnancy has been shown to contribute to the increase in percentage of preterm births [8] with the average gestational age of twin birth being 35 weeks [29]. The popular hypothesis is that multiple pregnancy causes over distension of the uterus which may stimulate premature uterine contractions resulting in preterm delivery [30] [31].

Hypertensive disorders in pregnancy were risk factors for preterm birth in almost a quarter of the patients in the present study. This is similar to reports from other authors in Nigeria [18] Nepal [27] and Thailand [32]. Onyiriuka and Okolo [33] carried out a study on neonatal morbidity pattern in infants born in Benin City to Nigerian mothers with hypertensive disorders in pregnancy. They reported that the rate of preterm delivery was

significantly higher in the hypertensive mothers compared to their normotensive counterparts. Hypertension in pregnancy is believed to predispose to acute or chronic utero-placental insufficiency resulting in antepartum and intrapartum foetal hypoxia with associated adverse outcomes of which preterm delivery is one [34].

Interestingly, abdominal massage also featured as a risk factor for prematurity in the present study. It is noteworthy that abdominal massage during pregnancy is common in the delta region of Nigeria where the present study was carried out [35]. The popular belief is that abdominal massage loosens the nerves and relaxes the muscles thereby facilitating easy pregnancy and delivery as well as correcting malpresentation [35]. This cultural practice however, has potentially harmful effects which include uterine rupture, abruptio placenta, premature rupture of foetal membranes, preterm labour and ruptured spleen [35]. Igbarase GO [36] reported a case of maternal and foetal death from ruptured spleen as a result of abdominal massage at 30 weeks gestation in a rural community in the delta region of Nigeria. This highlights the urgent need for public enlightenment campaigns on the dangers of abdominal massage in pregnancy.

The commonest morbidity in the patients in the present study was respiratory problems followed by jaundice and sepsis. This is similar to reports by Khan *et al.* [37] in Karachi, Pakistan who reported jaundice and sepsis as the commonest morbidities in their preterm patients. Onalo and Olateju [38] in Abuja, Nigeria also reported jaundice as the commonest morbidity in their preterm patients. Onwuanaku *et al.* [25] in Jos University Teaching Hospital Nigeria, however reported sepsis as the commonest morbidity, followed by jaundice. This highlights the importance of infection control in the management of preterm babies who are a high risk group for neonatal sepsis as a result of their immature immune system [39]. There is also an urgent need for the prevention and adequate management of jaundice in this vulnerable group.

The mortality rate in the present study was higher in the male preterms compared to their female counterparts which is similar to findings from other studies [16] [40]. This is not surprising as male neonates, including preterms have been consistently reported to have higher mortality rates compared to their female counterparts [41] [42]. In the present study, the duration of hospital stay increased with reducing gestational age. This may be explained by the fact that duration of hospital stay for specialized care is inversely proportional to gestational age as a result of associated illnesses and management requirements which increase with reducing gestational age [43].

The case fatality rate was highest in the patients with respiratory problems after necrotizing enterocolitis and seizures. Shrestha *et al.* [27] also reported respiratory problems as the commonest cause of death in their preterm patients. The overall survival rate was 65.9% with the survival rate improving with increasing gestational age and only one (11.1%) of the nine patients born at less than 28 weeks gestational age survived. This is not surprising as the average age of viability in Nigeria is still 28 weeks [17]. The survival rate of preterms born at less than 28 weeks gestation in developing countries like Nigeria tends to be low as a result of unavailability of exogenous surfactant and mechanical ventilation [32]. Kalimba and Ballot [44] in South Africa also reported a low survival rate of 26.5% in extreme low birth weight preterm babies who were not mechanically ventilated due to limited intensive care facilities. However 2007 reports in Netherlands, a developed country, showed that 52% of babies born between 23 and 27 weeks gestation survived to 2 years with 70.6% of them having no disability. Owa *et al.* [45] compared the birth weight and gestational age specific mortality rates among low birth weight infants at the neonatal units of Qatif Central Hospital, Saudi Arabia (with neonatal intensive care including 17 entilator support) and Wesley Guild Hospital, Ilesha, Nigeria (with only special care services but no 17 ventilator support). The overall mortality rate was lower in Qatif Central Hospital compared to Wesley Guild Hospital. This highlights the need for the establishment of neonatal intensive care units in developing countries like Nigeria with adequate equipment like portable x-rays and ventilators for more detailed evaluation and management of the extremely preterm for birth babies.

A limitation of the present study was that due to lack of sophisticated diagnostic facilities like portable xrays, cranial ultra sound scan and echocardiography, disease conditions like hyaline membrane disease, intra cranial haemorrhage and congenital heart disease were either under diagnosed or not diagnosed at all. Also as a result of late presentation to the hospital or incomplete information in the case notes, the gestational ages of some patients were unknown.

5. Conclusion

Preterms accounted for a significant percentage of neonatal admisions at the Special Care Baby Unit of the Nig-

er Delta University Teaching Hospital. The case fatality was higher among patients with necrotizing enterocolitis, seizures and respiratory problems. There is an urgent need for the establishment of a neonatal intensive care unit with adequate man power as well as appropriate diagnostic and management facilities in order to improve the survival rates of this vulnerable group of patients.

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References

[1] World Health Organization (1992) International Classification of Diseases and Related Health Problems. 10th Revision, Geneva.

[2] Huddy, C.L., Johnson, A. and Hope, P.L. (2001) Educational and Behavioral Problems in Babies of 32 - 35 Weeks Gestation. *Archives of Disease in Childhood. Fetal and Neonatal Edition*, **85**, 23-28. http://dx.doi.org/10.1136/fn.85.1.F23

[3] Wang, M.L., Dorer, D.J., Fleming, M.P. and Catlin, E.A. (2004) Clinical Outcomes of Near-Term Infants. *Pediatrics*, **114**, 372-374. http://dx.doi.org/10.1542/peds.114.2.372

[4] Engle, W.A., Tomashek, K.M., Wallman, C. and the Committee of Fetus and Newborn (2007) "Late-Preterm" Infants: a Population at Risk. A Clinical Report. *Pediatrics*, **120**, 1390-1401. http://dx.doi.org/10.1542/peds.2007-2952

[5] Federal Ministry of Health (2011) Saving Newborn Lives in Nigeria. Newborn Health I the Context of the Integrated Maternal, Newborn and Child Health Strategy. Revised 2nd Edition, 2011.

[6] Mohammad, T., Khattak, A.A., Shafiq-Ur-Rehman. (2009) Mortality and Morbidity Pattern in Small-For-Gestational Age and Appropriate-For-Gestational Age Very Preterm Babies: A Hospital Based Study. *Journal of Ayub Medical College Abbottabad*, **21**, 16-21.

[7] PeriStats (Online Database). White Plains, March of Dimes, New York, 2006. http://www.marchofdimes.com/peristats/

[8] Engle, W.A. and Kominiarek, M.A. (2008) Late Preterm Infants, Early Term Infants and Timing of Elective Deliveries. *Clinics in Perinatology*, **35**, 325-341. http://dx.doi.org/10.1016/j.clp.2008.03.003

[9] Beck, S., Wojdyla, D., Say, L., betran, A.P., Merialdi, M., Requejo, J.H., *et al.* (2010) The Worldwide Incidence of Preterm Birth: A Systematic Review of Maternal Mortality and Morbidity. *Bulletin of the World Health Organization*, **88**, 31-38. http://dx.doi.org/10.2471/BLT.08.062554

[10] Goldenberg, R.L., Culhane, J.F., Iams, J.D. and Romero, R. (2008) Epidemiology and Causes of Preterm Birth. *Lancet*, **371**, 75-84.

[11] Pennell, C.E., Jacobsson, B., Williams, S.M., Buus, R.M., Muglia, L.J. and Dolan, SM. (2007) Genetic Epidemiologic Studies of Preterm Birth: Guidelines for Research. *American Journal of Obstetrics & Gynecology*, **196**, 107-118. http://dx.doi.org/10.1016/j.ajog.2006.03.109

[12] Baron, L., Hodgaman, J.E. and Pavlova, Z. (1999) Causes of Death in the Extremely Low Birth Weight Infant. *Pediatrics*, **103**, 446-451. http://dx.doi.org/10.1542/peds.103.2.446

[13] Brewster, D. (1989) Neonatology in the developing world. Part 2. *Tropical Doctor*, **19**, 147-151.

[14] Etuk, S.J., Etuk, I.S. and Oyo Ita, A.E. (2005) Factors Influencing the Incidence of Preterm Birth in Calabar, Nigeria. *The Journal of Physiological Sciences*, **20**, 63-68.

[15] Abbasi, K.A. (1995) Neonatal Disease Profile in Larkana before and after Establishment of Neonatal Ward. *Journal Pakistan Medical Association*, **45**, 235-236.

[16] McGil Ugwu, G.I. (2010) Prematurity in Central Hospital and GN Children's Clinic in Warri Niger Delta. *Nigerian Medical Journal*, **51**, 10-13.

[17] Kuti, O. and Owa, J.A. (2003) Gestational Age Specific Neonatal Mortality among Preterm Singletons in a Nigerian Tertiary Institution. *International Journal of Gynecology & Obstetrics*, **8**, 319-320.

[18] Omole-Ohonsi, A. and Attah, RA. (2012) Risk Factors of Preterm Deliveries at Aminu Kano Teaching Hospital, Kano, Nigeria. *South Asian Journal of Management Sciences*, **1**, 3-10.

[19] Oyedeji, G.A. (1985) Socioeconomic and Cultural Background of Hospitalized Patients in Ilesa. *Nigerian Journal of Paediatrics*, **12**, 111-117.

[20] Filley, R.A. and Hadock, F.P. (2000) Sonographic Determination of Gestational Age. In: Callen, P.W., Ed., *Ultrasonography in Obstetrics and Gynecology*. 4th Edition, WB Saunders, Philadelphia, 146-170.

[21] Laing, F.C. and Frates, M.C. (2000) Ultrasound Evaluation during the First Trimester of Pregnancy. In: Callen, P.W.,

Ed., *Ultrasonography in Obstetrica and Gynacology*, 4th Edition, WB Saunders, Philadelphia, 105-144.

[22] Lumley, J. (2003) Defining the Problem: The Epidemiology of Preterm Birth. *BJOG*: *An International Journal of Obstetrics & Gynaecology*, **110**, 3-7. http://dx.doi.org/10.1046/j.1471-0528.2003.00011.x

[23] Lawn, J.E., Cousens, S. and Zupan, J. (2005) Lancet Neonatal Survival Steering Team. 4 Million Neonatal Deaths: When? Where? Why? *Lancet*, **365**, 891-900. http://dx.doi.org/10.1016/S0140-6736(05)71048-5

[24] McGil Ugwu, G.I. (2012) Pattern of Morbidity and Mortality in the Newborn Special Care Unit in a Tertiary Institution in the Niger Delta Region of Nigeria: A Two Year Prospective Study. *Global Advanced Research Journal of Medicine and Medical Sciences*, **1**, 133-138.

[25] Onwuanaku, C.A., Okolo, S.N., Ige, K.O., Okpe, S.E. and Toma, B.O. (2011) The Effects of Birth Weight and Gender on Neonatal Mortality in North Central Nigeria. *BMC Research Notes*, **4**, 562. http://dx.doi.org/10.1186/1756-0500-4-562

[26] Zeleke, B.M., Zelalem, M. and Mohammed, N. (2012) Incidence and Correlates of Low Birth Weight at a Referral Hospital in North-West Ethiopia. *The Pan African Medical Journal*, **12**, 4.

[27] Shrestha, S., Dangol Singh, S., Shrestha, M. and Shrestha, R.P.B. (2010) Outcome of Preterm Babies and Associated Risk Factors in a Hospital. *Journal of Nepal Medical Association*, **49**, 286-290.

[28] Onyiriuka, A.N. (2011) Twin Delivery: Incidence and Perinatal Outcome in a Nigerian Mission Hospital. *Bangladesh Journal of Medical Science*, **10**, 45-51.

[29] Lee, Y.M., Cleary-Goldman, J. and D'Alton, M.E. (2006) The Impact of Multiple Gestations on Late Preterm (Near-term) Births. *Clinics in Perinatology*, **33**, 777-792. http://dx.doi.org/10.1016/j.clp.2006.09.008

[30] Wood, N.S., Marlow, N., Costeloe, K., Gibson, A.T. and Wilkinson, A.R. (2000) Neurological and Developmental Disability after Extreme Preterm Birth. EPICure Study Group. *The New England Journal of Medicine*, **343**, 378-384. http://dx.doi.org/10.1056/NEJM200008103430601

[31] Gyetvai, K., Hannah, M.E., Hodnett, E.D. and Ohisson, A. (1999) Tocolysis for Preterm Labour: A Systematic Review. *Obstetrics & Gynecology*, **94**, 869-877. http://dx.doi.org/10.1016/S0029-7844(99)00329-4

[32] Charearnsutsiri, R. (2004) Outcomes of Very Low Birth Weight Infants at Prapokklao Hospital in the First Four Years of the New Millennium. *The Journal of Prapokklao Hospital Clinical Medical Education Center*, **21**, 175-183.

[33] Onyiriuka, A.N. and Okolo, A.A. (2007) Neonatal Morbidity Pattern in Infants Born in Benin City to Nigerian Mothers with Hypertensive Disorders in Pregnancy. *Nigerian Journal of Clinical Practice*, **10**, 294-299.

[34] Ferrer, R.L., Sibai, B.M., Mulrow, C.D., Chiquette, E., Stevens, K.R. and Cornell, J. (2000) Management of Mild Chronic Hypertension during Pregnancy: A Review. *Obstetrics & Gynecology*, **96**, 849-860. http://dx.doi.org/10.1016/S0029-7844(00)00938-8

[35] Igberase, G.O. (2012) Harmful Cultural Practices and Reproductive Health in Nigeria. *Continental Journal of Tropical Medicine*, **6**, 27-33.

[36] Igberase, G.O. (2012) Maternal and Foetal Deaths from Ruptured Spleen as a Result of Abdominal Massage by Traditional Birth Attendants in the Niger Delta, Nigeria. *Afrimedic Journal*, **3**, 34-36.

[37] Khan, M.R., Maheshwari, P.K., Shamim, H., Ahmed, S. and Ali, S.R. (2012) Morbidity Pattern of Sick Hospitalized Preterm Infants in Karachi, Pakistan. *Journal of Pakistan Medical Association*, **62**, 386-388.

[38] Onalo, R. and Olateju, K.E. (2013) Trend and Seasonality in Admissions and Outcome of Low Birth Weight Infants in Gwagalada Abuja, Nigeria. *International Journal of TROPICAL DISEASE & Health*, **3**, 190-198. www.sciencedomain.org

[39] McGuire, W., Clerihew, L. and Fowlie, P.W. (2004) Infection in the Preterm Infant. *British Medical Journal*, **329**, 1277-1280.

[40] Trotman, H. and Lord, C. (2007) Outcome of Extremely Low Birth Weight Infants at the University Hospital of the West Indies, Jamaica. *West Indian Medical Journal*, **56**, 409-413.

[41] Naeye, R.L., Burt, I.S. and Wright, D.I. (1971) Neonatal Mortality, the Male Advantage. *Pediatrics*, **48**, 902-906.

[42] Khoury, M.J., Marks, J.S. and McCarthy, B.J. (1985) Factors Affecting the Sex Differential in Neonatal Mortality. *American Journal of Obstetrics & Gynecology*, **151**, 777-782. http://dx.doi.org/10.1016/0002-9378(85)90518-6

[43] Escobar, G.J., Greene, J.D. and Hulac, P. (2005) Rehospitalization after Birth Hospitalization: Pattern among Infants of All Gestations. *Archives of Disease in Childhood*, **90**, 125-131. http://dx.doi.org/10.1136/adc.2003.039974

[44] Kalimba, E.M. and Ballot, D.E. (2013) Survival of Extremely Low Birth Weight Infants. *South African Journal of Child Health*, **7**, 13-16.

[45] Owa, J.A., Al-Dabbous, I. and Owoeye, A.A. (2004) Weight Specific Morbidity and Mortality Rates among Low Birth Weight Infants in Developing Countries. *Nigerian Journal of Paediatrics*, **31**, 19-25.