

Neonatal Deaths in Neonatal Care Unit and Surgical Ward of Children Welfare Teaching Hospital – Medical City - Baghdad (2005-2009)

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ABSTRACT:

BACKGROUND:

Neonatal deaths in Iraq account for more than half of under-five children deaths. The rates vary according to causative factors in each area of the world.

OBJECTIVE:

To have an idea about death rates and major causes of neonatal death in Children Welfare Teaching Hospital(CWTH), Medical City ,Baghdad .

PATIENTS & METHODS:

The medical records of 1074 neonatal deaths in Neonatal Care Unit(NCU)& surgical unit from 2005-2009 in Children Welfare Teaching Hospital, Baghdad , were studied retrospectively, especially for the cause of death as registered in the files.

RESULTS:

Neonatal deaths relative to admission (15.1%) distributed between Neonatal Care Unit & surgical ward into (11.38%) & (25.5%) respectively. Of 1074 total neonatal deaths, males were 653 (60.8%), 421 (39.2%) were females. Male to female ratio was 1:6. Major causes of death were: congenital anomalies (53.2%), respiratory problems (20%) & neonatal infections (14%).

CONCLUSION:

The results of this study indicate that neonatal death rates are still high, with congenital anomalies being the most common . More researches are needed to know the causes and the need for improvement in neonatal care services .

KEYWORDS: neonatal deaths, neonatal care unit, surgical ward

INTRODUCTION:

The neonatal death is defined as the death during the first 28 days of life, which is a highly vulnerable time for an infant. ⁽¹⁾Although neonatal deaths have become less common, they are still high, because of failure to address the causes in most cases. ⁽²⁾ The newborn deaths account for two-thirds of all deaths in the first year of life & 40% of under-five mortality.⁽³⁾

Causes of neonatal death can be summarized into: Immaturity related including multiorgan immaturity, hyaline membrane disease or clinical respiratory distress in the absence of any other detectable cause, Birth asphyxia: when a normally formed term baby is unable to initiate & sustain respiration at birth or has

low Apgar score, Congenital abnormalities: including fatal chromosomal & somatic malformations and Infections: sepsis, pneumonia or meningitis.^(4,5)

Two-thirds of the world's neonatal deaths occur in just "10" countries, mostly in Asia & Sub-Saharan Africa. Neonatal deaths in these two regions represent more than 2 millions of the annual deaths.^(6,7)

In Iraq, deaths in neonatal period account for more than half of under-five children deaths, highlighting urgent need to introduce health interventions to improve essential neonatal care & effective treatment for neonatal conditions. ⁽⁸⁾ In a previous study conducted in Children Welfare Teaching hospital (CWTH) during the period 2000-2005 , the average death rate was (10.7%) ,and the most common causes of deaths were congenital anomalies, neonatal sepsis ,and preterm and low birth weight neonates.⁽⁹⁾

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NEONATAL DEATHS

This study aimed to evaluate the causes of neonatal deaths in Children Welfare Teaching Hospital, medical city complex, Baghdad ,during the period 2005-2008.

PATIENTS & METHODS:

This study was done by reviewing the hospital records of admitted neonates who died over a period of 4 years, from the January first 2005 to December 31st 2008, at both the neonatal care unit (NCU) & the pediatric surgical ward in Children Welfare Teaching Hospital-Medical City/ Baghdad, which is tertiary referral hospital with 250 beds including 25 incubators in NCU and 50 beds for pediatric surgical ward, receiving out born neonates from different hospitals in Baghdad & other governorates plus private clinics & hospitals.

The data were collected from the medical records, & included name, gender, age on admission, body weight on admission, gestational age, mode of delivery, ward of admission (medical or surgical), cause of admission, age on death and the cause of death. Data collection faced some difficulties like: some lost files, inaccurate records of gestational age and birth weight assessment.

Neonatal deaths that occurred in the emergency department & those referred to respiratory care units (RCU) were excluded from this study, because of registration problems.

RESULTS:

The total number of neonates admitted to CWTH during 4 years period was 7092 distributed between Neonatal Care Unit (NCU)& surgical ward. NCU admission was 5209 which account for (15%) of admission to the pediatric medical wards. The number of neonates admitted to the surgical ward was 1883 & accounts for (57.5%) of admission to pediatric surgical ward of CWTH. Among the study years, 2008 was the year of highest rate of admission to CWTH. (Table 1)

Neonatal deaths in NCU during the 4 years period(2005-2009) were 593, their percentage from admission was (11.38%), while deaths in pediatric surgical ward were 481 forming (25.5%). (Table 2)

From total neonatal admissions which was 7092, 1074 (15.1%) neonates died, 653(60.8%) were males & 421 (39.2%) were females. Male to female ratio \cong 1.6:1. (Table 3).

Regarding body weight, 394 (36.7%) were \leq 1kg, 473 (44%) were $> 1\text{kg}-\leq 2.5\text{kg}$ & 207 (19.3%) were $>$

2.5kg. According to mode of delivery, and from total deaths of 1074 , 481 (44.8%) were delivered by normal vaginal delivery(NVD) at home, 203 (18.9%) by (NVD) at hospital & 390 (36.3%) by cesarean section.

The major causes of neonatal deaths were congenital anomalies, respiratory problems & neonatal infections. Neonatal deaths due to congenital anomalies (the first cause of death in this study) in both the NCU & the surgical ward were 572 which constitute (53.2%) from the total deaths, with gastrointestinal anomalies being the most common & were 481 cases (84.1%) from deaths due to anomalies & (44.7%) from total deaths. These are subdivided according to their types. The second most frequent type of anomalies was congenital heart diseases 75 [(13.1%) of anomalies,(7%) from total neonatal deaths).

Other types of anomalies were 16 which form (2.8%) of congenital anomalies and (1.5%) of total deaths. These include: neural tube defects 7, multicystic dysplastic kidneys 6, epidermolysis bullosa 2 and staphylococcal scalded skin syndrome 1 case. (Table4)

The major causes of neonatal deaths in the pediatric surgical ward were: Trachea-esophageal fistula and esophageal atresia 200 (41.5%), intestinal obstruction (mainly due to duodenal, jejunal or ileal atresia) 97 cases (20.2%), imperforated anus 94 (20%), omphalocele or gastroschisis 50 (10.2%), diaphragmatic hernia 23 (4.6%) and multiple anomalies 17 (3.5%). (Table 5)

Neonatal deaths in NCU due to respiratory problems were 215 (36.3%) and represent the first cause of death in NCU, form (20%) of total neonatal deaths (the second major cause). These were subdivided into Respiratory Distress Syndrome 165(15.3%) and meconium aspiration 50(4.7% of total deaths).(Table6)

Respiratory problems were followed by neonatal infections, 150 cases forming (25.3%) and (14%) of the total deaths. Neonatal infections were subdivided into: Septicemia 77 deaths forms (51.3%) of deaths due to neonatal infections in NCU and (7.2% of total deaths). Neonatal deaths due to meningitis were 40 representing (26.7%) of infections and (3.7%) of total. Deaths due to pneumonia were 22 (14.7%) of infections and (2.1%) of total deaths and deaths due

NEONATAL DEATHS

to gastroenteritis complications were 11(7.3%) of infections and (1%) of total deaths.(Table 6,7)

Most of neonatal deaths from neonatal sepsis were NVD at home & were 52 (67.5%) , 17 (22.1%) by NVD at hospital, the remaining 8 by C/S and form 8(10.4%) of neonatal deaths due to sepsis(total of 77).

The third cause of death in NCU was complications of hyperbilirubinemia, 80 deaths (13.5%) of deaths in NCU (Kernicterus, exchange problems including post exchange septicemia and apnea).

Other causes of death were congenital heart diseases 75 (12.6%), then birth asphyxia 57 (9.6%) of deaths in NCU.(Table 6).

Table 1: Distribution of neonatal admissions between Neonatal care unit and surgical ward.

Year	Number of admitted children/year in medical units	Number of neonates admitted to NCU	% of NCU admission	Number of admitted children to surgical unit	Number of neonates admitted to surgical unit	% of neonates in surgical unit
2005	7200	896	12.4	630	390	61.9
2006	6820	850	12.5	510	323	63.3
2007	8533	1301	15.3	911	450	49.4
2008	12155	2162	17.8	1221	720	59
Total	34708	5209	15	3272	1883	57.5

NCU :Neonatal care unit

Table 2: Neonatal deaths according to admissions with death rate per year.

Year	Number of neonates admitted to NCU	Number of neonatal deaths in NCU per year	death rate in NCU(%)	Number of neonates to surgical unit	Number of deaths among admitted neonates in surgical unit	Neonatal death rate in surgical ward (%)
2005	896	106	11.8	390	96	24.6
2006	850	113	13.3	323	91	28.2
2007	1301	140	10.76	450	101	22.4
2008	2162	234	10.8	720	193	26.8
Total	5209	593	11.38	1883	481	25.5

NCU :Neonatal care unit

Table 3: Distribution of total neonatal deaths according to gender.

Gender	2005	2006	2007	2008	Total	%
Male	109	115	139	290	653	60.8
Female	93	89	102	137	421	39.2
Total	202	204	241	427	1074	100

Table 4: Distribution of total neonatal deaths according to the type of congenital anomaly .

Type of anomalies	Number	% from anomalies	% from total death
1.Gastrointestinal	481	84.1	44.7
a. TEF and EA	200	35	18.6
b. Intestinal obstruction	97	17	9
c. Imperforated anus	94	16.4	8.8
d. Omphalocele and gastroschisis	50	8.7	4.7
e. Diaphragmatic hernia	23	4	2.2
f. TEF+ Imperforated anus (mixed)	17	3	1.6
2.Congenital heart diseases	75	13.1	7
3.Others: NTDS, renal anomalies....	16	2.8	1.5
Total malformations	572	100	53.2

TEF: Tracheo-esophageal fistula, EA: esophageal atresia, NTDS: Neural tube defects

NEONATAL DEATHS

Table 5: Distribution of neonatal deaths in surgical ward each year according to congenital anomaly.

Cause	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	Total n (%)
TEF & EA	29(30.3)	41(45.1)	46(45.6)	84(43.5)	200(41.5)
Intestinal obstruction	25(26)	12(13.2)	17(16.8)	43(22.3)	97(20.2)
Imperforated anus	22(22.9)	18(19.7)	20(19.8)	34(17.6)	94(20)
Abdominal wall defect (omphalocele, gastroschisis)	15(15.6)	11(12.1)	9(8.93)	15(7.77)	50(10.2)
Diaphragmatic hernia	3(3.1)	5(5.5)	6(5.9)	9(4.66)	23(4.6)
Mixed (TEF + imperforated anus)	2(2.1)	4(4.4)	3(2.97)	8(4.2)	17(3.5)
Total	96	91	101	193	481

TEF : Tracheo-esophageal fistula, EA: esophageal atresia, n: Number, %: percent

Table 6: Distribution of neonatal deaths in NCU each year according to the medical causes.

Cause	2005 n (%)	2006 n (%)	2007 n (%)	2008 n (%)	Total n (%)	% from total neonatal deaths
Respiratory (RDS+ meconium aspiration)	40(37.7)	37(32.7)	49(35)	89(38)	215(36.3)	20%
Infections	26(24.5)	23(20.4)	27(19.3)	74 (31.6)	150(25.3)	14%
Hyperbilirubinemia and its complications	11(10.4)	16(14.2)	24(17.1)	29(12.4)	80(13.5)	7.5%
CHD	16(15.2)	20(17.7)	19(13.6)	20(8.6)	75(12.6)	7%
Birth asphyxia	12(11.3)	14(12.4)	16(11.4)	15(6.4)	57(9.6)	5.3%
Other anomalies and disorders	1(0.9)	3(2.6)	5(3.6)	7(3%)	16(2.8)	1.5%
Total	106(100%)	113(100%)	140(100%)	234(100%)	593(100%)	55.3%

RDS: Respiratory Distress Syndrome, CHD: Congenital Heart Disease, n: Number, %: Percent

Table 7: Distribution of neonatal deaths according to types of infection.

Type of infection	2005 n	2006 n	2007 n	2008 n	Total n	% from total infection	% from total death
septicemia	16	14	13	34	77	51.3	7.2
Meningitis	5	7	8	20	40	26.7	3.7
Pneumonia	3	2	4	13	22	14.7	2.1
Gastroenteritis	2		2	7	11	7.3	1
Total	26	23	27	74	150	100%	14%

n: Number, %: percent

DISCUSSION:

This study showed overall neonatal death rate of (15.1%) which is higher than previous study in CWTH for the period (2000-2005), (10.7%)⁽⁹⁾, this may be due to increasing admissions & referral especially of complicated cases. It agrees with an Indian study (2006) (16.1%)⁽¹⁰⁾, but disagree with USA study(2004),(6.9%)⁽¹¹⁾. This difference may be due to delayed seeking medical help in our country, delayed referral & lack of many advanced techniques & equipments, and shortage in efficient nursing staff. Higher rates of admission were noticed in 2008, may be due to security circumstances improvement.

The higher male to female ratio of 1.6:1 (60.8% versus 39.2% of total deaths) agrees with Indonesian study (2002) (1.5:1)⁽¹²⁾, also with previous study in CWTH(1.8:1).⁽⁹⁾ This may be due to many biological factors that have been implicated with increased risks of neonatal deaths in males, including Immune deficiency: increasing the risk of infection & sepsis, later maturity: resulting in higher prevalence

of respiratory diseases in male newborn, and higher incidence of urogenital system malformations.^(1, 13,14)

NEONATAL DEATHS

Regarding body weight, (80.7%) had LBW ($\leq 2.5\text{kg}$), [(36.7%) were $\leq 1\text{kg}$, (44%) were $> 1\text{kg}-\leq 2.5\text{kg}$], may be due to prematurity or small for gestational age (SGA). These results were lower than that of Vagen et al study in England in 2005 (75%)⁽¹⁵⁾ but agree with Foran et al and Fleming et al studies in Ireland in 2004 when (55%) of neonatal deaths were $< 1.5\text{kg}$ & (33%) $< 1\text{kg}$.^(16,17)

Our results were lower than Wold et al study in 2000 in Norway, where (90%) of neonatal deaths had less than average weight.⁽¹⁸⁾ This may be due to lower survival of low birth weight neonates (preterm, Small for gestational age) in our country.

In this study, (44.8%) of neonatal deaths were normal vaginal delivery (NVD) at home, (18.9%) by NVD at hospital & (36.3%) by C/S. These results were lower than Imtiaz et al study in urban Pakistan where (19%) of neonatal deaths delivered by C/S, (76%) NVD at home⁽¹⁹⁾, and Indonesian study, (59%) of neonatal deaths were products of NVD at home.⁽¹²⁾ In Waiswa et al study in Uganda (2006), most neonatal deaths were delivered at home.⁽²⁰⁾ In these countries (Pakistan, Indonesia, Uganda), rates of home delivery were higher than in this study, because of more poverty & poor access to health care centers. While in more developed countries, the majority of deliveries occur at hospital.^(1,19)

In this study, Congenital anomalies formed the most frequent cause of neonatal deaths (53.2% of total deaths), which is higher than Hameed study (41.8%)⁽⁹⁾, and Awqati et al study in Iraq (10.3%).⁽⁸⁾ Also it is higher than other studies in Singapore, India, England, & USA, where anomalies formed (33%), (10%), (22%) & (21%) of neonatal deaths respectively.^(12, 10, 15, 21) WHO reports in South-East Asia attributed only (6%) of neonatal mortality to congenital anomalies.⁽²²⁾

Congenital heart diseases formed (13.1%) of anomalies deaths and (7%) of neonatal deaths. This is higher than previous study in CWTH (2.9%),⁽⁹⁾ but lower than Goonaward et al study in Sri Lanka, (17.4%).⁽²³⁾

Respiratory problems were a major cause of deaths in NCU (& in general follow congenital anomalies) & formed (20%), RDS (15.3%) & meconium aspiration (4.7%). These results disagree with Hameed study (6.8%)⁽⁹⁾, this may be due to increasing rates of premature deliveries & consequently preterm neonates admissions.⁽²²⁾ This figure is lower than Awqati et al study in Iraq as (42.3%) were due to difficulty in breathing.⁽⁸⁾

Infections were the major causes of neonatal death there.⁽²⁴⁾ Also agree with Wold et al study in Norway, where RDS formed the major cause of death for the years (1999-2000).⁽¹⁸⁾ Also agree with Rada et al study in the Basque region in Spain, where respiratory problems were the major cause of neonatal deaths followed by congenital anomalies.⁽²⁵⁾

Neonatal infections in this study formed (14%) of total deaths (& 25.3% if congenital anomalies excluded). This is lower than previous study in CWTH (33.4%).⁽⁹⁾ This decline may be due to improvement in some methods of infection control & early initiation of antibiotics. In studies of different countries, infections caused higher death rates in comparison with this study, as in Niger (42%)⁽²⁶⁾, India (36%)^(27,28), Pakistan (23%)⁽¹⁹⁾ & Sri Lanka (19.8%)⁽²³⁾. Also in Hotrakitya et al study in Thailand, infections formed the second cause of neonatal deaths after RDS⁽²⁴⁾. WHO reports in South-East Asia showed that infections constitute (34%) of neonatal mortality.⁽²²⁾

Sepsis formed more than half of deaths caused by infections (51.3%), this is lower than previous study in CWTH (83.8%).⁽⁹⁾ This agrees with Bang et al study where neonatal infections formed (36%) & sepsis alone (20%)⁽²⁸⁾, and WHO report in South-East Asia, where sepsis formed (27%) which is more than half of neonatal deaths caused by infections (34%).⁽²²⁾

In this study, (67.5%) of deaths due to neonatal infections were delivered by NVD at home. This is mostly caused by unhealthy circumstances associated with home delivery & infected instruments⁽²²⁾. This figure agree with that in India, where more than half of the neonatal deaths due to infections were delivered at home^(27,28). Maternal infections & septic field may contribute to the rest.⁽²²⁾

Neonatal deaths due to complications of hyperbilirubinemia formed (7.5%), mostly as a result of kernicterus, exchange complications (apnea, electrolytes disturbances... etc) or a result of post exchange septicemia. This percentage is significantly high, may be due unawareness of families to jaundice as early as possible, or using some social practices to decrease it without seeking medical help. Another factor may be delayed referral of already complicated cases to this center.

These results agree with those in less developed countries like Nepal & Pakistan where kernicterus &

This study results agree with Hotrakitya et al study in Thailand, where RDS followed by neonatal exchange sepsis form significant percent of neonatal deaths, but these results couldn't be compared

NEONATAL DEATHS

properly because most of the studies there consider this factor as either immaturity related or include sepsis post exchange with neonatal infections.^(29,30)

Although neonatal hyperbilirubinemia complications are rarely reported in developed countries due to strict follow-up & early diagnosis but still there's reported cases of kernicterus with significant mortality rates, even in USA.⁽³¹⁾

Birth asphyxia caused (5.3%) of total neonatal deaths in CWTH (9.6% if congenital anomalies excluded). This result agrees with previous study in CWTH (7.9%),⁽⁹⁾ also agrees with Vagen et al study in England in 2005 (7.5%)⁽¹⁵⁾, while it disagrees with studies in Niger, India & Pakistan where it caused (21%), (23%) & (26%) of neonatal mortality respectively,^(26,10, 19) may be due to higher rates of home delivery & its complications in these countries⁽²²⁾. In this study, we review the medical record of neonates looking mainly for the rates and causes of neonatal deaths, but the maternal and obstetric history and detailed causes of birth asphyxia were not found in the records.

An important note must be mentioned is that many worldwide studies consider prematurity itself as a major cause of neonatal death,^(32,33) while in this study (& according to what written in dead neonates' files), immaturity related complications were considered.

Lastly, this study included only admitted neonates died in both NCU & pediatric surgical unit while deaths that occur in RCU or emergency department were excluded due to registration difficulties.

CONCLUSION:

That neonatal death rate in CWTH was higher than that in more developed countries, but it was comparable to rates in developing countries. There was an increase in death rates due to congenital anomalies especially those involving the gastrointestinal tract. There was high neonatal deaths in males, low birth weight neonates, products of home deliveries, and those with RDS.

we **recommend** detailed studies & researches to be done to identify & reduce as possible the factors behind high death rates from certain causes mainly congenital anomalies. Discouraging home delivery especially for high risk pregnancies need to be stressed.

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NEONATAL DEATHS

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