CLINICAL & BASIC RESEARCH

Perinatal Mortality Rate as a Quality Indicator of Healthcare in Al-Dakhiliyah Region, Oman

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معدّل وفيات ما حول الولادة كمؤشر على جودة الرعاية الصحية في محافظة الداخلية في سلطنة عمان

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الملخص: الهدف: تهدف هذه الدراسة إلى توفير رؤية عن أسباب وفيات الإملاص ووفيات حديثي الولادة المبكرة وتحديد أفضل إستراتيجيات للتدخل. الطريقة: كانت هذه الدراسة بأثر رجعي خلال فترة 7 سنوات (يناير 2003 إلى ديسمبر 2009) لجميع حالات وفيات الإملاص ووفيات حديثي الولادة المبكرة في المستشفي المرجعي لمحافظة الداخلية سلطنة عمان (مستشفى نزوى). النتائج: من مجموع عدد الولادات 27,668 ولادة، كانت هناك 244 حالة وفيات الإملاص و 157 حالة وفيات حديثي الولادة المبكرة. كان معدل وفيات الفترة المحيطة بالولادة 14.49/1,000 ولادة حيث كان المعدل 17.23/1,000 ولادة في عام 2003، 18.33/1,000 ولادة في عام 2004، 15.20/1,000 ولادة في عام 2005، 12.20/1,000 ولادة في عام 2006، 12.46/1,000 ولادة في عام 2007 و12.09/1,000 ولادة في عام 2008. وكان الانخفاض في معدل الوفيات حسب السنوات معتد به إحصائيا 0.005>= P)،وأرتفع المعدل في عام 2009 إلى 15.63/1,000 ولادة كانت معظم الزيادة في وفيات حديثي الولادة المبكرة (التشوهات الخلقية). وكان السبب الأكثر شيوعا لوفيات الإملاص التشوهات الخلقية (18.82%)، وكان السبب الأكثر شيوعا من بين التشوهات الخلقية هو شذوذ مركزية الجهاز العصبي. وتشمل الأسباب الأخرى انفصال المشيمة الباكر (13%) وحوادث الحبل السري (12%) وتقييد النمو داخل الرحم، في حين ظلت الوفيات مجهولة السبب في 22.59%. شكلت التشوهات الخلقية 53.50% من وفيات حديثي الولادة المبكرة تليها الخداج (23.56%) والاختناق أثناء الولادة (5.73%). عمر الأم المتطرف كبيرا أو صغيرا كان مرتبطا بزيادة معدلات وفيات الفترة المحيطة بالولادة . الخلاصة: هناك تحسن بشكل عام في معدلات وفيات الإملاص ووفيات حديثي الولادة. ومع ذلك هناك حاجة لتحسين التدخل لتجنب عوامل الخطر التي يتعرض لها الأم والجنين. هناك حاجة لتوفير رعاية إضافية للنساء المعرضات للإصابة بسكري الحمل و ارتفاع ضغط الدم الناتج عن الحمل، وتقييد النمو داخل الرحم.

مفتاح الكلمات: وفيات الفترة المحيطة بالولادة، الإملاص، مؤشرات الجودة، والرعاية الصحية، عمر الأمهات، عمان

abstract: *Objectives:* This study aimed to provide insight into the causes of stillbirths and early neonatal deaths and identify better intervention strategies. *Methods*: This was a retrospective study during a 7-year period (January 2003 to December 2009) of all stillbirths and early neonatal deaths at the Nizwa regional referral hospital in Al-Dakhiliyah region, Oman. *Results*: Of a total 27,668 births, there were 244 stillbirths and 157 early neonatal deaths. The perinatal mortality rate (PMR) was 14.49/1,000 births. The period-specific rates were 17.23/1,000 in 2003, 18.33/1,000 in 2004, 15.20/1,000 in 2005, 12.20/1,000 in 2006, 12.46/1,000 in 2007 and 12.09/1000 in 2008. This decline in the death rate was significant (P = <0.005). The rate rose in 2009 to 15.63/1,000, mostly from an increase in early neonatal deaths (congenital anomalies). The most common identifiable cause of stillbirth was congenital anomalies (18.82%), in which central nervous system anomalies were most common. Other causes include *abruptio placentae* (13%), cord accidents (12%), and intrauterine growth restriction (IUGR), while the cause remained unknown in 22.59%. Congenital anomalies accounted for 53.50% of early neonatal deaths followed by prematurity (23.56%) and birth asphyxia (5.73%). Extremes of maternal age were related to higher PMRs. *Conclusion*: An overall improvement in the stillbirths and neonatal death rates was witnessed; however, further improvement is warranted for common avoidable fetal and maternal risk factors. Extra care needs to be provided for women who are at risk of developing complications such as gestational diabetes, pregnancy-induced hypertension, IUGR, etc.

Keywords: Perinatal Mortality; Stillbirth; Quality Indicators; Health Care; Maternal Age; Oman.

Advances in Knowledge

This retrospective study in Oman reveals the following contributing factors to high perinatal mortality rate:

- *Comorbidity during the pregnancy, especially diabetes (mainly uncontrolled),,*
- *Pregnancy at later ages (>35 years).*
- *Lack of knowledge among treating physicians of risk factors for high perinatal mortality.*

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Application to Patient Care
A background knowledge of identified risk factors for the Omani population may contribute to decreasing the perinatal mortality through:
- *Education regarding strict control of sugar levels during the pregnancy.*
- *Timely interventions during pregnancy and close monitoring of sick neonates.*
- *More emphasis on prenatal screening and possible termination of pregnancy—if socially and religiously acceptable—when lethal congenital anomalies are detected.*

THE PERINATAL MORTALITY RATE (PMR) is defined as the number of stillbirths and early neonatal deaths for every 1,000 births, while stillbirth is defined as a baby born dead after the 24th week of gestation.[1] Maternal care is assessed by PMR as it is a very useful and comprehensive quality indicator. The PMR is much higher than the maternal death rate; hence, the PMR is more relevant in daily practice and also provides a clearer picture of the problems encountered.[2] The extended Wigglesworth classification mentions four main categories (congenital malformations, antepartum stillbirths, intrapartum stillbirths and prematurity) and has the potential to provide information which may lead to further reduction in perinatal mortality.[2]

Congenital malformations are considered the most common cause of perinatal mortality, with cardiac anomalies being the commonest reason as cardiac deformities can be missed on a routine anomaly scan. In addition, detection of *in utero* cardiac abnormalities not only requires expertise but also expensive equipment.

The majority of antepartum stillbirths, or fetal deaths taking place prior to the onset of labour, are classified as "unexplained" by the Confidential Enquiry into Maternal and Child Health (CEMACH), and are also considered as unavoidable by most professionals.[3] A recent study in the UK reported intrauterine growth restriction (IUGR) in >50% of unexplained stillbirths.[4] Better screening for IUGR was recommended by the 8th Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). It reported that 45% of all stillbirths were found to be related to suboptimal care and failure to recognise women at high risk for such events. A change in the frequency or strength of fetal movements are also often noticed by many mothers; therefore, prompt check-ups are required for concerns regarding fetal movement.[5]

The main problems in antepartum and intrapartum care, and the main risk factors in intrapartum stillbirths are suboptimal fetal assessment (heart rate monitoring and fetal blood sampling) and non-perception of risk factors. Adherence to the guidelines of the Royal College of Obstetricians & Gynaecologists for improved standards of care in labour, and for electronic fetal monitoring in labour will overcome these problems.[6]

In the USA, prematurity, or preterm birth, accounts for 12% of all births and 75% of all neonatal mortality.[7] The immediate causes of neonatal death include respiratory distress syndrome (RDS), infection, neurological causes and gastrointestinal causes. The survival of neonates has improved due to the administration of antenatal RDS prophylaxis and better neonatal care.

Currently, the quality of antenatal and perinatal care is best judged by the PMR. This aim of this study was to highlight the risk factors causing perinatal mortality in Oman and how these can be prevented.

Methods

This was a retrospective study on all stillbirths (n = 244) and early neonatal deaths (n = 157) from January 2003 to December 2009 at Nizwa Hospital, a regional referral centre providing secondary-level antenatal and neonatal care in the Al-Dakhliyah central region of Oman.

Data were collected from the hospital's computer system and the records of the identified cases were scrutinised. Apart from the cases of stillbirths and early neonatal deaths, 3,258 mothers of live births were selected randomly from a total of 27,668 for the analysis of maternal age and adequacy of antenatal care (ANC), which was defined as >6 ANC visits. Additionally, a birth interval of 2 or >2 years was considered to see the effect of these contributory factors on perinatal mortality. In addition to the general health profile of the mother, any illnesses or factors known to predispose to perinatal loss were carefully analysed. The same procedure was performed on the neonates' records.

The date of the mother's last menstrual period,

Table 1: Effect of contributory factors on perinatal mortality

Factors	Survival rate n (%)	Perinatal mortality rate n (%)	Total	*P* value (comparing survival and PMR)
Maternal age in years				
<20	220 (6.8)	40 (10)	260 (7.1)	
21–35	2,558 (78.5)	285 (71.1)	2,843 (77.7)	0.003
>35	480 (14.7)	76 (19)	556 (15.2)	
Total	3,258	401	3,659	
ANC visits				
≤6	1,128 (34.6)	157 (39.2)	1,286 (35.1)	
>6	2,130 (65.4)	244 (60.8)	2,374 (64.9)	0.069
Total	3,258	401	3,659	
Birth interval				
≤2 years	1,186 (36.4)	89 (36.5)	1275 (36.4)	
>2 years	2,072 (63.6)	155 (63.5)	2,227 (63.6)	0.987
Total	3,258	*244	3,503	

Data not available for early neonatal deaths.
PMR = perinatal mortality rates; ANC = antenatal care.

early antenatal ultrasound scans, and neonatal examination (where feasible) were used to estimate the gestational age of each baby. Maternal age and parity, and the infants' birth weight and gestational age were used to analyse the perinatal deaths. Wigglesworth's classification was used to determine the cause of perinatal deaths. A similar earlier study, carried out at Nizwa Hospital before 2002, was used a comparison to highlight the improvements achieved over the last 7 years.[8]

Data were analysed using the Statistical Package for the Social Sciences (SPSS, IBM, Corp., Chicago, Illinois, USA) Version 16. The Chi square test was used to evaluate the hypothesis with a level of significance of >0.05.

This study was approved by the Research & Ethics Committee of Nizwa Hospital.

Results

Out of all 27,668 deliveries which took place during the study period, there were 244 stillbirths and 157 early neonatal deaths. This figure includes all the referral cases from the Al-Dakhliyah region. If the neonate was delivered at ≥26 weeks' gestation or at a birth weight of ≥800 g, then resuscitation was started. In cases of precious pregnancy such as infertility treatment or a poor obstetric history, then the threshold was 700 g. The PMR was 14.49/1,000 births. The period-specific rate showed an improving trend, descending from 17.23/1,000 in 2003 to 12.09/1,000 in 2008, which is statistically significant (P ≤0.005). However, the rate was 15.63/1,000 in 2009 due to an unusual increase in early neonatal deaths (congenital anomalies) [Figure 1].

The most common identifiable cause of stillbirth was congenital anomalies (18.82%), in which central nervous system anomalies were the most common. Other causes included *abruptio placentae* (13%) and cord accidents (12%), while in 22.59% of cases, the cause remained unknown [Figures 2 and 3].

Congenital anomalies accounted for the highest percentage of early neonatal deaths (53.5%) followed by prematurity (23.56%) and birth asphyxia (5.73%) [Figures 4 and 5]. Two-thirds (66%) of stillbirths occurred between 28 and 40 weeks' gestation and 34% were before 28 weeks' gestation.

The results from the analysis of the 3,258 randomly selected women from a total of 27,668 mothers of births other than stillborn and early neonatal deaths are shown in Table 1. We found that the perinatal mortality was 19% in women over 35 years of age compared to 14.7% live births
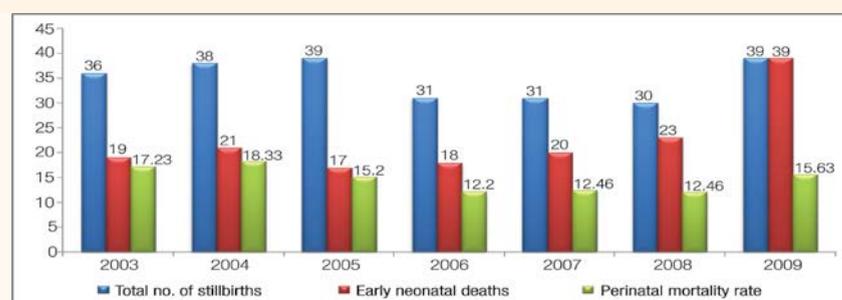
Figure 1: Incidence of perinatal mortality at Nizwa Hospital, Oman.
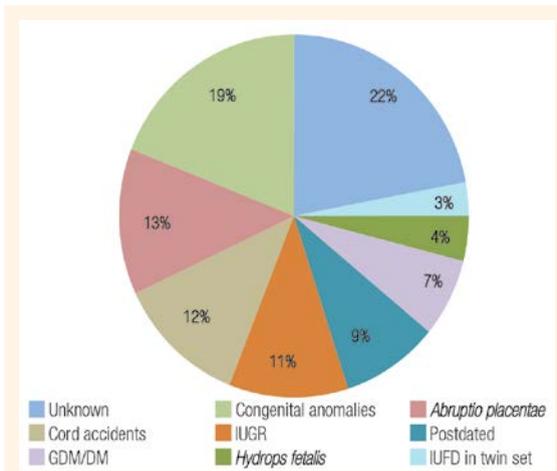
Figure 2: Causes of stillbirths at Nizwa Hospital, Oman.

IUGR = intrauterine growth restriction; DM = diabetes mellitus; GDM = gestational diabetes mellitus; IUFD = intrauterine fetal death.

in the younger age group (P = 0.003). In women who had less than 6 antenatal visits, the PMR was 39.2%, which was higher than those having live births (34.6%; P = 0.069). There was no association between perinatal mortality and birth interval (P = 0.987).

Discussion

The PMR is a sensitive indicator of the quality of care provided to women in pregnancy, during and after child birth and to the newborns in the first week of life.[9]

This study of a 7-year period showed an aggregate PMR of 14.49/1,000 births which is better than the rate of 19.1/1,000 births reported in a study
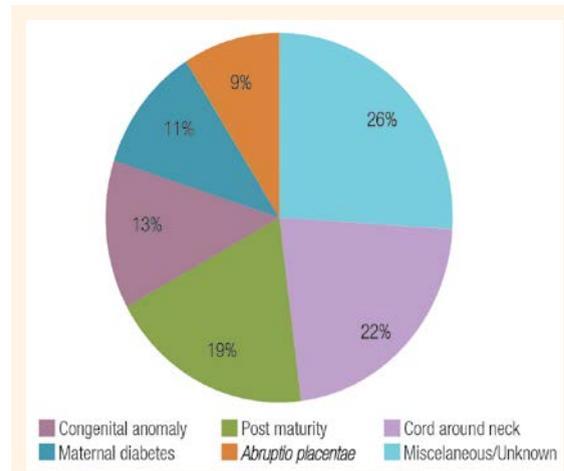
Figure 3: Causes of death in stillbirth fetuses weighing >2.5 Kg (n = 76) at Nizwa Hospital, Oman.

from Nepal.[9] The period-specific rate declined from 17.23/1,000 in 2003 to 12.00/1,000 in 2008, followed by a rise to 15.63/1,000 in 2009, mostly from increased early neonatal deaths (congenital anomalies). It was 21.06/1,000 births in the last study at Nizwa Hospital carried out prior to 2002.[8] The main reason for the decrease in the PMR was the improvement of both mother and newborn care.

Worthy of note is that despite a significant increase in the number of births in the last 7 years, there was no concurrent increase in perinatal death. Despite this success, the PMR in Oman is higher than in the UK. For example, in 2007 it was 14.7/1,000 births in Oman, whereas in the UK it was 7.7/1,000 births.[3,10] This was partially due to differences in patient compliance; for example, in
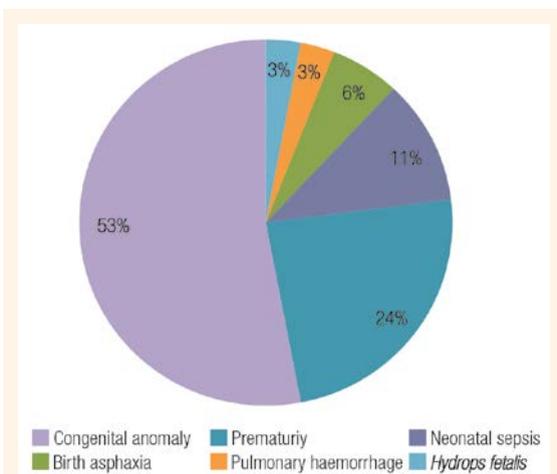
Figure 4: Causes of early neonatal deaths at Nizwa Hospital, Oman.
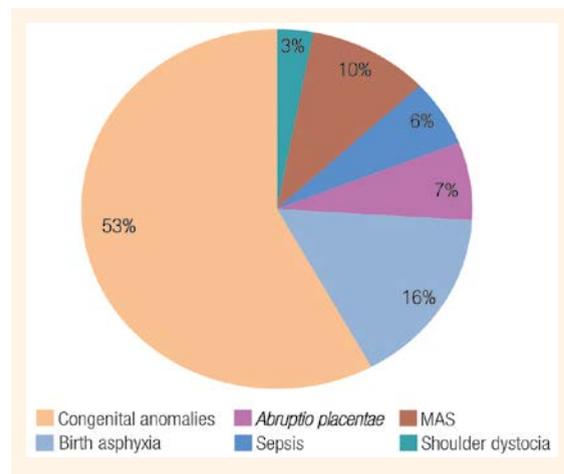
Figure 5: Causes of early neonatal death in infants weighing >2.5 Kg (n = 31) at Nizwa Hospital, Oman.
MAS = myconium aspiration syndrome.

Oman there may be a higher frequency of cases of diabetic patients not willing to be admitted for blood glucose profile testing or to start taking insulin, or there may be a reluctant toward induction of labour where indicated, or pregnancy termination may be declined, due to religious and cultural customs, in cases of lethal congenital anomalies.

This 7-year study in Oman revealed a 22% unexplained stillbirth rate whereas studies from the UK and Kathmandu, Nepal, showed 33% and 36% rates, respectively.[1,9]

The most common identifiable cause of stillbirths in Oman was congenital anomalies (19%), which is much lower than the number reported from Nepal (63.6%) but higher than that in the CEMACH study in the UK (4%).[3,9] *Abruptio placentae* and cord accidents were responsible for 13% and 12% of cases, respectively as a cause of stillbirths, which is similar to the study from Nepal (13.6% *abruptio placentae* and 17.9% cord accidents).[9] In our study, IUGR was responsible for 11% of stillbirths, which is lower than the figure given in the Royal College of Obstetricians & Gynaecologists 2010 guidelines on late intrauterine fetal death and stillbirth, where one-third (33.3%) of stillbirths were due to the fetus being small-for-gestational-age.[11] Because of strict hospital protocols, including early identification of IUGR fetuses, appropriate monitoring and timely intervention, the perinatal mortality from IUGR was reduced in our study. Other causes of stillbirth in our study were prolonged pregnancy, pregnancy associated with diabetes (DM), and *hydrops fetalis*. More recent studies have shown an increased risk of stillbirth in prolonged pregnancies, pregnancies associated with DM and *hydrops fetalis*.[12-14] Different ethnic backgrounds and methodologies, plus improved obstetrics and neonatal care, might be the reason for differences observed in various studies.

During the study period, there were 157 early neonatal deaths at Nizwa Hospital (5.64/1,000 live births). These rates were comparable with overall national rates.[15] The rate of early neonatal deaths was higher than that reported from other Gulf countries. In Qatar, the early neonatal death rate was 2.3/1,000 live births.[16] In Saudi Arabia it was 3.14/1,000 live births.[17] Out of the 157 babies that died in the first week of life, 84 (54%) died from lethal malformations, making this the most common cause of neonatal death. Prematurity

(n = 37; 24%), neonatal sepsis (n = 16; 11%), birth asphyxia (n = 9; 6%), *hydrops fetalis* (3%) and inborn error of metabolism (2.2%) were seen in early neonatal deaths.

Mothers over 35 years of age have been found to have an increased risk of stillbirth and neonatal death compared to younger mothers, with the magnitude of the risk increasing from 40 years of age onwards.[18] In the current study, 2.1/1,000 births were intrapartum stillbirths, which was a rate higher than the 1.1/1,000 stillbirths in an American study.[18] The cause of the higher rate in our study was the increased incidence of congenital anomalies.

In our study, nearly two-thirds (61%) of stillbirths and 69% of early neonatal death occurred at <37 weeks' gestation which is a rate similar to the CEMACH 2007 results in the UK (66% and 74%, respectively).[3] Of all documented stillbirths in our study, 46.7 % weighed 1–2.5 Kg, compared to 54.5% in the Nepalese study. The same study reported 10% of cases weighing <1 Kg while in our study, 40.7% weighed <1 Kg.[9] Overall, the feedback showed that individualised perinatal mortality reports have been well documented and are being used locally to discuss and review perinatal deaths.

The results of this retrospective study reveal that the contributing factors for high PMR are comorbidities during pregnancy, especially DM (mainly uncontrolled), pregnancy at later ages (>35 years), and a lack of knowledge of risk factors in treating physicians.

This knowledge of identified risk factors for the Omani population may contribute to decreasing Oman's PMR. This could be achieved by education regarding proper follow-up and strict control of sugar levels during pregnancy; timely intervention during the pregnancy; close monitoring of sick neonates; more emphasis on prenatal screening, and possible termination of pregnancy if this is socially and religiously acceptable to the family concerned.

As the data were collected retrospectively, some records were not complete. In particular, the rate of anaemia in mothers, and information on maternal malnutrition and cephalopelvic disproportion were not available. Prolonged labour could not be correlated with perinatal mortality. Autopsy was not performed in these cases due to social and cultural beliefs. It is a known fact that to reach accurate diagnoses, especially in cases where there

was no obvious cause of death, perinatal autopsy provides important information.

Conclusion

Our findings show an improvement in stillbirth and neonatal death rates at Nizwa Hospital, Oman, but more vigilance is required to prevent common avoidable fetal and maternal risk factors, especially in women who need extra support and care. The PMR is a major marker to assess the quality of health care delivery. Early interventions, high-quality antenatal care, proper care of sick neonates, prevention of preterm births, intensive care of low birth weight babies, and the implementation of a policy of standard intrapartum care, including appropriate and timely interventions, are important factors in reducing perinatal deaths. Improving access to prenatal screening for congenital abnormalities and early termination of pregnancy for lethal congenital anomalies may help further in the reduction of the PMR.

References

1. Drife J. Can we reduce perinatal mortality in the UK? Expert Rev Obstet Gynecol 2008; 3:1–3.

2. Baker PN, Johnson I, Jones G, Kean L, Kenny LC, Mires G, et al. Maternal and perinatal mortality: The confidential enquiries. In: Baker P, Ed. Obstetrics by Ten Teachers. 18th ed. London: Hodder Arnold, 2006. Pp. 20–33.

3. Cox S, Golightly S, Sullivan A. Perinatal Mortality 2007. United Kingdom: Confidential Enquiry into Maternal and Child Health (CEMACH), 2009.

4. Gardosi J, Kady SM, McGeown P, Francis A, Tonks A. Classification of stillbirth by relevant condition at death (ReCoDe): Population based cohort study. Brit Med J 2005; 331:1113–7.

5. Confidential Enquiry into Stillbirths and Deaths in Infancy Report, 2001. From: www.dhsspsni.gov.uk/cesdi_report.pdf Accessed: Feb 2013.

6. Royal College of Obstetricians and Gynaecologists. Standards for Maternity Care. Report of a Working Party. From: www.rcm.org.uk/EasySiteWeb/GatewayLink.aspx?alld=130242 Accessed: Feb 2013.

7. Alvarez JR, Apuzzio JJ. Controversies in the management of preterm premature rupture of membranes. In: Studd J, Tan SL, Chervenak F, Eds. Progress in Obstetrics and Gynaecology. 18th ed. Edinburgh: Elsevier, 2008. Pp. 203–22.

8. Pandey B, Hamdi I, George S, Pandey R. Perinatal mortality in Nizwa Hospital. Oman Med J 2002; 19:52–5.

9. Shrestha M, Manandhar D, Dhakal S, Nepal N. Two year audit of perinatal mortality at Kathmandu Medical College Teaching Hospital. Kathmandu Univ Med J (KUMJ) 2006; 4:176–81.

10. Ministry of Health of Oman. Status of health programmes and morbidity and mortality. Muscat: Ministry of Health 2007. Pp. 8.15, 8.6, 9.45.

11. Royal College of Obstetricians and Gynaecologists. Late Intrauterine Fetal Death and Stillbirth (Green-top 55), 2010. From www.rcog.org.uk/womens-health/clinical-guidance/late-intrauterine-fetal-death-and-stillbirth-green-top-55 Accessed: Feb 2013.

12. Crowley P. Prolonged pregnancy. In: Edmonds DK, Ed. Dewhurst's Textbook of Obstetrics and Gynaecology. 7th ed. London: Blackwell, 2007. Pp. 192–204.

13. Tower CL. Diabetes mellitus. In: Luesley DM, Baker PN, Eds. Obstetrics and Gynaecology: An evidence-based text for MRCOG. 2nd ed. London: Edward Arnold, 2010. Pp. 49–58.

14. Smoleniec JS. Fetal Hydrops. In: James DK, Ed. High Risk Pregnancy Management Options. 4th ed. London: Elsevier Saunders, 2011. Pp. 437–48.

15. Ministry of Health of Oman. Health Domains, Morbidity and Mortality. Muscat: Department of Health Information & Statistics, Ministry of Health.

16. Salameh K, Rahman S, Al-Rifai H, Masoud A, Lutfi S, Abdouh G, et al. An analytic study of the trends in perinatal and neonatal mortality rates in the State of Qatar over a 30-year period (1977 to 2007): A comparative study with regional and developed countries. J Perinatol 2009; 29:765–70.

17. Majeed-Saidan MA, Kashlan FT, Al-Zahrani AA, Ezzedeen FY, Ammari AN. Pattern of neonatal and postneonatal deaths over a decade (1995-2004) at a military hospital in Saudi Arabia. Saudi Med J 2008; 29:879–83.

18. Getahun D, Ananth CV, Kinzler WL. Risk factors for antepartum and intrapartum stillbirth: A population-based study. Am J Obstet Gynecol 2007; 196:499–507.