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Perinatal deaths in singleton pregnancy in Hong Kong

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In Hong Kong, the perinatal death rate remains low, but the stillbirth rate has fluctuated over the past 12 years. Between 2000 and 2019, the leading causes of perinatal death were fetal growth restriction, chorioamnionitis, congenital malformations and genetic abnormalities, placental abruption, and preeclampsia. However, 43.5% of fetal growth restriction cases were not diagnosed during routine antenatal care, and about one-third of all singleton stillbirths were unexplained. The common causes of early neonatal death were congenital or genetic abnormalities, prematurity, sepsis, and hypoxic-ischaemic encephalopathy. The World Health Organization and the United Nations Children's Fund have called for efforts to end preventable newborn deaths and stillbirths by 2030. This perspective aimed to review the current trend, leading causes, and preventive measures of perinatal death in Hong Kong.

Keywords: Fetal death; Perinatal death; Perinatal mortality; Stillbirth

Introduction

Perinatal deaths include both stillbirths and early neonatal deaths (within 7 days of life); they are devastating for women, their families, and healthcare providers. The World Health Organization and the United Nations Children's Fund have called for efforts to end preventable newborn deaths and stillbirths by 2030[1]. Effective interventions are available to prevent and manage the main causes of perinatal death including prematurity, intrapartum-related deaths (including birth asphyxia), neonatal infections, and congenital anomalies[1]. Saving Babies' Lives Care Bundle (SBLCB) is the evidence-based best practice designed by the United Kingdom's National Health Service to reduce perinatal mortality[2]. This perspective aimed to review the current trend, leading causes, and preventive measures of perinatal death in Hong Kong, and to discuss the six elements of SBLCB and other clinical practices in Hong Kong.

Trend and causes of perinatal mortality

In Hong Kong, the perinatal death rate (per 1000 total births) decreased from 6.98 in 1992 to 2.23 in 2012, but has fluctuated between 2.23 and 4.6 thereafter[3-9]. In particular, the stillbirth rate (per 1000 total births) reduced to 1.6 in 2012 but has fluctuated between 1.6 and 3.7 thereafter, whereas the early neonatal death rate (per 1000 live births) reduced to 0.6 in 2011 and remained unchanged (at approximately 1.0). Despite the COVID-19 pandemic, the perinatal death rate decreased from 4.6 in 2020 to 3.5 in 2022. Fluctuation in the stillbirth rate over the past 12 years could be the result of the delay in childbearing, as a larger proportion of pregnant women were of advanced maternal age, used assisted reproductive techniques, or had complex medical conditions.

In the United States, the perinatal death rate decreased by 30% from 1990 to 2011 and was stable from 2011 to 2016 and then decreased 4% from 5.93 in 2017 to 5.69 in 2019[10]. In 2020, the perinatal death rate was 5.64 in the United States and 4.6 in Hong Kong. However, a direct comparison was inappropriate because the definition of stillbirth differs between these two places[6,10].

In a tertiary obstetric unit in Hong Kong, the perinatal death rate significantly decreased by 16.7% from 5.50 between 2000 and 2009 to 4.59 between 2010 and 2019[11]. The decrease is probably due to improvements in early prenatal diagnosis and treatment of congenital malformations and genetic disorders, as well as in the management of preeclampsia and moderately preterm (31-33 weeks of gestation) neonates[11,12]. The leading causes of stillbirths are fetal growth restriction (FGR), chorioamnionitis, congenital malformations and genetic abnormalities, placental abruption, and preeclampsia[11]. However, FGR is not diagnosed during routine antenatal care in 43.5% of patients, and about one-third of all singleton stillbirths are unexplained[11]. Around 6% of all stillbirths

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are intrapartum and caused by placental abruption, known lethal fetal anomalies, chorioamnionitis, uterine rupture, maternal diabetic ketoacidosis, or umbilical cord accident (eg, cord ulceration)[11]. The low intrapartum stillbirth rate is related to the use of continuous fetal heart rate monitoring, short decision-to-delivery interval, and short bradycardia-to-delivery interval[11]. The leading causes of early neonatal death are congenital or genetic abnormalities, prematurity, sepsis, and hypoxic-ischaemic encephalopathy[12]. Around two-thirds of hypoxic-ischaemic encephalopathy cases are caused by acute perinatal events such as cord prolapse, uterine rupture, vasa praevia, and placental abruption[12]. The rate of early-onset group B streptococcal infection has significantly decreased since the implementation of universal group B *Streptococcus* screening and peripartum antibiotic prophylaxis in 2012[12].

Interventions to reduce perinatal deaths

To reduce avoidable perinatal deaths, continuous care before pregnancy and during pregnancy, labour, and delivery, as well as throughout the neonatal period is required.

Pre-pregnancy advice includes a healthy balanced diet and being physically active at a healthy weight, stopping smoking or exposure to second-hand smoke, reducing or stopping alcohol consumption, taking folic acid supplementation, and having routine vaccinations including rubella and COVID-19 vaccines[2]. Women with pre-existing medical disorders or a family history of genetic disorders require individualised counselling.

During the first antenatal visit, it is important to identify risk factors of stillbirths. Common risk factors include advanced maternal age, age <20 years, obesity, assisted reproduction technology, smoking, pre-existing diabetes mellitus, chronic hypertension, renal disease, systemic lupus erythematosus, previous stillbirth, and multiple pregnancies[13]. In Hong Kong, additional risk factors include nulliparity, non-booked status, and non-Chinese Asian ethnicity[11].

General antenatal interventions to prevent stillbirth include balanced energy/protein supplementation (to enhance fetal growth), particularly in undernourished pregnant women[14]. Periconceptional folic acid supplementation can reduce the perinatal mortality and the risk from major birth defects including neural tube defects[15]. Pregnant women should avoid sleeping on their back after 28 weeks' gestation, as this might be associated with stillbirth[16]. Reducing the number of antenatal care visits may increase the risk of perinatal death[14].

Pregnant women should be advised to maintain oral hygiene, receive vaccinations and boosters (for seasonal flu, pertussis, and COVID-19), and avoid contact with people who have infectious illnesses including *Listeria*, cytomegalovirus, toxoplasmosis, parvovirus, and monkeypox[2].

Reducing smoking in pregnancy

In Hong Kong in 2015, the proportion of women who still smoke during pregnancy was 1.7%; around half of these women continued to smoke throughout their pregnancy[17]. Smoking status should be noted at booking and support given to women who have difficulty quitting smoking. Women should avoid second-hand smoke exposure before and during pregnancy because such exposure may increase the risk of stillbirth by 23% and the risk of congenital malformation by 13%[18].

Electronic cigarettes should not be considered a 'safer alternative' to conventional cigarettes during pregnancy; they are an independent risk factor for adverse outcomes including small for gestational age (SGA), low birthweight, and preterm delivery[19]. The proportion of Hong Kong young smokers (aged ≤25 years) who have used electronic cigarettes or heated tobacco products increased from 57.4% in 2017-2018 to 85.9% in 2019-2020; the reasons for the increase include curiosity, peer influence, and misconceptions[20]. Electronic cigarettes are an increasingly popular tool for drug abuse because the devices can be filled with narcotics or 'space oil'. It is necessary to educate young people and legislate against new tobacco products.

Congenital malformation and genetic abnormalities

Prenatal screening for severe fetal abnormalities should be offered to all pregnant women. At present, the universal, combined, first-trimester screening for Down syndrome is provided by the Hospital Authority, whereas non-invasive prenatal testing of cell-free DNA for detecting common trisomies and other chromosomal abnormalities is a common practice in the private sectors. Non-invasive prenatal testing is superior to combined first-trimester screening; its universal application in the public sector for common trisomies may be cost-effective as the costs decrease over time[21].

Mid-trimester morphology scanning is the standard

of antenatal care and usual practice in the private sectors, but it is not yet routinely provided by the Hospital Authority. The 2022 International Society of Ultrasound in Obstetrics and Gynecology guidelines added eleven fetal structures/elements in the consideration; nonetheless, extra time, effort, and skills are required[22,23]. Basic scanning is sufficient for pregnant women with no risk factors, but a more detailed ultrasound examination, as recommended by the Institute of Ultrasound in Medicine guidelines, is required when there are risk factors or abnormal or suspicious findings[22].

Chorionic villous sampling or amniocentesis, followed by karyotyping and/or chromosomal microarray analysis for aneuploidy and copy number variants, is common practice for investigating the genetic cause of fetal structural anomalies. Chromosomal microarray analysis cannot detect most single-gene disorders. Low-pass genome sequencing can be used to identify additional and clinically significant information with enhanced resolution and increased sensitivity in detecting mosaicism[24]. Whole-exome sequencing can be considered after careful case selection when chromosomal microarray analysis is negative[25].

Prenatal screening is the usual practice. Alpha or beta thalassaemia is the most common inherited genetic disorder in the Hong Kong population. Other haemoglobinopathies may be encountered in other populations. To identify couples at risk of having babies with other inherited genetic disorders such as spinal muscular atrophy and fetal akinesia syndrome, expanded carrier screening is offered, particularly to those with a history of consanguineous marriage[12]. Non-invasive prenatal testing enables early detection of a set of single-gene disorders, particularly in the presence of abnormal ultrasound findings, a positive family history, or advanced paternal age (≥40 years)[26].

When severe fetal abnormalities are diagnosed, termination of pregnancy before 24 weeks of gestation is an option. Fetal therapy is an alternative for cases of fetal anaemia or congenital diaphragmatic hernia, for example, after careful counselling. Fetal therapy should be performed in specialised centres by a multidisciplinary team to manage both maternal and fetal complications[27].

Fetal growth restriction

Risk assessment, surveillance, and management of FGR are important. In view of the increasing rates of stillbirth related to placental pathologies and FGR, improvements in FGR detection are needed[11]. It is important to differentiate between FGR and SGA and between early-onset and late-onset FGR, as the management is different. Mid-trimester ultrasonography, in combination with maternal risk factors, can be used to screen for early-onset FGR and placental dysfunction by measuring fetal biometry, estimating fetal weight, and checking the uterine artery on Doppler ultrasonography[2]. Early-onset FGR should be monitored and managed in tertiary-level units with the highest-level neonatal care[28].

For late-onset FGR, third-trimester ultrasonography may increase the detection of SGA or FGR but also increase obstetric intervention[29,30]. Screening for SGA/FGR by estimating fetal weight or measuring abdominal circumference is more accurate when the ultrasound examination is performed at 36 rather than 32 weeks[30]. Declining fetal growth velocity from 32 weeks' gestation is at risk for stillbirth from late-onset FGR[2].

In Hong Kong, >40% of FGR cases involving stillbirths without obvious causes of FGR (or in low-risk pregnancies) were not diagnosed until after delivery[11]. Serial measurement of the symphysis-fundal height is used to screen for SGA or FGR in low-risk pregnancies in public hospitals or maternal child health centres, but its detection rate is low. A routine third-trimester scan at 36 weeks' gestation should be offered to low-risk women to improve the detection rate of late-onset FGR.

The middle cerebral artery pulsatile index and the umbilical artery pulsatile index should be used to monitor late-onset FGR[28]. As the median interval between a low middle cerebral artery pulsatile index and stillbirth was ≤5 days, twice-weekly Doppler surveillance may be required after 34 weeks. Delivery should be based on gestational age, fetal size, Doppler studies, biophysical assessments, and maternal conditions. At 38+0 to 39+0 weeks, delivery is indicated if there is evidence of cerebral blood-flow redistribution or any other feature of FGR.

Raising awareness of reduced fetal movement

In the National Institute for Health and Care Excellence guidelines, pregnant women are encouraged to report any reduced fetal movement (RFM) after 24 weeks without delay[16]. Increased awareness of fetal movement may reduce neonatal intensive care unit admissions and cases of Apgar scores of <7 at 5 minutes and may increase maternal-fetal attachment and decrease maternal anxiety when compared with standard care[31]. However, there remained uncertainty about the current evidence regarding

the effect of increased awareness of RFM on stillbirth, probably because RFM may be too late as an indicator in an acute obstetric event[31]. Counting fetal movement may cause great anxiety for some women and hence repeated attendance at maternity units.

If pregnant women are unsure about whether fetal movements are reduced after 28 weeks, they should be advised to lie on their left side and focus on fetal movement for 2 hours[32]. In managing a pregnant woman with RFM, maternal risk factors for stillbirth and FGR as well as fetal size should be assessed. Cardiotocography can be performed to exclude fetal compromise. If RFM persists or recurs or if risk factors for stillbirth/FGR are present, ultrasound should be performed to detect SGA/FGR and fetal abnormalities[32]. A biophysical profile can also be performed[32]. Expediting birth should be discussed from 39+0 weeks[2]. Induction of labour before 39 weeks should be individualised if there is evidence of fetal compromise or concern other than RFM[2].

Therefore, all pregnant women should be encouraged to report RFM, whereas high-risk pregnant women should be advised to count fetal movements. Timely reporting and prompt assessment of RFM are required to reduce stillbirths.

Reducing preterm birth

Improving the predication and prevention of preterm birth and optimising perinatal care when preterm birth cannot be prevented can reduce adverse fetal and neonatal outcomes[2]. Asymptomatic women at intermediate- or high-risk of preterm labour should be offered transvaginal cervix scanning to assess the need for intervention[2]. Both vaginal progesterone and intramuscular 17-hydroxyprogesterone caproate can reduce the risk of birth before 34 weeks' gestation in high-risk singleton pregnancies (including women with a short cervix)[33]. Quantitative assessment of fetal fibronectin can differentiate between very-high and very-low risks of spontaneous preterm birth in asymptomatic pregnancies and thus help guide antenatal management and in-utero transfers[34].

Therefore, screening for a short cervix should be a part of the routine mid-trimester scanning using transabdominal imaging. Although transvaginal imaging is more accurate than transabdominal imaging in measuring cervical length, the former requires a separate consent. However, transvaginal imaging can be used selectively in high-risk cases or when transabdominal imaging shows abnormal or suspected findings.

Acute tocolysis may be used when short-term delay is desirable during in-utero transfer and to ensure that adequate antenatal exposure to corticosteroid/magnesium sulphate is given[2]. A single course of antenatal corticosteroids administered between 22+0 and 34+6 weeks inclusive, with a neonate born within 24 to 48 hours of their administration, has been shown to reduce perinatal and neonatal death and respiratory distress syndrome[35]. Besides, magnesium sulphate should be offered to women between 22+0 and 29+6 weeks and considered for women between 30+0 and 33+6 weeks of pregnancy to reduce the risks of cerebral palsy in their children[36].

Management of medical disorders

Pre-existing diabetes in pregnancy is associated with perinatal death. Multidisciplinary team management and an intensified focus on glucose management, including glycated haemoglobin measurement and continuous glucose monitoring, are recommended[2]. In Hong Kong, pre-existing diabetes, in contrast to gestational diabetes, is not common. Affected women are usually referred to physicians/endocrinologists for diabetic care.

Preeclampsia, especially diagnosed in the preterm period, is associated with a remarkably high risk of fetal death because of the associated FGR and placental abruption[11,37]. Increased preeclampsia prevalence in the Hong Kong population over the years is related to an increased prevalence of advanced maternal age and obesity[11]. Primary prevention via first-trimester screening and aspirin prophylaxis can reduce adverse fetal outcomes[11]. In Asian populations, implementation of the screen-and-prevent strategy for preterm preeclampsia cannot significantly reduce its incidence, but low-dose aspirin effectively can reduce the incidence of preterm preeclampsia by 41% among high-risk women[38]. Therefore, first-trimester screening for preeclampsia should be offered to all pregnant women.

Intrahepatic cholestasis of pregnancy usually presents with pruritus in the third trimester of pregnancy but a normal appearance of the skin. The risk of stillbirth is increased when the peak serum bile acid concentrations are of ≥100 mmol/L[39]. The Royal College of Obstetricians and Gynaecologists recommends considering a planned birth at 35-36 weeks, at 38-39 weeks, and by 40 weeks when peak bile acid levels are ≥100, 40-49, and 19-39 mmol/L, respectively[39]. In clinical practice, when a pregnant woman presents with a generalised pruritus during the second or third trimester, diagnosis of intrahepatic cholestasis of pregnancy should be considered.

Umbilical cord abnormalities

Umbilical cord anomalies are associated with an increased risk of pregnancy and perinatal complications including FGR and stillbirth. Antenatal detection of cord anomalies can help inform perinatal risks and management options and can improve perinatal outcomes by appropriate management[40]. Common anomalies include single umbilical artery and velamentous cord insertion. The former is associated with FGR and other structural anomalies, whereas the latter is associated with FGR and vasa previa. Vasa previa, if undetected, is associated with high perinatal morbidity and mortality because of the risks of rupture or compression of fetal vessels when uterine contractions occur or the membranes rupture.

Most umbilical cord abnormalities can be detected by mid-trimester ultrasound examination. In the presence of risk factors for vasa previa (including twin pregnancy, conception after assisted reproductive technology, a low-lying or bilobed placenta, succenturiate placental lobes, and velamentous cord insertion), a targeted transvaginal ultrasound examination with colour Doppler imaging is recommended to detect vasa previa[23]. If vasa previa is detected, follow-up scans during pregnancy and customised obstetric management are indicated[23].

Therefore, screening for vasa previa should be performed at the mid-trimester scans in all pregnancies with a low-lying placenta, velamentous cord insertion, or a risk factor for vasa previa. Transvaginal scans are particularly useful but require a separate consent, additional scanning time, skill, and resources.

Induction of labour

Pregnancies continuing beyond 41+0 weeks' gestation increase the risks of stillbirth and neonatal death, particularly among women with advanced maternal age, intrahepatic cholestasis of pregnancy, and hypertensive disorders of pregnancy[20,33]. Compared with expectant management, induction of labour at or beyond term is associated with fewer perinatal deaths and fewer Caesarean sections, despite more operative vaginal births[41,42].

In low-risk nulliparous women, induction of labour at 39 weeks is not associated with a decrease in composite adverse perinatal outcomes but is associated with a decrease in rates of Caesarean section delivery and gestational hypertension/preeclampsia[43]. Both elective induction of labour and expectant management are reasonable options at 39 weeks for low-risk nulliparous women because of comparable neonatal outcomes. When counselling women about elective induction of labour at 39 weeks, shared decision-making is vital[44]. Some women may opt for an elective induction of labour because of the benefits of decreased rates of Caesarean section delivery and gestational hypertension/preeclampsia; others may prefer expectant treatment with the possibility of spontaneous labour and vaginal delivery[44]. Elective induction of labour may reduce the risk of an emergency admission for labour, but there are resource implications and logistic difficulties when slots are taken by women with medical or obstetric indications for delivery[44].

Intrapartum care

In Hong Kong, approximately 6% of all stillbirths are intrapartum[11]. A hospital trust in the United Kingdom recommends that hospitals improve the quality and safety of maternity care by focusing on human factors, system issues, effective training and learning, and the provision of sustainable, high-quality maternity, anaesthetic, and neonatal care[29]. Human factors include lack of situational awareness, failure of escalation or acting on risk, and poor communication between professionals[29]. Multidisciplinary obstetric emergency training such as Practical Obstetric Multi-Professional Training is required[29].

Standard protocols can help prevent or reduce intrapartum risks of birth asphyxia, prolonged labour, infection, shoulder dystocia, and difficult vaginal delivery[45,46].

Perinatal asphyxia

Effective fetal monitoring during labour should be provided. All staff responsible for monitoring the fetus should be competent in the techniques that they use (intermittent auscultation and/or cardiotocography) in relation to the clinical situation; they should use the buddy system and escalate accordingly when concerns arise or risks develop[2].

The National Institute for Health and Care Excellence guidelines recommend a physiological approach to cardiotocography interpretation and global overview of the clinical picture[47]. Intrapartum use of fetal blood sampling is no longer recommended because of lack of evidence[47]. Continuous cardiotocography in labour can halve the rate of neonatal seizures, compared with intermittent auscultation, although rates of perinatal death or cerebral palsy are not reduced[48]. A combination of external monitoring cardiotocography and simultaneous maternal heart rate recording is recommended to decrease rates of neonatal encephalopathy and severe neonatal acidaemia, compared with monitoring without maternal heart rate recording[49].

During intrapartum, clinicians should review previous fetal heart monitoring results and antenatal or intrapartum risk factors including FGR and infection to determine whether there are any changes in baseline fetal heart rate, variability, or decelerations[47]. Acute hypoxic event such as placental abruption, cord prolapse, and uterine rupture may present with prolonged bradycardia, which can be easily recognised. Immediate delivery, preferably within 30 minutes, is required to prevent fetal death or neonatal hypoxic sequelae.

Slowly evolving hypoxia may develop in response to intermittent episodes of oxygen deprivation (such as cord compression and hypoxaemia) and excessive oxytocin infusion. Slowly evolving hypoxic changes in cardiotocography throughout a long labour may be too subtle to identify. For instance, a rise in baseline fetal heart rate may represent either infection or hypoxia[47]. A combination of reduction in variability and a rise in the baseline fetal heart rate indicates fetal compromise[47].

Oxytocin is commonly used in the first and second stage of labour. However, oxytocin-induced uterine hyperstimulation can cause oxygen desaturation, non-reassuring fetal heart rate characteristics[50], and adverse neonatal outcomes including hypoxic-ischaemic encephalopathy. Oxytocin should thus be used with caution to avoid hyperstimulation, especially among at-risk women. Once occurring, hyperstimulation should be treated in a timely manner until the fetal heart rate pattern becomes non-reassuring[50].

Fetuses with chronic hypoxia may present with a silent or absent baseline variability together with shallow decelerations[47]; these fetuses can deteriorate and die within a short time. Early delivery is indicated.

Infection

Despite the reduced risk of neonatal group B streptococcal infection, clinicians should remain vigilant about the presence of chorioamnionitis and risk factors for sepsis. Early-onset neonatal infection is a major cause of morbidity and mortality; any new risk factors throughout labour such as fever should be monitored[51]. To prevent early-onset neonatal infection, intrapartum antibiotic prophylaxis should be given to women with maternal group B streptococcal colonisation, preterm labour, prolonged prelabour rupture of membranes, or other risk factors[51].

Whenever intra-amniotic infection or chorioamnionitis is suspected, intrapartum antibiotics should be administered, followed by communication with the neonatal care team to optimise subsequent neonatal management[52]. In prelabour rupture of membranes, women with latency >12 hours who have received antibiotics have a lower rate of chorioamnionitis (2.9% vs 6.1%), compared with women with latency <12 hours[53]. Therefore, antibiotics should be considered when the latency is >12 hours.

Intrapartum fever is associated with an increased risk for perinatal mortality because the fetus is often exposed to a combination of hyperthermia and inflammation and, in some cases, to infection[54]. Prevention of prolonged labour can reduce the rates of intrapartum fever[54]. Among nulliparas at >36 weeks' gestation, a high-dose oxytocin regimen is associated with a lower rate of intrapartum fever, compared with a low-dose oxytocin regimen (10.4% vs 15.6%)[55]. Although intrapartum fever generally has a non-infectious origin, intra-amniotic infection or chorioamnionitis cannot be excluded with available clinical or biochemical markers[54]. Therefore, antibiotic treatment should be considered even with an isolated intrapartum fever of >38°C[54].

Shoulder dystocia

Risk assessment for the prediction of shoulder dystocia is insufficiently predictive[56]. Induction of labour at term can reduce the incidence of shoulder dystocia in women with gestational diabetes, whereas elective Caesarean section should be considered for suspected macrosomia[56].

Timely management of shoulder dystocia requires prompt recognition by attending midwives or doctors[56]. The conventional recommendation is to start with external manoeuvres including the McRoberts' manoeuvre and suprapubic pressure, followed by internal manoeuvres including rotation and posterior arm delivery[57]. However, posterior arm delivery has a consistently higher success rate than rotational methods and external manoeuvres[57]. Therefore, the conventional recommendation should be followed in view of the current evidence. If external manoeuvres do not lead to the delivery of the shoulders, internal manoeuvres should be performed early, avoiding prolonged excessive traction on the fetal neck, which carries a risk of brachial plexus injury. Besides, all trainees should undergo proper training (such as the Advanced Life Support in Obstetrics programme) and simulation exercises to learn the proper techniques of delivery manoeuvres. Both the safety and the success of various manoeuvres are related, as is how properly these manoeuvres are performed[57].

Operative vaginal birth

Expediting delivery in the second stage of labour via operative vaginal birth (forceps or ventouse) is associated with increased risk of neonatal and maternal morbidity and mortality. Poor outcomes of operative vaginal birth are associated with inaccurate determination of fetal head position, among other factors[58]. The ascertainment of fetal head position and station is a prerequisite before considering operative vaginal birth. The use of ultrasound before operative vaginal birth is associated with fewer infants delivered in an unexpected position and reduced neonatal morbidity[58]. The Royal College of Obstetricians and Gynaecologists guidelines recommend using ultrasound to assess fetal head position before the use of ventouse or forceps, when uncertainty exists after a clinical examination[59]. Therefore, use of transabdominal ultrasound for fetal position is highly recommended.

Fetal head position in the axial and sagittal planes can be assessed through transabdominal ultrasound to identify the fetal occiput and spine, the two orbits, and the midline cerebral echo (for occipital transverse) for occipital anterior, occipital posterior, and occipital transverse positions, respectively[60]. An ultrasound machine equipped with a wide-sector and low-frequency transducer should be made readily available in each maternity unit[60].

Obstetrician and neonatologist attendance

A specialist in obstetrics and gynaecology should arrive to attend to an obstetric patient in an emergency (life threatening to the mother and/or the fetus) within 30 minutes of such an alert. Hospital guidelines on the presence of a neonatologist at delivery can improve communication. Attending obstetrician/midwives should assess the degree of neonatal risk anticipated and communicate their concerns early and effectively to the neonatologist to make management decisions.

New developments

There are limitations to the currently available tools for fetoplacental monitoring. Development of more accurate and nuanced methods is needed such as wearable fetal movement monitors, mRNA markers measurement for prediction of stillbirth, and magnetic resonance imaging for assessment of placental and fetal oxygenation[61].

Machine learning and artificial intelligence on conventional fetoplacental monitoring have been applied to improve diagnostic or predictive accuracy[61]. Examples of potential applications are ultrasonography for estimation of fetal body weights and gestational age, first trimester placental volume, and vascularity for predicting SGA, FGR, and preeclampsia, whereas intrapartum cardiotocography and fetal electrocardiography are for assessment of fetal wellbeing.

Conclusion

The perinatal death rate in Hong Kong remains low, but the stillbirth rate has fluctuated over the past 12 years. Efforts should be made to prevent avoidable perinatal death, focusing on SGA/FGR, preterm birth, congenital malformations and genetic disorders, perinatal asphyxia, preeclampsia, diabetes, and infection. Non-invasive prenatal testing for common trisomies, first-trimester screening for preeclampsia, and mid-trimester morphology scanning should be offered to pregnant women. Screening for a short cervix and vasa previa should be included in the mid-trimester morphology scan. To increase the detection rate of SGA/FGR, a routine third-trimester scan can be offered to low-risk population. Timely reporting and prompt assessment of RFM are important. Elective induction of labour at 39 weeks can be offered to low-risk nulliparous women after careful counselling and shared decision-making. During intrapartum, it is important to provide effective fetal monitoring and remain vigilant about the presence of chorioamnionitis and risk factors for sepsis. Ultrasound can be used selectively to assess fetal head position before the use of ventouse or forceps, when uncertainty exists after a clinical examination. All trainees should undergo proper training in emergency obstetric care to improve their clinical competency.

Contributor

The author designed the study, acquired the data, analysed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. The author had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

As an executive editor of the journal, KYL was not involved in the peer review process.

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Data availability

All data generated or analysed during the present study are available from the corresponding author upon reasonable request.

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