

Trends of Neonatal Mortality in context of Case Overload in Al - Alwyia Pediatric Teaching Hospital at Baghdad during 2005-2012

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ABSTRACT

Background: Data on the impact of neonatal and total pediatric admissions volume on neonatal mortality are sparse.

Objectives: This study is done to estimate the neonatal mortality in relation to neonatal admissions and to total hospital admissions in Al-Alwyia Pediatric Teaching Hospital through years 2005-2012

Type of the study: A retrospective study.

Methods: statistical records of all cases admitted to APTH were studied during 2005-2012.

Results: Neonatal mortality decreased to the nadir at last year of study period (2012) and reached 6.1% of neonatal admissions compared to 2005 level which was 9.7 %. Mortality rate among premature and low birth weight (LBW) infants decreased also. The study also reveals that neonatal mortality constitute significant a contribution to childhood mortality (61.4 %) and morbidity (28.3%) throughout the study years. With a highly significant p value parallel to increasing number of neonatal admissions (case over load) , there is a trend of neonatal mortality rate to be decreased Case fatality rate also decreased among overall children to 3.5% in 2005 and to 3.3% in 2013 in spite of 2.4 times increase in neonatal admission during the study period. This

neonatal overload is more than overall pediatric over load, because the total hospital admissions are increased just 1.2 times.

Conclusions: The neonatal admissions case overload is high and increasing and constitutes a significant proportion of total childhood mortality. Neonatal mortality including premature and (LBW) infants is decreasing .Further actions are needed to meet global goals.

Keywords: neonatal mortality rate, case fatality rate, case overload

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Neonatal mortality (NM) accounting for an estimated 4 million deaths worldwide each year, constitutes approximately 57% of infant mortality [1]. Furthermore 98% of global neonatal mortality occurs in developing countries [1]. Since 2000, when the United Nations Millennium declaration was signed, there have been ever greater efforts to reduce mortality among children under five years of age The fourth Millennium Development Goal(MDG) is to reduce the 1990 mortality rate among under-five children by two thirds[2]. The (MDG) for child survival cannot be met without substantial reductions in neonatal mortality[3], Since more than one third of all child deaths occur within the first month of life[2].

neonatal mortality rate (NMR) rate is still high in Iraq in spite of declined level to 19 /1000 live births in years 2011 and 2012 [4]. It was 20/1000 live births in years 2008, 2009 and 2010 and was 26 /1000 in 1990. In 2011 NMR per 1000 live births was 11 in Iran, 6 in Kuwait 5 in Saudia Arabia and 29 in sudan [4]. There are highly feasible and cost-effective interventions that could avert up to 72% of neonatal deaths [5] but this can only be achieved if countries adopt locally relevant and focused interventions that are guided by evidence.

The study aims to study pattern neonatal mortality among neonates admitted to Al-Alwyia Pediatric Teaching in context of admission rate to this hospital.

Material and Methods: Study design: The study used the cross- sectional type with retrospective trend

analysis for all children admitted to hospital from 2005-2012.

The study setting: In Al-Alwyia Pediatric Teaching Hospital which is affiliated with Alkindy medical college, located in Rusafa part of Baghdad and admissions come from nearby sectors sometimes from far sectors or other governorates .

Hospital has no delivery unite but outdoor delivered neonates might be admitted to this hospital while surgical cases referred to other hospitals. Neonatal unite (NNU)in 2012 contains 42 incubators 12 cots but in 2005 has about half of 2012 capacity. This NNU is equipped with a resuscitation trolley, radiant warmer, pulse oxymeter glucometer, bilirubinometer, 6 phototherapy units but lacks ventilators. Cerebrospinal fluid cytological analysis, hemoglobin percentage, urea level, blood culture facilities are done round the clock in hospital laboratory but rest of the biochemical, arterial blood gas (ABGs) monitoring facilities and hematologic screening is done only in the morning hours. Neonatal deaths include in patients deaths during 1st 28 days of age.

The study sample: Statistical records of all children admitted to hospital were studied from 2005-2012. Total neonatal admissions and deaths were also compared with total children deaths. Neonates are considered up to 28 days of age. Non-neonates are from the age of 28 days to 16 years. Preterm was considered if the gestational age was less than 37 completed weeks. LBW was recorded if the birth weight was under 2.5 kg,

Ethical considerations: the study approved by ethical and scientific committee.

Data analysis: Statistical Package for Social Science (SPSS) program version 17, MINITAB V 16 and, and p-value of less than 0.05 considered statistically significant .The correlation coefficient r measures the strength and direction of a linear relationship between two variables on a scatter plot. Values interpretation as follows :

Exactly -1. A perfect downhill (negative) linear relationship

- -0.70. A strong downhill (negative) linear relationship
- -0.50. A moderate downhill (negative) relationship
- -0.30. A weak downhill (negative) linear relationship
- 0. No linear relationship
- +0.30. A weak uphill (positive) linear relationship
- +0.50. A moderate uphill (positive) relationship
- +0.70. A strong uphill (positive) linear relationship
- Exactly +1. A perfect uphill (positive) linear relationship

Results Table1 shows neonates contribute a 18.6 % in 2005 increasing to 36.3 % in 2012 of total hospital admissions while premature and/ LBW infants decreased from 37.3 % to 18.1% of total neonatal admission number for the same years . The table also shows increase in number of neonatal admission from 2662 in 2005(nadir) to 6385 in 2012 (peak)which indicate highest level of case overload among study years . From 2005to 2012 the total hospital admissions increased by just 1.2 times compared to neonatal admissions which is increased by 2.4 times .

Table 1 : contribution of neonatal and premature admissions to total hospital admissions

Year	Total hospital admission	No .of total neonates	% of neonates to total admissions	No. of premature or LBW neonates	% of premature or LBW to no. of neonates
2005	14343	2662	18.6	992	37.3
2006	11831	3429	26.7	812	25.6
2007	11919	3465	29.1	727	21
2008	13644	3972	29.1	739	18.6
2009	17315	4587	26.5	769	16.8
2010	18101	5621	31.1	989	17.6
2011	22282	6018	27	1132	18.8
2012	17569	6385	36.3	1156	18.1
Years 2005-2012	127004	36139	28.3	7316	20.2

Table2 shows with a highly significant p value CFR was 3.4on average. The highest figure was 4.4 in 2006) .The table also shows that the neonatal mortality highest figure was in 2005 (9.7%) declined to lower level in

2012 (6.1%) . Premature or LBW deaths were 54.2% of total neonatal deaths for all the study period. Premature and / LBW deaths contribute 54.2 % on average for whole study period.

Discussion: Neonatal death rate % relative to neonatal admission(in a study which include indoor deliveries only) was 15 ,20, and 19.2 in medical city in Baghdad for years 2004,2008 and 2009 respectively which is high compared to our study [6] . Also the current study showed that the neonatal death rate(6.1%) among admitted neonates is lower than Rashid et al study in Bangladesh 2008 (15.5%) a study done at a hospitals with pediatric department and NICU[7]. Neonatal deaths is 21% in a study done in Kasturba hospital in India (a study from 1999-2001)[8] which is high compared to our study . In Pakistan it was 9% among neonatal total admissions in Rawalpindi General Hospital during the year 1995 and 1996[9]. In Paediatric Hospital in Ho Chi Minh City, Vietnam), The neonatal death rate in years 2009-2010 was 4%[10] which is less than our study . In this study NM among neonates was 9.7 % in 2005 declined to 6.1 in 2012. The decline in NM was parallel (except in 2011) to increase in total neonatal admission ratio which is 18.6% in 2005 . In 2011 there is increase in NM % to 7.4% but with decrease of overall case fatality rate among children to its nadir level throughout the study period which was (2.9%).

In the year 2008 in a pediatric department of Khulna Medical College Hospital in Bangladesh neonatal case overload were 942/ year[7] . It was 2,506 cases over 12 years in Kasturba hospital in India (a study from 1999-2001)[8] . In study done in Pakistan was 1984 admissions in 2001[11].In Lahore 1554 neonates were admitted in 2006 Neonatal Unit of Services Hospital Lahore (a tertiary care neonatal unit) [12]. 2584 neonate admitted patients in neonatal unit of tertiary care hospital Nawabshah (in Pakistan)during 2010[13].

In Baghdad hospital in medical city , it was 687,1204,and 1125 for the years 2007,2008, and 2009 respectively [6] .All these figures are less than our figures which were 2662, 3429,,3465,3972,4587,5621,6018,and 6385 for the years 2005-2012 respectively.This increase together with the increase in neonatal admissions /total admission ratio indicates need expansion of NNU to met the high admission rates .The neonatal admissions /total admission ratio increased from 18.6 (nadir)in 2005 to 36.3 (peak) in 2012 .

The proportion of neonatal admissions of the total paediatric \leq 5 years admissions significantly increased from 11% in 1990 to 20% by 2008 in Kilifi District Hospital in Kenya[14]. This figure is lagging behind our high figures. Studies based on NICU caseloads are sparse nevertheless ,neonatal mortality among infants admitted to NICUs was 12.2% in small NICUs and 10.2% in large NICUs in German state of Lower Saxon ,this study done on VLW infants <1500 g weight.[15] Although volume might serve merely as a proxy for other causal factors, satisfactory outcomes are more likely to

be achieved in hospitals with substantial caseloads[16] which is met with our results .In nonfederal Californian hospitals, neonatal mortality was higher in low-volume versus high-volume level III NICUs(average census, >15 patients per day) [17] , furthermore in our study the case overload is parallel with a decrease in CFR and NM% (fig1). The United Kingdom Neonatal Staffing Study Group did not find an association between hospital volume and hospital mortality among neonates[18].However, those analyses were not restricted to VLBW infants. No association between patient volume and mortality has been reported by the Vermont Oxford Network[19] NM /total children mortality constitute 39.9% in a study done in Kasturba hospital in India (a study from 1999-2001) [8] while in our study was 61.4 % in 7 years of this might be explained by high neonatal admission compared to older age group admission which raise from 46.6% in 2005 to 67.9% in 2012 . Total child mortality (including neonates) was 6.2 % in in Kasturba hospital in India [8] and was 3.57% of total admissions in Rawalpindi General Hospital in Pakistan[13]. Both tow figures are higher than our figure (3.3) % . Total admission s in 2012 decreased in spite of increased neonatal admissions this decrease may be related to general improvement in health services, expanded new vaccination program which includes pentavelant vaccine instead of triple vaccine in addition to oral Rota vaccine which are started to be given in beginning of 2012. Through the study period both number and ratio of neonatal admissions are increasing and in spite of decreasing NM among neonates more actions are needed to achieve global goals. Although prematurity and LBW constitute about 20.2 % of total neonates admitted to NNU the mortality fraction was 54.2 %among all dead neonates compared to 80% in Baghdad hospital in medical City and 68.8 % in Faluja [20].There were 87 (59.59%) preterm related deaths and 98 (67.12%) deaths due to Low Birth Weight (LBW) in a study done in (Khulna Medical College Hospital in Bangladesh) [7] which is comparative to our results regarding prematurity and LBW infants .The high contribution of prematurity to neonatal mortality was in agreement with Population-based cohort study for US birth cohorts for 1985 and 1995 and Canadian birth cohorts (excluding Ontario) for 1985-1987 and 1992-1994[18]. This indicates high relative risk for death in such age group. The finding of high percentage of prematurity and low birth weight which constitutes average of 20.2 % is of concern and need further studies to understand the causes behind such finding early deliveries by c/s or high admission rate of premature or LBW might be a factor. It is stated that Preterm birth rates are increasing in almost all countries with reliable data [22]. More than 1 in 10 of the world's babies born in 2010 were born prematurely, making an estimated 15 million preterm births. Prematurity is the leading cause of newborn deaths and now the second leading cause of death after pneumonia in children under the age of 5.

Premature babies can be saved now with feasible, cost-effective care such as warmth, breastfeeding support, and basic care for infections and breathing difficulties .Historical data and new analyses show that deaths[22]from preterm birth complications can be reduced by over three-quarters even without the availability of neonatal intensive care. . Over the last decade, some countries have halved deaths due to preterm birth by ensuring frontline workers are skilled in the care of premature babies and improving supplies of life-saving commodities and equipment New WHO estimates of global rates of preterm births indicate that of the 135 million live births worldwide in 2010, about 15 million babies were born too early, representing a preterm birth rate of 11.1%[22].

Studies in Iraq regarding prematurity are scares anyhow in one study done in Basrah prematurity was 3.1% [23] in 1996.

Conclusions and recommendations :The NM in our study showed a declining trend in the last 7 years but an increasing contribution to total deaths . This decline in NM is in parallel to increased in overall hospital case overload and increased neonatal admissions . In spite of reduction in NM and CFR , achievements to reduce neonatal mortality still lag behind.

To decrease neonatal mortality in this and similar hospitals more actions are needed. Furthermore, implementation of standard mortality audit should be started.

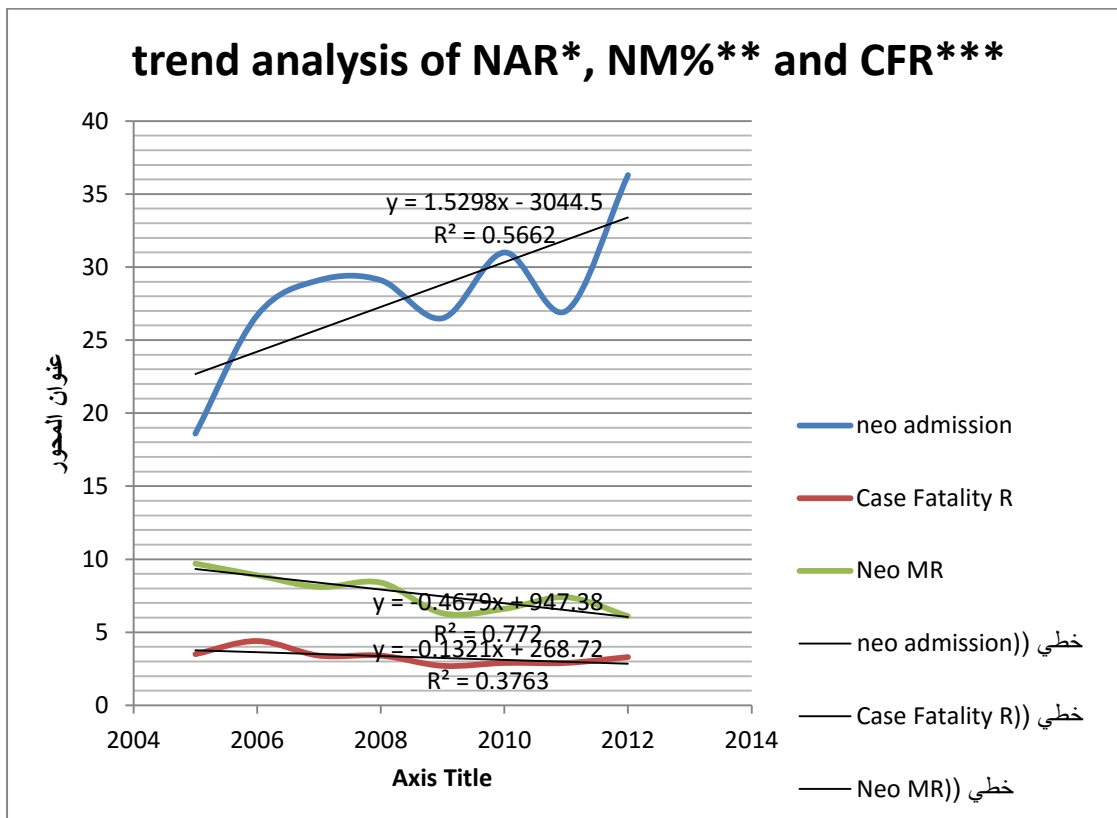
Table 2

Year	Total hospital admission	Total deaths	CFR*	Total neonatal admission	No. of Dead Neonate	NM%**	% of neonatal deaths / total deaths	No. of premature or LBW neonates	No. of premature or LBW deaths	% of premature or LBW deaths/ neonatal deaths	P value
2005	14343	554	3.5	2662	258	9.7	46.6	992	162	62.8	0.001
2006	11831	517	4.4	3175	304	8.9	58.8	812	173	21.3	
2007	11919	530	3.4	3465	282	8.1	53.2	727	171	60.6	
2008	13644	463	3.4	3972	332	8.4	71.7	739	181	56	
2009	17315	462	2.7	4587	291	6.3	62.9	769	169	57.6	
2010	18101	521	2.9	5621	371	6.6	71.2	989	217	61.2	
2011	22282	734	2.9	6012	447	7.4	60.1	1132	218	48.8	
2012	17569	574	3.3	6385	390	6.1	67.9	1156	158	40.5	
Years 2005 - 2012	127004	4355	3.4	35879	2675	7.4	61.4	7316	1449	54.2	

*CFR : case fatality rate for each 1000 pediatrics admissions

**NM% : neonatal mortality among neonates admitted to NNU %

Table 2 CFR , NMR . Premature/ LBW deaths %



*NAR : neonatal admission rate

** NM% neonatal mortality % among neonates

***CFR : case fatality rate expressed for each 1000 admissions

Neo : neonatal

Fig1;- show total neonatal admission and case fatality rate and neonatal mortality rate between 2005-2012 and R square* of each as trend analysis .

The trend shows decrease NMR and CFR over time with increase in total neonatal admission rate (NAR).

CORRELATION ANALYSIS	Years 2005-2012	NAR	CFR
NAR	0.752	0	0
P value	0.031	0	0
CFR	-0.613	-0.163	0
P value	0.106	0.700	0
NMR	-0.879	-0.733	0.671
P value	0.004	0.039	0.069

Table 3

Table3 show total Correlation Coefficient r^{**} and its p value of neonatal admission and case fatality rate and neonatal mortality % between 2005-2012.

The analyses shows negative correlation of NMR and CFR over time versus positive correlation with total neonatal admission rate (NAR).

Year	Neonatal/total admissions %	NM%	P
2005	18.6	9.7	0.001
2006	26.7	8.9	
2007	29.1	8.1	
2008	29.1	8.4	
2009	26.5	6.3	
2010	31	6.6	
2011	27	7.4	
2012	36.3	6.1	

Table 4 shows that over the study period neonatal admissions % increase with a decrease in neonatal death % with a significant p value of 0.001.

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