The current pattern of facility-based perinatal and neonatal mortality in Sagamu, Nigeria

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Abstract
Background: Perinatal and neonatal mortality rates have been described as sensitive indices of the quality of health care services. Regular audits of perinatal and neonatal mortalities are desirable to evaluate the various global interventions.
Objective: To describe the current pattern of perinatal and neonatal mortality in a Nigerian tertiary health facility.
Methods: Using a prospective audit method, the socio-demographic parameters of all perinatal and neonatal deaths recorded in a Nigerian tertiary facility between February 2017 and January 2018 were studied.
Results: There were 1,019 deliveries with stillbirth rate of 27.5/1000 total births and early neonatal death (END) rate among in-born babies of 27.2/1000 live births. The overall perinatal mortality rate for in-facility deliveries was 53.9/1000 total births and neonatal mortality (till the end of 28 days) rate of 27.2/1000 live births. Severe perinatal asphyxia and prematurity were the leading causes of neonatal deaths while obstructed labour and intra-partum eclampsia were the two leading maternal conditions related to stillbirths (25.0% and 21.4% respectively).
Gestational age < 32 weeks, age < 24 hours and inborn status were significantly associated with END ($p = 0.002$, $p < 0.001$ and $p = 0.002$ respectively).
Conclusion: The in-facility perinatal mortality rate was high though stillbirth rate was relatively low. There is a need to improve the quality of emergency obstetric and neonatal services prior to referral to tertiary facilities.
Keywords: Asphyxia, neonatal death, obstructed labour, perinatal death, stillbirth.
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Introduction
Perinatal mortality, which refers to the death of a fetus after the age of viability and neonatal deaths within the first seven days of life, is a crucial measure of the quality and degree of utilization of obstetric and immediate post-birth neonatal care services[1]. Neonatal mortality is known to contribute close to 45% of all under-five deaths in the developing parts of the world[2]. Remarkably these neonatal deaths frequently occur within the first week of life and mostly within the first 24 hours of life[3-5]. This relates to events occurring in the immediate ante-partum and intra-partum periods. Hitherto, global efforts have been focused mostly on the reduction of neonatal deaths and one of such interventions is the Essential Newborn Care which focuses on simple measures for reducing the burden of the leading causes of neonatal morbidity and mortality such as asphyxia, prematurity, severe infections and severe hyperbilirubinaemia[6]. In addition, the reduction of stillbirth rates, especially in the poor parts of the world where pregnant women have poor access to quality health care, have been brought to the lime light and concerted efforts are being put in place to reduce the risks of intra-uterine foetal deaths[7]. These call for regular audit

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of perinatal deaths (stillbirth and early neonatal deaths) to assess the progress made in this respect or otherwise.
The bulk of neonatal mortalities and stillbirths have been reported to occur in the Sub-Saharan Africa and the Southeast Asia where the poorest population of the world reside[8]. The poor development and the poor state of the economy of those places would explain to a large extent their characteristic high burden of perinatal and neonatal mortality[9].

The Olabisi Onabanjo University Teaching Hospital, Sagamu, south-west Nigeria has provided specialized obstetric and neonatal care services for more than thirty years. The pioneer report of perinatal mortality in the hospital, covering the first thirty months of its operation (March 1989 to August 1991), was retrospectively done in 1994[10]. In that report, the overall intra-facility perinatal mortality rate was 119.9/1000 total births with stillbirth rate of 87.5/1000 total births and early neonatal death rate of 35.5/1000 live births[10]. In a similar retrospective study of neonatal mortality in the same institution covering January 1991 to December 1992[11], the neonatal mortality rates for intra-facility births was 50.88/1000 live births. In another retrospective follow-up study covering the period between 1996 and 2005[12], only the pattern of neonatal mortality in the hospital was reported as 47.2/1000 live births with 78.3% of all neonatal deaths contributed by out-born babies. The early neonatal death rate in the latest report was 33.2/1000 live births. Given the varying figures recorded over time and the various efforts made at improving neonatal survival within the preceding decade on account of the defunct Millennium Development Goals, it is important to review the current pattern of perinatal and neonatal mortality in this facility by auditing prospectively kept data, as an indirect way of evaluating the progress made.
Therefore, the objective of the present study was to describe the current pattern of perinatal and neonatal mortality in this Nigerian tertiary health facility, more than a decade after the last retrospective audit.

Materials and methods

This audit of prospectively kept perinatal mortality data was carried out at the Neonatal and Maternity Units of the Olabisi Onabanjo University Teaching Hospital, Sagamu, south-west Nigeria over a period of twelve months (February 2017 to January 2018). It was a component part of a larger study of Childhood Mortality (In press) for which ethical approval was obtained from the Health and Research Ethics Committee of the hospital.
The hospital as a tertiary health facility provides specialized paediatric care, including middle level neonatal care services to at least four of the thirty-six states of the federation. The neonatal unit is a 28-cot ward equipped to provide care for high risk babies delivered within the hospital or referred from other facilities within Sagamu and from the environs. Out-born babies are usually self-referred from homes or officially-referred from peripheral government-owned and privately-owned clinics. Similarly, pregnant women utilize the obstetric care services in the hospital as booked, unbooked, emergency and non-emergency cases. Deliveries (spontaneous, instrumental and surgical) are usually conducted by a team of obstetricians and midwives. The pattern of utilization of the obstetric care services in the hospital had earlier been described[13].
The neonatology team, comprising two consultants, senior residents and junior residents, is usually involved in the management of high-risk pregnancies including neonatal resuscitation and post-resuscitation care in the neonatal unit as necessary. The facilities available for the care of hospitalized babies include the use of infant incubators and radiant warmers for thermoregulation, the use of improvised nasal bubble Continuous Positive Airway Pressure ventilation for respiratory support, phototherapy machines and other facilities for the management of severe hyperbilirubinaemia, partial parenteral nutrition and gavage feeding. Facilities for mechanical ventilation, blood gas analysis and total parenteral nutrition are presently not available in the unit.

Data collection

Using a structured, close-ended data capture form, the socio-demographic and clinical parameters of all the deaths recorded on the neonatal ward and all the stillbirths recorded in the maternity unit were included. The mothers were not interviewed. Babies who were dead on arrival in the hospital were excluded. The data obtained included the estimated gestational age EGA (derived from the Modified Ballard Method[14] for live babies and from the mothers' last menstrual period for stillbirths), place of birth (categrized as in-born or out-born), age on admission (in hours) for live babies, sex, birth weight or body weight on admission, intra-uterine growth pattern as determined by plotting the birth weights on the Lub-

chenco chart[15], antenatal care booking status of mothers, the major clinical diagnoses for live babies (where multiple morbidities were present, only the major underlying morbidities are recorded rather than the complications) and maternal morbidities and obstetric complications for stillbirths, duration of hospitalization and time of death for live deliveries. The socio-economic status of each family was determined using the highest educational qualification and present occupation of both parents[16]. These parameters are scored and the mean score to the nearest whole number represented socio-economic classes I, II, III, IV or V. In this study, classes I to III were re-grouped as upper class and classes IV and V as lower class. Parental educational qualification was also separately regrouped into low (none or primary) and high (secondary and tertiary).

The total numbers of live deliveries and stillbirths as well as the total number of neonatal admissions (inborn and out-born) were retrieved from the Health Information Management Unit of the hospital. Deaths within the first seven days of life were classified as early neonatal deaths (END) while deaths occurring after seven days till 28 days of age were classified as late neonatal deaths (LND). The data for hospital deliveries were used to compute the intra-facility perinatal mortality rate (PNMR) (number of stillbirths and END per 1000 total births) and neonatal mortality rate (NMR) (number of inborn deaths per 1000 live births) while the neonatal mortality rate for out-born babies were computed per 1000 admissions[10]. For this study, stillbirth was defined as foetal death occurring at or after 28 weeks of gestation[17].

Data management

Using the SPSS version 20.0 software, descriptive statistics (proportions, mean, median with interquartile range IQR and standard deviation) was carried out. Inferential statistics such as the Chi-Square test, and the Mann Whitney-U test were also used to compare the attributes of the variables for the groups of study subjects. Parametric tests (Student's test) applied when the data were normally distributed while non-parametric tests (Chi-Square test and Mann Whitney-U test) were used for data which were not normally distributed. P-values less than 0.05 defined statistical significance.

Results

A total of 1019 deliveries were recorded in the hospital during the period of study; these comprised 991 live births and 28 stillbirths. There were 19 (67.9%) and 9 (32.1%) fresh and macerated stillbirths respectively. Two hundred and thirty-two in-born babies (23.4% of the live births) were hospitalized. A total of 519 babies were hospitalized; these comprised 44.7% (232/519) inborn and 55.3% 287/519) out-born babies.

Intra-facility Mortality Rates (Inborn babies only)

The stillbirth rate was 27.5/1000 total births (28/1019) while the early neonatal death rate was 27.2/1000 live births (27/991). Overall, there were 55 perinatal deaths among hospital deliveries giving an overall perinatal mortality rate (PNMR) of 53.9/1000 total births. The intra-facility neonatal mortality rate for inborn babies was 27.2/1000 live births.

Pattern of neonatal deaths for both inborn and out-born babies

Overall, there were 68 neonatal deaths out of 519 admissions; this gave overall neonatal mortality rate of 131.0/1000 admissions. These neonatal deaths comprised 27 (39.7%) inborn babies and 41 (60.3%) out-born babies. In addition, the neonatal deaths included 54 (79.4%) END and 14 (20.6%) LND. All the 27 inborn neonatal deaths were END whereas the 41 out-born deaths comprised 27 (65.9%) END and 14 (34.1%) LND. The ENDR was 104.0/1000 admissions (54/519) while the LNDR was 26.9/1000 admissions (14/519).

Characteristics of neonatal deaths

The median age on admission was 3.5 hours (IQR 0.6-56.7 hours), the mean body weight was 1.9±0.8kg and the mean EGA was 35.3±4.3weeks. The median duration of hospitalization was 15.0 hours (IQR 5.3-48hours) and the median age at death was 40.5 hours (IQR 11.7-75.8 hours). Table I shows that there were 44 (64.7%) males; the babies were mostly aged <6 hours on admission (54.4%), preterm (57.3%), low birth weight (54.4%), appropriate for gestational age (44.1%), with duration of hospitalization 24 hours or less (66.1%) and were aged 72 hours or less at death (69.1%). Maternal characteristics included unbooked status among 88.2%, at least secondary education among 75% and lower socio-economic status among 80.8%.

Table I: General characteristics of neonatal deaths

Parameters		*Frequencies (n = 68)*	*Percentages*
Sex	Female	24	35.3
	Male	44	64.7
Age on admission (hours)	<6h	37	54.4
	6-12h	5	7.4
	13-24h	5	7.4
	25-72h	6	8.8
	>72	15	22.0
EGA (weeks)	Missing	5	7.4
	<28	2	2.9
	28-31	11	16.2
	32-34	12	17.6
	35-37	14	20.6
	>37	24	35.3
Birth Weight (kg)	Missing	17	25.0
	<1.0	3	4.4
	1.0-1.49	18	26.5
	1.5-2.49	16	23.5
	2.5-3.99	14	20.6
IUGP*	LGA	4	5.9
	SGA	17	25.0
	AGA	30	44.1
	Unknown	17	25.0
Place of delivery	Inborn	27	39.7
	Outborn	41	60.3
ANC Booking	Booked	8	11.8
	Unbooked	60	88.2
Maternal Education**	None	4	5.9
	Primary	13	19.1
	Secondary	42	61.8
	Tertiary	9	13.2
Socio-economic Status***	II	2	2.9
	III	11	16.2
	IV	43	63.2
	V	12	17.6
Duration of hospitalization	<12h	33	48.5
	13-24h	12	17.6
	25-72h	16	23.6
	>72h	7	10.3
Age at death	<24h	22	32.3
	25-72h	25	36.8
	>72h	21	30.9

EGA – Estimated Gestational Age
*IUGP –Intrauterine Growth Pattern; SGA – Small for gestational age, LGA- Large for gestational age, AGA – Appropriate for gestational age
**High-Secondary and tertiary education; Low – None and primary education
***High- I-III; Low – IV and V

The clinical diagnoses among the babies included severe perinatal asphyxia (25; 36.8%), prematurity (25; 36.8%), severe hyperbilirubinaemia with acute bilirubin encephalopathy (6, 8.8%), sepsis (6; 8.8%), congenital malformations (4; 5.9%) and tetanus (2; 2.9%).

Table II shows that compared to babies with LND, significantly higher proportions of babies with END were younger on admission ($p < 0.001$), inborn ($p = 0.002$), with EGA <37 weeks ($p = 0.004$), with EGA <32 weeks ($p = 0.002$), were inappropriately grown for gestational age (small for gestational age/large for gestational age) ($p < 0.001$), spent less time on admission ($p = 0.015$) and were younger at the point of death ($p < 0.001$). On the other hand, the babies in the comparison groups were similar in terms of antenatal booking status of mothers, body weight on admission, socio-economic status and

maternal education. The clinical diagnoses among the 54 babies with END included prematurity (23; 42.6%), asphyxia (24; 44.4%), congenital malformations (4; 7.4%) and acute bilirubin encephalopathy (3; 5.6%). On the other hand, sepsis (6; 42.9%), acute bilirubin encephalopathy (3; 21.4%), prematurity (2; 14.3%), tetanus (2; 14.3%) and asphyxia (1; 7.1%) were the clinical diagnoses among the 14 babies with LND. There was no baby with congenital malformation in the LND group.

Table II: Comparison of the characteristics of babies with Early Neonatal Deaths (END) and Late Neonatal Deaths (LND)

Parameters		***END (n = 54)(%)***	***LND (n = 14)(%)***	***Statistics***
Median Age (Hours)		1.75 (IQR 0.5-14.0)	252 (IQR 150.0-390.0)	MWU p = 0.000
Median Weight (kg)		1.88 (IQR 1.21-2.64)	2.05 (IQR 1.5-2.38)	MWU p = 0.705
Median EGA (weeks)		36.0 (IQR 31.0-39.0)	39.0 (IQR 33.7-40.0)	MWU p = 0.570
Age on admission				
	<24hours	45 (83.3)	2 (14.3)	*χ^2 = 21.702
	>24 hours	9 (16.7)	12 (85.7)	P <0.001
Place of delivery				
	Inborn	27 (50.0)	0 (0.0)	*χ^2 = 9.615
	Outborn	27 (50.0)	14 (100.0)	P = 0.002
Antenatal Booking Status				
	Booked	8 (14.8)	0 (0.0)	*χ^2 = 1.140
	Unbooked	46 (85.2)	14 (100.0)	P = 0.286
Gestational Age				
	<37 weeks	29 (53.7)	3 (21.4)	*χ^2 = 13.331
	>37 weeks	24 (44.4)	7 (50.0)	P = 0.004
	Unknown	1 (1.9)	4 (28.6)	
Gestational Age				
	<32 weeks	15 (27.7)	1 (7.1)	*χ^2 = 12.866
	>32 weeks	38 (70.4)	9 (64.3)	P = 0.002
	Unknown	1 (1.9)	4 (28.6)	
Weight on admission				
	<1.5kg	19 (35.2)	3 (21.4)	*χ^2 = 0.436
	>1.5kg	35 (64.8)	11 (78.6)	P = 0.509
Weight on admission				
	<2.5kg	37 (68.5)	12 (85.7)	*χ^2 = 0.890
	>2.5kg	17 (31.5)	2 (14.3)	P = 0.345
Intra-Uterine Growth Pattern*	AGA	28 (51.8)	2 (14.3)	*χ^2 = 34.995
	SGA/LGA	21 (38.9)	0 (0.0)	p<0.001
	Unknown	5 (9.3)	12 (85.7)	
Maternal Education**				
	High*	42 (77.8)	9 (64.3)	χ^2 = 1.079
	Low	12 (22.2)	5 (35.7)	P = 0.299
Socio-economic Status***				
	High**	10 (18.5)	3 (21.4)	*χ^2 = 0061
	Low	44 (81.5)	11 (78.6)	P = 0805
Median duration of hospitalization		11.5 (IQR 4.8-32.2)	25.0 (IQR 8.0-156.0)	MWU P = 0.015
Median age at death		27.3 (IQR 10.2-54.3)	351.0 (IQR 259.5-564.0)	MWU p <0.001

Figures in parentheses are percentages of the total in the respective columns
EGA – Estimated Gestational Age; MWU – Mann Whitney-U Test
*SGA – Small for gestational age, LGA- Large for gestational age, AGA – Appropriate for gestational age
**High-Secondary and tertiary education; Low – None and primary education
***High- I-III; Low – IV and V

Characteristics of stillborn babies

Table III shows that the mean weight of the 28 stillborn babies was 2.5±0.9kg while the mean EGA was 36.4±4.3 weeks. Most of the babies delivered stillborn were males (60.7%), weighed 2.5kg or greater (64.2%), had EGA 35 weeks or greater (71.4%) and were appropriately grown for gestational age (71.4%). These babies mostly belonged to mothers who were unbooked for antenatal care (71.4%), had at least secondary education (71.4%) and belonged to the lower socio-economic classes (64.3%). The leading maternal conditions and complications associated with stillbirths included obstructed labour (7; 25.0%), intra-partum eclampsia (6; 21.4%), chorioamnionitis (5; 17.9%) and abruptio placentae (4; 14.3%).

Table III: General characteristics of stillborn babies

Parameters		*Frequency*	*Percentage*
Sex	Female	11	39.3
	Male	17	60.7
Weight	1-1.49kg	5	17.9
	1.5-2.49kg	5	17.9
	2.5-3.99kg	16	57.1
	>4.0	2	7.1
EGA (weeks)	28-31	4	14.3
	32-34	4	14.3
	35-37	8	28.6
	>37	12	42.8
IUGP*	AGA	20	71.4
	SGA	5	17.9
	LGA	3	10.7
Booking	Booked	8	28.6
	Unbooked	20	71.4
Maternal Education	Primary	8	28.6
	Secondary	10	35.7
	Tertiary	10	35.7
Socio-economic Status	II	2	7.1
	III	8	28.6
	IV	15	53.6
	V	3	10.7
Type of Stillbirth	Fresh	19	67.9
	Macerated	9	32.1
Maternal complications	Abruptio placentae	4	14.3
	Chorioamnionitis	5	17.9
	Intra-partum eclampsia	6	21.4
	Obstructed labour	7	25.0
	Placenta praevia	3	10.7
	Ruptured uterus	2	7.2
	Severe Pre-eclampsia	1	3.6

EGA – Estimated Gestational Age
*IUGP –Intrauterine Growth Pattern; SGA – Small for gestational age, LGA- Large for gestational age, AGA – Appropriate for gestational age

Discussion

The present study of perinatal and neonatal deaths in Sagamu, Nigeria spanning twelve months was an audit of prospectively kept hospital records unlike the previous studies which were retrospectively carried out in the last three decades of the existence of the hospital[10-12]. The method applied in the present study removed the problems of incomplete data; where data were recorded as missing, it was because the needed parameters (birth weight, EGA, Intra-uterine growth pattern) could not be determined because the infants, who were referred, were older than 48 hours at presentation. The overall perinatal mortality rate of 53.9/1000 total births obtained in the present study was remarkably lower than 119.9/1000 total births reported at the same centre more than two decades ago[10].

The remarkable decline in the perinatal rate in the same centre can be attributed to improved quality of intra-facility obstetric and perinatal care over time, particularly in terms of personnel, facilities and practices. The current perinatal mortality rate was similarly lower than 78/1000 total births recorded in a multi-centre Nigerian study of 2011[18] as well as 62.7/1000 total births, 81/1000 total births, and 130/1000 total births reported from South-East Nigeria,[19] Ilorin,[20] and Katsina[21] in the Northern

part of Nigeria in the year 2011, 2012 and 2014 respectively. These previously reported data were similarly hospital-based and could be compared with the current data without remarkable bias.

On the other hand, the perinatal mortality rate in the present study was higher than 36/1000 total births obtained from the analysis of National Demographic Survey data on non-hospital births in the country as reported in 2014[22]. The observed difference is difficult to explain as perinatal rate among non-hospital births may be ordinarily expected to be higher compared to hospital births due to lack of expertise at the community level. However, this observation may be related to the pattern of obstetric care seeking behaviour where difficult labour and deliveries only get to the tertiary hospital as the last resort and almost always as emergencies[13,23].
The perinatal mortality rates obtained from the studies conducted outside Nigeria vary widely without a consistent pattern just as the study designs varied over time and across facilities. In the same vein, the perinatal mortality rate in the present study was higher than 47.9/1000 total births and 29.2/1000 total births reported from Nepal and South Africa in 2011 and 2015 respectively[24,25]. This observation may suggest that the quality of perinatal care or the pattern of utilization of perinatal care are remarkably better in those countries compared to what presently obtains in Nigeria.

The stillbirth rate of 27.5/1000 total births was lower than 87.5/1000 total births earlier recorded in the same facility in 1994[10]. The observed difference may suggest better management of pregnancy complications which present in the hospital early enough. Lending some supports to this observation was the predominance of fresh stillbirths compared to macerated stillbirths as the forer are usually suggestive of severe intra-partum events arising from complications of labour and delivery causing foetal hypoxia. While the stillbirth rate in the present study was comparable to 30.7/1000 total births reported from Nepal in 2004[24], it was remarkably lower than 71/1000 total births,[17] 52/1000 total births[19], and 85/1000 total births[21], previously reported from other facilities in Nigeria for unknown reasons aside improved quality of obstetric care services.

Therefore, it is attractive to speculate that the low stillbirth rate recorded in the present study may be attributed to better management skills and facilities for pregnancy and labour complications which have improved over the years. The recorded stillbirths were more likely to be due to avoidable delays in presentation in the hospital or late referrals from peripheral health facilities. Fresh stillbirths constituted two-thirds of all stillbirths in the present study and this was higher than the average of half of all stillbirths suggested by the WHO.[17] This observation suggests that the stillbirth rate could be further reduced if the quality of intra-partum care (in terms of the care received at peripheral facilities, prompt referral of high-risk pregnancies to better equipped facilities and prompt effective interventions) could be enhanced. These are included in the recommendations of the Every Newborn Action Plan[26].

Nevertheless, the relatively high birth weight (>2.5kg) and estimated gestational age (>35 weeks) of most of the babies delivered as stillborn may suggest that these deaths were due to other problems apart from prematurity. It is important to add that obstructed labour, eclampsia and chorioamnionitis were the leading morbidities among the mothers with stillbirth. These conditions are modifiable but their association with stillbirth may be related to poor obstestric care-seeking behaviours as determined by poor socio-economic status. More local studies are desired to determine the current burden of severe intra-partum events on the occurrence of stillbirth in a resource-constrained setting, facility and community inclusive. Obviously, the preponderance of unbooked antenatal care status of the mothers and the low family socio-economic status despite relatively high education appeared to point to poor utilization of available services as a result of poor finances as a contributory factor in stillbirths.

The pattern of neonatal deaths was similar to previous reports from the same facility although the early neonatal death rate was lower in the present study (27.2/1000 live births) compared to the previously recorded rates of 35.5/1000 live births in 1994[10], and 47.2/1000 live births in 2005[12]. Improved quality of immediate post-delivery care of neonates may explain the lower early neonatal death rate recorded in the present study. However it is instructive that 55% of the hospitalized infants were referred. The details of perinatal events for these referred babies were not known but could be speculated to be somewhat poor for them to have required hospitalization. The burden of perinatal and neonatal mortality contrib-

uted by unbooked pregnancies, intra-partum referral of pregnancies and post-delivery referral of compromised babies deserve a lot more attention.

Although less than a quarter of the live births required hospitalization, the pattern of clinical diagnoses were not different from the previous reports[11,12]. Perinatal asphyxia and prematurity with its complications were the leading clinical problems similar to previous reports within and outside the country[18,19,21,25,27]. Interestingly, severe hyperbilirubinaemia with acute bilirubin encephalopathy and severe infections were not as common in the present report compared to the findings in the previous studies[12]. Equally striking is the rarity of tetanus as a cause of death in the present study. These observations may be related to the use of efficient management protocols for both severe infections and hyperbilirubinaemia in the unit. Improved awareness and better tetanus toxoid coverage may explain the rarity of tetanus as no other facility within the environs possessed the equipment and expertise required for the management of neonatal tetanus hence, cases were not likely to be sequestrated in other facilities. For obvious reasons, prematurity and asphyxia were prominent among babies with END. Respiratory failure happens to be major cause of death in both morbidities and the use of mechanical ventilation within the confines of a resource-limited setting may be the solution to the challenge. At present, improvised nasal bubble continuous positive airway pressure[28] is administered to babies with compromised respiratory functions and this has been efficint in reducing mortalities except in situations of multiple organ-system involvement. Severe infections and ABE predominated among babies with LND probably because most cases may not be directly related to intra-partum events hence, the tendency to present much later in early life.

It is instructive that early neonatal deaths constituted close to four-fifth of the recorded neonatal deaths in this study. This calls for serious attention to immediate perinatal events such as foetal hypoxia and birth injuries which may result in death. Screening for obstetric risk factors and early detection of morbidities should be incorporated into the training and practice of personnel who attend deliveries, particularly the non-specialized birth attendants within the community and at the peripheral facilities. Referred or out-born babies constituted more than half of neonatal admissions and close to two-thirds of neonatal deaths in this study. This group of babies have previously been noted to contribute a larger proportion of neonatal deaths[12]. Therefore, interventions to facilitate prompt materno-foetal referral or early neonatal referral to facilities adequately equipped for the care of such high risk babies should be designed and built into the existing health system and practices.

END was significantly associated with prematurity, abnormal intra-uterine growth pattern, early age at admission and delivery within the hospital. The association between END and in-born status can be explained by the fact that many of the pregnancies delivered in our hospital were referred as emergencies from other less-equipped facilities where the referral decision could have been delayed for various socio-cultural and economic reasons. Therefore, the foetuses often arrived at the tertiary facility, compromised and predisposed to perinatal death. These factors reflect the presence of risk for morbidities. The younger age at admission and in-facility delivery may be explained by the severity of intrapartum complications in the mother warranting immediate institution of specialized care for the babies. Specialized care is available in the hospital except for intensive care and assisted ventilation needs are largely met using the bubble nasal CPAP. The similarities between babies who had END and LND suggested comparable problems of poor antenatal booking status and low socio-economic status which are strong risk factors for poor perinatal outcome.

Conclusion

The in-facility perinatal mortality rate in the present study was high though stillbirth rate was relatively low. This study showed decline in intra-facility overall perinatal mortality, stillbirth and early neonatal mortality rates compared to the findings recorded at the same centre over three decades ago. Nevertheless, the intra-facility design of this study is acknowledged as limitations to this study.

Conflict of interest

The authors have none to declare.

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