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Neonatal Deaths and Autopsy Rates in a Nigerian Tertiary Hospital: A 10-Year Trend Analysis in University of Calabar Teaching Hospital, Calabar, Nigeria

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Abstract

The pains and challenges of pregnancy and delivery are made worse when the resultant neonate dies. Fortunately, many of these neonatal deaths can be prevented if autopsies are routinely conducted to ascertain the immediate and remote causes of death toward subsequent prevention. Unfortunately, there is paucity of studies on neonatal autopsy rates (NARs) in many developing countries, with few reports indicating unacceptably low rates. This study was therefore aimed at assessing the trend in neonatal deaths and autopsy rates in Calabar, Nigeria. Trend analysis of retrospective data obtained from medical records of neonatal deaths and deliveries was conducted. Neonatal mortality rate (NMR) and NAR were obtained for each of the years within 2004-2013. Ethical approval was obtained from the ethical committee of University of Calabar Teaching Hospital (UCTH), Calabar, Nigeria. In the 10-year study period, there were 22,916 deliveries with a male:female ratio of 1:0.95. There were 1136 neonatal deaths, yielding a total NMR of 49.6 per 1000 live births (ranging from 26.7 in 2011 to 93.7 in 2004). Bimodal peak in NMR was found at 2008 and 2012. Eighty six neonatal autopsies were conducted within the study period yielding a mean autopsy rate of 7.57%, ranging from 0% in 2008 to 25.0% in 2013. This study found unacceptably high NMR and low NAR in the study setting. There was, however, gradual decrease in mortality and increase in autopsy rates through the study period. It is essential to redouble the efforts at improving public health education and awareness on the relevance of autopsy toward improved health service delivery. Similar studies are recommended in other similar and dissimilar settings.

Keywords: Neonatal mortality; Neonatal autopsy; UCTH; Calabar; Nigeria.

1. INTRODUCTION

The first 28 days of life (neonatal period) is a vulnerable period owing to potential newborn maladjustment to new environment [1]. Globally, death during this period, which is estimated to be four million annually, is not uncommon in low-income countries with low standards of maternal and newborn care [2, 3]. One of the United Nation's 2030 sustainable development goals aims at ensuring healthy lives and promotion of well-being for all ages [4]. A logical approach to attain such goal for the neonatal age group includes accurate documentation of the number, rate, and causes of neonatal deaths toward development and implementation of better preventive strategies [5].

Unfortunately, autopsy rates appear to be declining worldwide [6, 7], although there are reports of rates of 71.2% and 71.7% in the United States [8] and Australia [9], respectively. In addition, only few developing countries have accurate vital registration systems for estimation of trend in neonatal mortality rates (NMRs) [10, 11]. There is paucity of studies on neonatal autopsy rates (NARs) in the highly multicultural and religious Niger-Delta region of Nigeria. This study was, therefore, aimed at assessing the trend in neonatal autopsies in a referral health center in Calabar, a metropolitan city in the oil-rich Niger-Delta region.

2. METHODS

Retrospective study of data obtained from medical records and childbirth registries was conducted within 2004-2013 at University of Calabar Teaching Hospital (UCTH). Trend analysis was conducted, and the data were presented using tables and graphs. UCTH is a tertiary care referral center with a 50-bed space neonatal unit, comprising a sick babies unit and a special care baby unit. The neonatal unit admits an average of 48 neonates monthly for special care babies unit and 50 neonates monthly for sick babies unit. The obstetric unit of UCTH records an average of 300 births monthly. Ethical approval was obtained from UCTH Ethical Committee.

3. RESULTS

In the 10-year trend analysis, there were a total of 22,916 deliveries with a male:female ratio of 1:0.95 and 1136 neonatal deaths. During this period, the total NMR was found to be 49.6/1000 live births, as shown in Table 1.

Table 1: 10-year trend analysis of neonatal deliveries, deaths, and autopsies in UCTH (2004-2013).

Year	Deliveries			Neonatal death				Neonatal autopsies			
	Male	Female	Total	Male	Female	Total	NMR	Male	Female	Total	NAR (%)
2004	639	631	1270	70	49	119	93.7	1	0	1	0.84
2005	607	553	1160	39	27	66	56.9	2	2	4	6.06
2006	983	866	1849	49	32	81	43.8	0	2	2	2.47
2007	972	977	1949	69	55	124	63.6	6	6	12	9.68
2008	1073	1164	2237	97	66	163	72.9	0	0	0	0.00
2009	1248	1147	2395	97	69	166	69.3	0	3	3	1.81
2010	1395	1252	2647	58	47	105	39.7	4	4	8	7.62
2011	1804	1678	3482	59	34	93	26.7	4	5	9	9.68
2012	1538	1513	3051	82	41	123	40.3	16	7	23	18.70
2013	1513	1363	2876	52	44	96	33.4	7	17	24	25.00
Total	11,772	11,144	22,916	672	464	1136	49.6	40	46	86	7.57

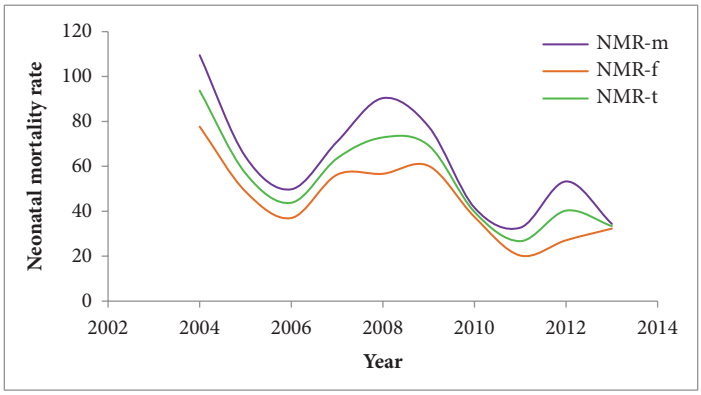
NMR = neonatal mortality rate; NAR = neonatal autopsy rate.

Table 2: Comparison of male and female neonatal mortality rates in UCTH (2004-2013).

Year	Male	Female	Total	NMR-m	NMR-f	NMR-t
2004	70	49	119	109.5	77.7	93.7
2005	39	27	66	64.3	48.8	56.9
2006	49	32	81	49.8	37.0	43.8
2007	69	55	124	71.0	56.3	63.6
2008	97	66	163	90.4	56.7	72.9
2009	97	69	166	77.7	60.2	69.3
2010	58	47	105	41.6	37.5	39.7
2011	59	34	93	32.7	20.3	26.7
2012	82	41	123	53.3	27.1	40.3
2013	52	44	96	34.4	32.3	33.4
Total	672	464	1136	57.1	41.6	49.6

NMR-m = neonatal mortality rate for males; NMR-f = neonatal mortality rate for females; NMR-t = NMR total.

Figure 1: Line graph showing 10-year trend in male and female neonatal mortality rate in UCTH (2004-2013).



The NMR was found to be consistently higher among male compared with female neonates, although this difference in rates was not found to be statistically significant for each of the years studied (Table 2 and Figure 1). A bimodal pattern of NMR, with an initial peak in 2008 and a subsequent but smaller peak in 2012, is identifiable on a line graph in Figure 1. This is particularly for total and male-specific NMRs.

Eighty-six neonatal autopsies were conducted within the study period yielding a mean autopsy rate of 7.57%, ranging from 0% in 2008 to 25.0% in 2013. There was an initial gradual increase in NAR in the initial half of the study period

(2004-2007), followed by a sudden decline (in 2008) before a more rapid increase through the latter half of the study period (2009-2013).

4. DISCUSSION

During this period, the total NMR was found to be 49.6 per 1000 live birth. NMR was found to be higher among male compared with female neonates, although this difference in rates was not found to be statistically significant for each of the years studied ($p < 0.05$) (Table 2 and Figure 1). A bimodal pattern of NMR, with an initial peak in 2008 and a subsequent but smaller peak in 2012, is identifiable on a graph as shown in Figure 1. This is particularly for total and male-specific NMRs. The NMR of 49.6 per 1000 live births in the study is high when compared to that in India where a quarter of global neonatal deaths occur with a national neonatal mortality of 43 per 1000 live births is documented [12]. This rate is higher than that of Northern Nigeria with the highest estimates observed in Zamfara and Katsina at 30 deaths per 1000 live births and the lowest in Yobe at 20 deaths per 1000 live births [13]. Since 2000, China, India, Nigeria, and Pakistan are among the world's most populous countries with the most annual births and have consistently experienced the greatest number of neonatal deaths [13]. It is notable that Nigeria and Pakistan now have more neonatal deaths than China, owing to China's decreasing NMR and fertility rate [13]. The average rate of reduction of NMR has been very low at approximately 1% per year for sub-Saharan African Countries [12].

During the period of study between 2004 and 2013, the overall NAR was found to be 7.57% ranging from 0.84% in 2004 to 26.0% in 2013, as shown in Table 1. There was a steady increase in NAR from 2010 to 2013 with the highest NAR of 26% recorded during the period of study and no single neonatal autopsy carried in the year 2008. These low autopsy rates could be attributed to lack of interest by the attending pediatricians to request for autopsy investigation and lack of hospital policy for autopsy and refusal by parents to provide consent for autopsy. The improved but still low rate of neonatal autopsy from 2012 onward is attributable to the policy instituted by the pediatrics department following intervention of the pathology department and hospital management that all neonatal deaths should have an autopsy investigation conducted at no cost to the parent or relative.

The overall NAR in this study is very low and a far cry when compared to other studies. Kumar *et al*. in the United States reported a steady decline in NAR during a 10-year period from 71.2% (1984-1988) to 47.7% (1988-1993) [8]. Khong *et al*. in a similar study in South Australia reported that the autopsy rates for stillbirths and neonatal deaths have fallen significantly further since the "organ retention" controversy but not significantly so following the new consenting process [9]. They showed that the overall autopsy rates have been falling significantly between three study periods (1999-2001, 71.7%; 2001-2002, 61.5%; 2003-2004, 50.5%). Autopsy rates have fallen significantly between 1990-1993 and 1999-2001 ($p < 0.00005$) and between 1990-1993 and 1999-2004 ($p < 0.0000001$) [9]. Despite the importance of autopsy in establishing a final diagnosis and providing genetic advice, there has been a worldwide decline in the NAR [6, 7]. The reasons for the fall in autopsy rates are multifactorial and complex. The reasons most commonly cited by clinicians for the decline in autopsy rate include an increasingly onerous consent process, an assumption that bereaved families are hostile to the idea of autopsy, and the fear that autopsy will reveal a mistake in treatment and lead to litigation [14, 15].

5. CONCLUSION

There are unacceptably high NMRs and low NARs in the study setting. Stakeholders particularly in sub-Saharan Africa should redouble their effort of reducing NMRs. Low NAR reflects global decline in autopsy rates. There is need for further research on the reasons for low rates, with clinicians, family members, and relevant policy makers as study population.

Pediatricians also should develop increased willingness to follow through and know the cause of death by changing the negative attitude of refusing to request. They should also promptly assess and recommend those parents who are paupers to the social works department of the hospital for necessary payment waivers. These measures, including health education of the general public on the relevance of neonatal autopsies, may yield the desired result of improved rates toward attainment of sustainable development goals.

Author Contributions

Ugbem, T – Conceptualized the study; developed draft proposal for study
Ekanem, I & Bassey, I – Supervised proposal development
Nnoli, M, Ebughe, G & Ushie, D – Supervised proposal finalization & manuscript development
Omoronyia, O – Analyzed data and contributed to manuscript finalization and corrections

Conflict of Interest

There is no conflict of interest to declare.

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