Mortality and Short Term Outcome of Very Low Birth Weight (VLBW) Infants at a Tertiary Care Center in Saudi Arabia: 9 Years’ Data

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Kuwait Medical Journal 2014; 46 (3): 233 - 236

ABSTRACT

Objectives: To assess the mortality and major morbidity rates of very low birth weight (VLBW) infants delivered at King Khalid University Hospital (KKUH) over a nine-year period. The secondary objective was to benchmark our data to the National Institute of Child and Health Development (NICHD) neonatal research network published figures.

Design: Retrospective analysis of prospectively collected data

Setting: Neonatal Intensive Care Unit, KKUH, Riyadh, KSA

Subjects: All VLBW infants born alive at KKUH with birth weights less than 1500 g and gestational age of 32 weeks or less during the period from 1999 to 2007.

Interventions: Data were collected from NICU database and follow-up clinic database and then analyzed by the use of Microsoft Excel program. Mortality and various morbidities in this group of infants were evaluated and results were compared with international figures.

Main Outcome Measures: Mortality and major morbidity rates

Results: A total of 468 VLBW infants were included in this study. The infants had a mean gestational age of 27.5 weeks and a mean birth weight of 992 g. Mortality rate was 11.2% (survival rate of 88.8%). Survival varies dramatically per gestational age. The commonest morbidity was respiratory distress syndrome (95.2%), followed by retinopathy of prematurity (34.5%), and bronchopulmonary dysplasia (BPD) (27.4%). Early neonatal sepsis was documented in 11% of infants.

Conclusion: The survival of VLBW infants at KKUH is high and comparable to international figures. Although short term outcomes were quite satisfactory, the high rate of sepsis is alarming and requires urgent intervention.

KEY WORDS: gestational age, neonatal morbidity, preterm birth, survival of infants

INTRODUCTION

Survival of very low birth weight (VLBW) infants continues to improve, particularly of infants less than 1000 g at birth, mainly due to advances in prenatal care including the use of antenatal corticosteroid therapy, and postnatal surfactant replacement therapy[1]. Despite this improvement, there has been minimal change in the boundaries of viability and in the number of infants surviving without significant neonatal morbidity[2]. Poor growth in early childhood is common in extremely preterm children. Improving early growth must be a priority for clinical care[3]. The contribution of preterm birth to population disability rates has often been discussed with the implication that increasing survival at extremely low gestational age simply increases the burden of disability in the population as a whole. Being born prematurely is not a normal event, despite its routine nature today. Although a lot of work had been done to prevent or reduce prematurity, the main duty of neonatologists remains to work on dealing with morbidities of these infants and trying to prevent or minimize long term adverse neurodevelopmental outcome which could be optimally conducted by the use of proper long-term follow-up programs designed to deal with such group of infants and their families[4-5]. Knowledge of local data augment clinicians ability to provide appropriate counseling to parents, plan resources and benchmark local data to international standards.

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Few published studies from Saudi Arabia reported
the rates of mortality and morbidity outcomes in such
tiny newborns. However, most of these studies
were single centered and did not reflect the magnitude
of prematurity and its complications at the national
level.

Our main objectives were to assess the mortality
and major morbidity rates of VLBW infants delivered
at King Khalid University Hospital (KKUH) over a
nine-year period. Our secondary objective was to
benchmark our data to the National Institute of Child
and Health Development (NICHD) neonatal research
network published figures.

SUBJECTS AND METHODS
A retrospective analysis of prospectively collected
data at KKUH in Riyadh, Saudi Arabia was conducted.
Data were collected from year 1999 to 2007. VLBW
infants born alive with a birth weight less than 1500 g
and 32 weeks gestation or less were included. Data
were collected after careful review of the medical
records. The Institutional Ethics ReviewBoard (IERB)
at KKUH approved our study.

Baseline demographic data included maternal
history, maternal age, parity, use of antenatal steroids,
antenatal antibiotics, gestational age, birth weight,
sex, mode of delivery, Apgar score, as well as need for
mechanical ventilation, and surfactant administration.

Our primary outcome was mortality defined as
death prior to hospital discharge. Other neonatal
morbidity rates were also included as secondary
outcomes. Intraventricular hemorrhage (IVH) was
detected routinely by head ultrasound performed
during the first four weeks of life, and IVH was graded
depending on Papile's classification, from 0 - 4. If
multiple ultrasounds were done in the first four weeks,
then the worse grade was recorded. Periventricular
leuromalacia (PVL) refers to periventricular
echogenecity detected on head ultrasound done at
any time during the NICU stay. Respiratory distress
syndrome (RDS) was diagnosed, if the infant needed
supplemental oxygen along with a chest radiograph
consistent with RDS. Pneumothorax was considered
to be present, if the infant had extra pleural air diagnosed
by chest radiograph or needle aspiration. Patent ductus
arteriosus (PDA) was diagnosed via echocardiography
with evidence of left-to-right shunting. Necrotizing
enterocolitis (NEC) was diagnosed clinically with
abdominal distension and intolerance to feed or bloody
stool, in addition to an abdominal radiograph showing
pneumatosis intestinalis, pneumoperitoneum, or gas
in the biliary tree. Bell's classification was used for
staging. Retinopathy of prematurity (ROP) was
detected on routine retinal examination and was
recorded utilizing the International Classification of
ROP. Bronchopulmonary dysplasia (BPD) was
defined as oxygen requirement at 36 weeks corrected
age. Sepsis was considered, if a blood culture or
cerebrospinal fluid culture was positive with a
bacterial pathogen and early sepsis was defined as
positive culture in the first 72 hours of life.

We present our descriptive data as median
and range for continuous variables and frequency
and percentages for categorical data. Our data for
mortality was further subcategorized according to
mortality by gestational age. To benchmark our data
and performance, we performed a direct comparison

Table 1: Maternal and infants baseline characteristics

<table>
<thead>
<tr>
<th>Infant Characteristics</th>
<th>Mean ± (Standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight (g)</td>
<td>992.7 (287)</td>
</tr>
<tr>
<td>Mother age</td>
<td>28.9 (6.1)</td>
</tr>
<tr>
<td>Parity ±</td>
<td>1 (0-11)</td>
</tr>
<tr>
<td>Apgar score 1 min</td>
<td>5 (2.0)</td>
</tr>
<tr>
<td>Apgar score 5 min</td>
<td>7.4 (1.5)</td>
</tr>
<tr>
<td>Admission temperature</td>
<td>35.7 (1.0)</td>
</tr>
<tr>
<td>Days on oxygen</td>
<td>57 (53.9)</td>
</tr>
<tr>
<td>Length of hospital stay</td>
<td>71 (53.2)</td>
</tr>
<tr>
<td>Day feeding started</td>
<td>1 (1-32)</td>
</tr>
<tr>
<td>Age full feed ±</td>
<td>39.4 (51.1)</td>
</tr>
<tr>
<td>Weight on discharge (g)</td>
<td>2357.4 (739.5)</td>
</tr>
</tbody>
</table>

RESULTS
A total of 468 eligible infants were included for the
study period (1999 - 2007). Included infants had a mean
birth weight of 992 g. Majority of mothers were Saudis
(93%), and around 70% of them were booked at our
hospital. There was equal gender distribution. Four
hundred and fifteen infants survived to discharge,
with survival rate of 88.8%. Maternal and infants
demographic data are shown in Table 1. Survival rate
per gestational age showed a dramatic improvement
of survival beyond 25 weeks gestation. Infants born
at 23 and 24 weeks gestation had a survival rate of
61 and 65% respectively. Only one infant at 22 weeks
gestation was included and it died (Table 2). Of note,
extreme low birth weight infants born at our institution

Table 2: Survival rates based on gestational age

<table>
<thead>
<tr>
<th>Gestational age in weeks</th>
<th>Survived / Total</th>
<th>Survival rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>0 / 1</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>11 / 18</td>
<td>61.0</td>
</tr>
<tr>
<td>24</td>
<td>26 / 40</td>
<td>65.0</td>
</tr>
<tr>
<td>25</td>
<td>28 / 33</td>
<td>84.8</td>
</tr>
<tr>
<td>26</td>
<td>63 / 70</td>
<td>90.0</td>
</tr>
<tr>
<td>27</td>
<td>44 / 49</td>
<td>90.0</td>
</tr>
<tr>
<td>28</td>
<td>58 / 62</td>
<td>93.6</td>
</tr>
<tr>
<td>29</td>
<td>54 / 59</td>
<td>91.5</td>
</tr>
<tr>
<td>30</td>
<td>77 / 78</td>
<td>98.7</td>
</tr>
<tr>
<td>31</td>
<td>39 / 43</td>
<td>91.0</td>
</tr>
<tr>
<td>32</td>
<td>15 / 15</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>415 / 468</td>
<td>88.8</td>
</tr>
</tbody>
</table>
were offered full resuscitation, if they were born with a weight of 500 g or more. Antenatal steroids were administered to 77.5% of mothers (Table 3).

RDS was present in 95.2% of infants. Surfactant treatment was given to 80% of infants, and around 28% of infants received postnatal steroids for evolving BPD, which developed in 28% of infants. Postnatal steroids were administered to 77.5% of mothers (Table 3).

SVD = spontaneous vaginal delivery

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The baseline characteristics of our subjects including mean birth weight, antenatal steroids utilization, rate of cesarean section (CS) deliveries, were quite comparable to NICHD data. As for the short term neonatal morbidities, the rate of RDS and delivery room endotracheal intubation in our unit was double the number reported in the NICHD data possibly due to different definitions and delivery room practices utilized. Our rates of early and late onset sepsis far exceed the rates reported by NICHD. The rates of severe IVH (grade III and IV) were almost half the reported figures in the NICHD data probably due to utilization of indomethacin prophylaxis strategy in our unit.

DISCUSSION

In this study, we report our institutional short-term outcome data of VLBW infants. Our data showed a similar survival rate in addition to major short term outcomes when compared to international figures. Although we had no survivals at 22 weeks (those born above 500 g), the survival rate of infants born at 23 weeks was surprisingly high. A recent report from a high quality tertiary care unit showed no survival at this age[14]. This could partially be explained by accuracy of gestational assessment since 30% of our mothers were un-booked.

The high rate of RDS in our unit is quite puzzling compared to international figures. The retrospective nature of our data makes it difficult to pinpoint a clear explanation to this observation. However, we believe that the high rate of un-booked mothers makes it difficult to anticipate and prepare for such high risk deliveries, to administer full course antenatal steroids, and have the infant born with the presence of an experienced neonatal team. It is also not clear to us why 75% of cases got intubated in the delivery room and what were the criteria utilized for such an aggressive practice.

Despite having a higher rate of RDS and possibly sicker infants compared to NICHD report, we observed almost half the rate of severe IVH in our population. This observation is most likely due to our inherited practice of indomethacin prophylaxis for infants born less 1000 g at birth. Our practice for many reasons did
not decline post the publication of the TIPP trial as observed in the international arena.

It is well known that both early and late onset sepsis decreases the survival of VLBW infants and increases their risk of long-term neurocognitive impairment\(^2\). We have observed a very high rate of sepsis in our unit compared to international standards. The increased rates of early onset sepsis could be explained by the increased rate of un-booked mothers and lack of proper preparatory action prior to delivery. However, it is not quite difficult to explain the high rate of late onset sepsis. Lack of vigilance in observing proper hand washing, extremely low rates of exclusive breast feeding, over crowding in improper NICU design are all possible contributory factors.

Although our study represents one of the largest cohorts of VLBW infants in the country, the retrospective nature of our data collection, in addition to the heterogeneity in the resource availability and neonatal practices hamper our ability to generalize our data to a national level. Therefore, accurate, representative and prospective data of survival and major morbidities of VLBW infants in Saudi Arabia are still needed.

CONCLUSION

The survival of VLBW infants at KKUH is high and comparable to international figures. Although short-term outcomes were quite satisfactory, the high rate of sepsis is alarming and requires urgent intervention.

ACKNOWLEDGMENT

We thank all NICU physicians who filled data sheets and kept them updated, and neonatal follow-up clinics team who provided great help and support in completing this project.

Competing interests: None to declare

REFERENCES


