

Original Article

Perinatal statistics of a 15-year period in the Central Region of Saudi Arabia

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ABSTRACT

Perinatal statistics are one of the most essential outcome indicators used by many developed countries in order to evaluate perinatal services provided to newborns. In this retrospective study, we collected 15 years of perinatal data at King Khalid University Hospital in Riyadh, Saudi Arabia in order to determine stillbirth and other mortality rates in our institute and compare them with international figures. A total of 58,073 babies were evaluated. Data were collected from maternal and neonatal registry books and from perinatal mortality and morbidity meeting reports between 1994 and 2008. Data were entered and analyzed using Microsoft Office Excel 2007. The stillbirth rate was 11.7/1000, early neonatal death

rate was 3.4/1000, perinatal mortality rate (PMR) was 14.9/1000, and corrected PMR was 11.9/1000. Our rates were not significantly different from those of North American and European ones. We noticed a dramatic reduction in the corrected PMR in the last 3 years of the study because of greater advancement in perinatal and neonatal care. Our mortality rates were comparable to the North American and European rates which may reflect the quality of perinatal care provided in our institute.

Keywords

Stillbirth rate; Early neonatal death rate; Perinatal mortality rate; Saudi Arabia.

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INTRODUCTION

The newborn period is a unique stage in the life of a human being. Many children die soon after birth, some of them in the first 4 weeks of life (neonatal deaths), and most neonatal deaths occur in the first week (early neonatal deaths). For every early neonatal death, another baby is born dead (fetal deaths or stillbirths). The causes and determinants of neonatal deaths and stillbirths differ from the causes of post neonatal and child deaths [1]. Perinatal mortality rate is an important indicator of the level of health-care provided to the mother and her fetus as well as the socio-economic status of the population [2]. Fetal mortality is a major but often overlooked public health problem. Public concern is more focused on infant mortality rather than fetal mortality. The concept of a perinatal period emerged in the early period of the nineteenth century as researchers and scientists observed the relatively large numbers of deaths occurring immediately before or after delivery [3]. Recently, most of the developed countries report their perinatal vital statistics on a yearly basis in order to monitor their perinatal health-care system.

The aim of this retrospective study was to report perinatal statistics over a period of 15 years at King Khalid University Hospital in Riyadh, Saudi Arabia. These statistics include death rates such as the perinatal mortality rate (PMR), early neonatal death rate (ENDR), and stillbirth rate (SBR). We also examined the gender distribution of newborns, neonatal intensive care unit (NICU) admission rates, and distribution of newborns based on birth weight.

MATERIAL AND METHODS

This is a retrospective study based on perinatal data collected over a period of 15 years at King Khalid University Hospital in Riyadh, Saudi Arabia to determine stillbirth and other mortality rates in our

institute. A total of 58073 babies were evaluated in this study as a result of 57063 deliveries over the study period. All inborn babies were included: alive, stillbirths, and congenitally malformed babies. Out born babies admitted to our Neonatal Intensive Care Unit (NICU) were excluded.

Information about total numbers of newborns and their distribution according to gender and birth weight, maternal un-booking rate (never seen at antenatal clinics at our hospital), multiples, and congenital anomalies was taken from maternal registry books, perinatal mortality and morbidity reports, and NICU registry books over a period of 15 years (1994 to 2008). The study was approved by the institutional review board (IRB) at King Khalid University Hospital. All data were entered and analyzed using Microsoft Office Excel 2007, p-values were given and a 95% confidence interval calculated (95% CI). We evaluated only complete data, thus some figures were reported over the entire 15-year period, and others were reported over 7- or 8-year periods. We also made two-period comparisons (1997–2002 and 2003–2008) of changes in SBR, ENDR, PMR, corrected PMR [(neonatal deaths + stillbirths) – (severe congenital and lethal anomalies) / 1000 total live births], and NICU admission rate. We then compared our data with available regional and international data.

RESULTS

Data were collected on 58,073 newborns as a product of 57,063 deliveries (Figure 1). Eight years of complete data for newborn gender (2001–2008) showed that 13,807/27,313 newborns (50.5%) were male, 13,495/27,313 (49.4%) were female and 13/27,313 (0.05%) were ambiguous (Table 1). A total of 26,332 newborns (96.5%) over the 8-year period were singletons, with quadruplets as the highest order of multiples reached (8 cases, 0.035%); the twins' rate was 3.4% (924 newborns).

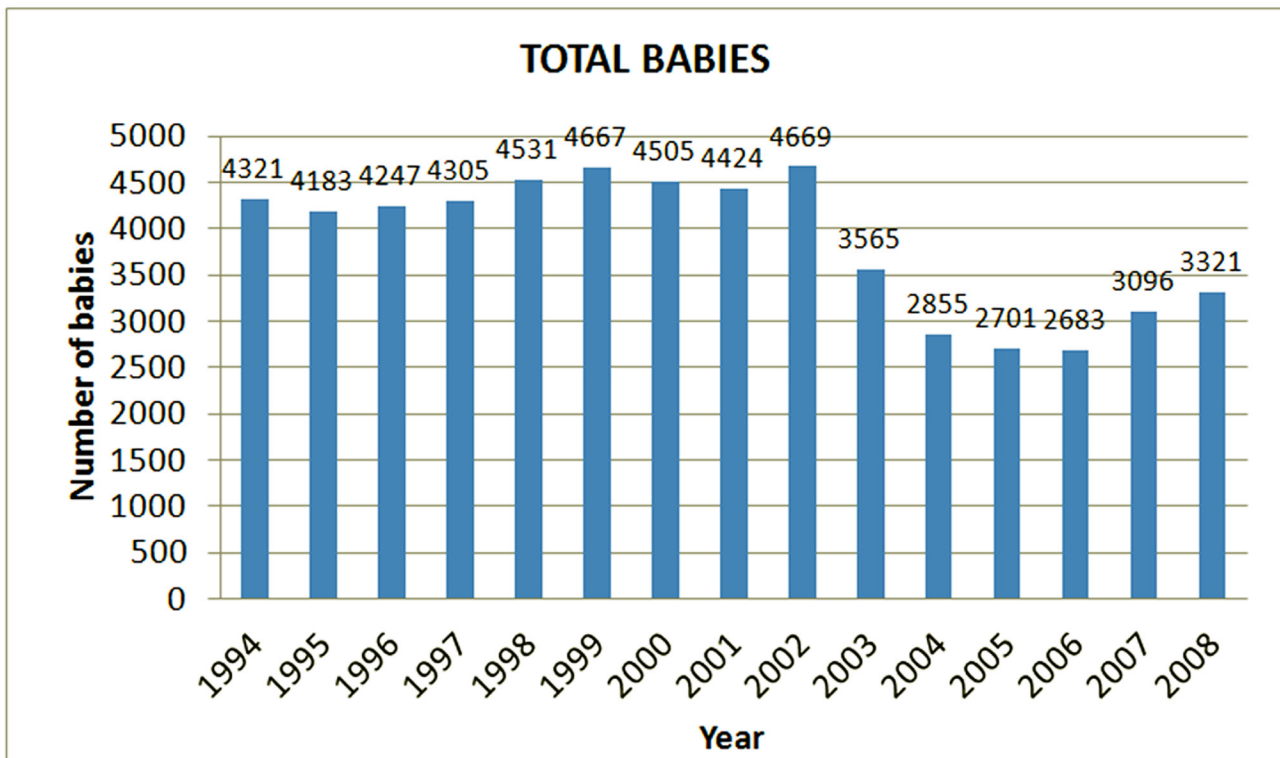


Figure 1- Total number of newborns by year during the study period (1994-2008).

Table 1- Eight-year gender and multiples distribution data

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	TOTAL
Total newborns	4424	4669	3565	2855	2701	2683	3096	3321	27,313 (100 %)
Males (%)	2234 (50.5)	2380 (50.9)	1790 (50.2)	1420 (49.7)	1360 (50.4)	1382 (51.5)	1564 (50.5)	1677 (50.5)	13807 (50.5)
Females (%)	2189 (49.5)	2287 (49)	1775 (49.8)	1435 (50.5)	1337 (49.5)	1299 (48.4)	1529 (49.4)	1644 (49.5)	13,495 (49.4)
Ambiguous (%)	1 (0.02)	3 (0.06)	0	0	4 (0.15)	2 (0.07)	3 (0.1)	0	13 (0.05)
Singletons (%)	4267 (96.5)	4522 (96.9)	3453 (96.9)	2738 (95.9)	2598 (96.2)	2577 (97)	2963 (96.4)	3194 (96.2)	26,332 (96.5)
Twins (%)	136 (3)	130 (2.8)	106 (3)	114 (4)	114 (3.6)	106 (4)	110 (3.6)	108 (3.3)	924 (3.4)
Triplets (%)	21 (0.5)	18 (0.4)	6 (0.2)	3 (0.1)	3 (0.1)	18 (0.7)	3 (0.1)	15 (0.5)	87 (0.33)
Quadruplets (%)	0	0	0	0	4 (0.16)	0	0	4 (0.12)	8 (0.035)

The SBR and other mortality rates over the 15-year period showed an average SBR of 11.7/1000, ENDR of 3.4/1000, PMR of 14.9/1000, and a corrected PMR of 11.9/1000 (Table 2). A comparison of two periods (1994–2000 and 2001–2007) SBR and mortality rates showed no significant difference in SBR (12.0 vs. 11.5, $p = 0.452$), ENDR (3.7 vs. 3.3, $p = 0.282$), and PMR (15.3 vs. 14.3, $p = 0.346$); whereas a significant difference was observed in corrected PMR (13.6 vs. 11.1, $p = 0.012$) (Table 3). The average un-booking of pregnant women over a period of 8 years (2001–2008) was 7.6%. There was no significant difference in the rate of un-booking

between the two periods (1994, 2001, 2002, and 2003–2005) (7.95 and 8.04, respectively; $p = 0.82$). The average NICU admission rate was 13.9% (7833 newborns) over the 15-year period (Figure 2). Two 5-year comparison periods (1998–2002 and 2003–2007) of the percentage of newborn admissions to the NICU showed a significant increase in the second period (17.6%) compared with the first period (11.7%) ($p = 0.001$). The newborns were distributed based on birth weight over the 7-year period (2002 – 2008) (Table 4). The majority of newborns (83.7%) were born with appropriate birth weights for age; 5.6% were large for their gestational

Table 2- Still birth and mortality rates over 15 years

Year	SBR (per 1000)	ENDR (per 1000)	PMR (per 1000)	CPMR
1994	14.6	2.6	17	16
1995	10.9	4.8	15.1	14.3
1995	12.6	2.6	15	13.6
1997	13.2	3.5	16.7	14.8
1998	10.8	4.7	14.9	12.1
1999	11.4	3.1	13.7	11.8
2000	12.2	3.2	14.5	12.4
2001	9.2	2.8	11.6	10.1
2002	10.5	2	12.2	11.8
2003	11.7	3.7	14.9	14
2004	13.6	4.3	15.9	13.9
2005	14.4	2.3	16.6	14.7
2006	10.6	3.8	14.1	3.9
2007	13	4.7	17.1	9
2008	11.9	2.1	13.8	5.4
AVERAGE	11.7	3.4	14.9	11.9

CPMR-Corrected perinatal mortality rate, ENDR-Early neonatal death rate, PMR-Perinatal mortality rate, SBR-Still birth rate

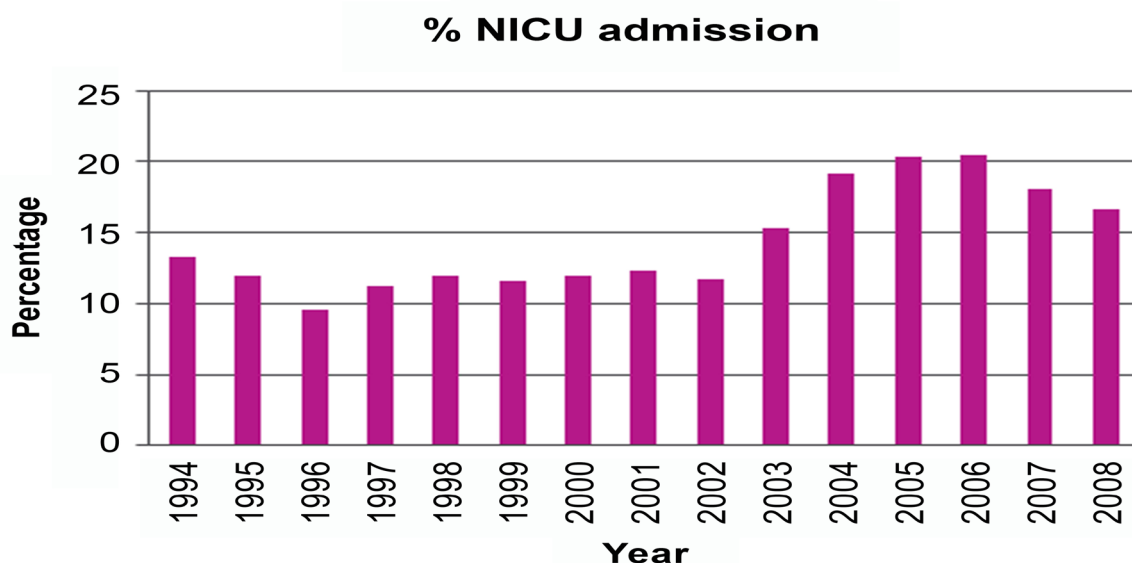


Figure 2- Percentage of Neonatal Intensive Care (NICU) Admissions during the study period (1994-2008).

Table 3- Comparison of still birth and mortality rates in two 5-year periods

YEAR	SBR (per 1000)	ENDR (per 1000)	PMR (per 1000)	Corrected PMR	% NICU ADMISSION
1997	13.2	3.5	16.7	14.8	11.2
1998	10.8	4.7	14.9	12.1	12
1999	11.4	3.1	13.7	11.8	11.6
2000	12.2	3.2	14.5	12.4	12
2001	9.2	2.8	11.6	10.1	12.3
2002	10.5	2	12.2	11.8	11.7
MEAN	11.22	3.22	13.93	12.17	11.8
SD	1.05	0.59	1.43	0.96	0.3
95% CI	9.54 -12.9	2.2 - 4.16	11.65-16.21	10.63 -13.71	11.32 -12.28
YEAR	SBR	ENDR	PMR	CPMR	% NICU ADMISSION
2003	11.7	3.7	14.9	14	15.3
2004	13.6	4.3	15.9	13.9	19.2
2005	14.4	2.3	16.6	14.7	20.4
2006	10.6	3.8	14.1	3.9	20.5
2007	13	4.7	17.1	9	18.1
2008	11.9	2.1	13.8	5.4	16.6
MEAN	12.53	3.48	15.4	10.15	18.35
SD	1.13	0.86	1.13	4.05	1.68
95% CI	10.73 -14.33	2.08 -4.88	13.6 -17.2	3.87-16.43	15.67- 21.03
P-Value	0.45	0.282	0.346	0.012	0.001

CPMR-Corrected perinatal mortality rate, ENDR-Early neonatal death rate, NICU-Neonatal intensive care, PMR-Perinatal mortality rate, SBR-Still birth rate

Table 4 - Newborn distribution according to birth weight

Birth weight	2002 No. (%)	2003 No. (%)	2004 No. (%)	2005 No. (%)	2006 No. (%)	2007 No. (%)	2008 No. (%)	Total No. (%)
<500g	1 (0.02)	0 (0)	0 (0)	1 (0.04)	1 (0.04)	0 (0)	0 (0)	3 (0.014)
500-749g	14 (0.3)	18 (0.5)	26 (0.9)	16 (0.6)	18 (0.7)	11 (0.4)	33 (1.0)	136 (0.63)
750-999g	14 (0.3)	20 (0.6)	24 (0.8)	17 (0.6)	15 (0.6)	20 (0.6)	15 (0.4)	125 (0.56)
1000-1499g	47 (1.0)	48 (1.3)	40 (1.4)	45 (1.7)	53 (2.0)	48 (1.6)	49 (1.4)	330 (1.5)
1500-1999g	96 (2.1)	64 (1.8)	61 (2.1)	78 (2.9)	60 (2.2)	83 (2.7)	74 (2.2)	516 (2.3)
2000-2499g	255 (5.5)	170 (4.8)	183 (6.4)	162 (6.0)	166 (6.2)	215 (6.9)	20 (6.0)	1351 (6.0)
2500-3999g	3976 (85.2)	3026 (84.9)	2360 (82.7)	2241 (83.0)	2249 (83.8)	2578 (83.3)	2766 (83.0)	19,196 (83.7)
≥ 4000g	259 (5.6)	215 (6.0)	159 (5.6)	142 (5.3)	121 (4.5)	142 (4.6)	120 (7.5)	1164 (5.6)

Table 5 - Comparison of still birth and other mortality rates with global estimates, World Health Organization (WHO) - year 2000

	Still birth rate	Early neonatal death rate	Perinatal mortality rate
Worldwide	24	23	47
Africa	32	31	62
Asia	27	24	50
Europe	8	4	13
Latin America and Caribbean	10	12	21
North America	3	4	7
King Khalid University Hospital	11.7	3.4	14.9 (corrected 11.9)

age with birth weights exceeding 4000 g. Only three newborns (0.014%) weighed <500 g at birth. Then our data were compared with world- wide and other countries' data (Table 5).

DISCUSSION

In this study, we evaluated our performance in perinatal and neonatal care, which can be reflected by certain parameters such as the SBR, PMR, and ENDR. We also explored some characteristics of our newborns such

as gender distribution, birth weights, and multiples. Many similar studies were performed locally and regionally [4-10]. There was a slight predominance of the male gender. Although it was mentioned in the results that the maximum number of multiples were quadruplets, we had one set of sextuplets (not mentioned in this study because they were born in the year 2000, which had incomplete data) whose outcome at 11 years of age was previously reported

[11]. There was a dramatic drop (approximately 25%–30%) in the total number of deliveries at our institute starting in the year 2003 because of the combined decision made by the obstetrics and neonatology departments to reduce the acceptance of pregnant women according to limited eligibility criteria. This decision was made to overcome recurrent crises at our NICU that led to frequent closures of the unit because we exceeded capacity. Our NICU capacity at that time was 24 beds, and expansion was difficult. For this reason, we examined the two periods, before 2003 and from 2003 to 2008, to determine the effect of such a decision on the mortality rates and NICU admission ratios. We found that the NICU occupancy percentage had indeed increased in spite of the reduction in total deliveries. This can be explained by the quality of cases accepted starting from the year 2003, when we became more selective and accepted mainly high-risk deliveries. In addition, the un-booking rate did not decrease and the vast majority of un-booked cases presented as emergencies, which obviously required NICU admission.

Compared with global estimates of SBRs and mortality rates, our ENDR was comparable with the North American ENDR (3.4 and 4, respectively). Our SBR was almost identical to the Latin American rate (11.7 and 10, respectively). The PMR was closer to the European rate (14.9 and 13, respectively) than to the African and the Asian rates, which reflects better standards of perinatal and neonatal care provided to pregnant women and their babies. In spite of the improvement in, and advancement of, perinatal and neonatal service, the mortality rates only slightly improved, which might be explained by the concomitant increase in survival of high-risk newborns with the advancement of perinatal and neonatal care. However, there was a dramatic improvement in the corrected PMR in the last 3 years of the second period (3.9, 9, and 5.4, respectively). Our institute was one of

the first in the region to introduce the use of antenatal steroids, which eventually became part of the routine care of pregnant women at high risk of premature delivery. Newer technologies used in the care of sick newborns have also become available, such as high-frequency oscillation and nitric oxide inhalation, as well as an early intervention program in the form of Neonatal Follow-up Program, which was established in 1999 [12].

CONCLUSION

Perinatal mortality rate (PMR) is a major indicator of perinatal care involving obstetrics and neonatology services. Our rates were closer to the developed countries' rates and much better than other regions such as Africa and the world-wide figures. We recommend the starting of annual national vital statistics reports in Saudi Arabia with the collaboration of all regional centers in the Country in order to monitor and improve our national perinatal care.

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