

Preventable stillbirth in the Solomon Islands – a retrospective review

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Abstract

Introduction: Stillbirth is a significant global public health issue, with approximately 98% occurring in low- and middle-income countries. The Solomon Islands is a Pacific nation with poor perinatal outcomes and very little previous research investigating stillbirth. **Methods:** We conducted a retrospective cohort study investigating all stillbirths at the National Referral Hospital in Honiara, Solomon Islands, between January 2017 and December 2018. Causes of stillbirth and risk factors were classified on review of available case files. **Results:** Over two years, there were 341 stillbirths and 11,056 total births at the National Referral Hospital (30.8 stillbirths per 1000 births). Cause of death was documented for 198 and 142 full case files were available. Most stillbirths occurred antenatally (n=170/198) and 62% were at preterm gestations (<37 weeks). Low birthweight (<2500g) was present in 59% (n=84/142) and preventable maternal conditions, including hypertensive disorders and syphilis, were present in 42% (n=59/142) of cases. Acute events caused 46% of intrapartum deaths and 92% of these had inadequate intrapartum monitoring. **Conclusion:** Our study is the first to investigate causes of stillbirth in the Solomon Islands. We found a large proportion of preventable stillbirths and significant gaps in documentation. This highlights the importance and feasibility of a national registry. There is an urgent need for targeted training in data collection, improved quality of antenatal and intrapartum care and community awareness to reduce preventable stillbirths in the Asia-Pacific.

Introduction

Stillbirth is a significant global public health issue, with an estimated 2.6 million women affected every year. ¹⁻³ Approximately 98% of stillbirths occur in low-and middle-income countries (LMICs), with this burden most heavily felt in South-Asian and African countries. ²⁻⁵ Many stillbirths in LMICs are thought to be preventable. Despite this, little progress has been made in reducing these numbers compared to other perinatal outcomes.

The Solomon Islands is a Pacific LMIC with a population of approximately 700,000, spanning across 993 islands. The country faces significant geographical, socioeconomic and cultural barriers to achieving health equity. The National Referral Hospital, situated on the main island of Guadalcanal, is the only tertiary

hospital in the country. Despite this, there are limited midwifery staff, only 4 consultant obstetricians and just one or two working cardiotocograph machines at any given time. Like many of its counterparts in the Asia-Pacific, the Solomon Islands has poor perinatal outcomes, with a recent study showing a high rate of preventable maternal mortality⁶ and an estimated stillbirth rate of 17.6 per 1000 births in 2015 from World Health Organization data.⁷ In contrast, the rate of stillbirth in Australia, one of the nation's closest neighbours, has a stillbirth rate of 6.8 per 1000 births.⁸ Despite this, there has been little research into improving perinatal outcomes, and in particular, no previous targeted research investigating causes of stillbirth in the Solomon Islands.

In order to reduce the global burden of stillbirths, accurate recording of cause of death and preventable risk factors is required. This could help direct where to place scarce resources to have maximal impact in reducing rates of stillbirth. However, in many LMICs this is a significant challenge due to a lack of health worker training and diagnostic tools.⁹ Furthermore, many countries do not have a national registration system for perinatal deaths, particularly in the Asia-Pacific region.^{2, 10} While there is also no national registry or classification of stillbirths in the Solomon Islands, they are audited at National Referral Hospital. This recording of cases creates an opportunity to investigate the causes of stillbirth and identify those that may be preventable, as well as identifying gaps in information with the current data collection system. Such an investigation would assist in directing scarce resources towards the most effective clinical service with the aim of ultimately reducing stillbirth in the Solomon Islands and other similar Pacific Island nations. Thus, we undertook a retrospective cohort study investigating the incidence of stillbirth and associated risk factors in the Solomon Islands.

Methods

We conducted a retrospective cohort study investigating all stillbirths recorded at the National Referral Hospital in Honiara, Solomon Islands, between January 2017 and December 2018. Ethical approval was obtained from the Solomon Islands Ministry of Health and Medical Services Ethics Board (HRE032/18).

Stillbirth was defined as the death of a fetus before birth at ≥ 20 estimated gestational weeks, or greater than 500g in birthweight. Antepartum stillbirth was defined as a death occurring before the onset of labour or "macerated" in appearance. Intrapartum death was considered a death occurring after the onset of labour or during birth which had a "fresh" appearance. Neonates were weighed at birth and fetal weight cut-offs of <2500g and <1500g were used to define low birth weight and extremely low birth weight, respectively, as gestational uncertainty decreased the accuracy of gestational centiles. The total numbers of live births and stillbirths during the study period were obtained from an existing hospital birth registry. Where available, case files were reviewed for details regarding maternal risk factors, contributing factors, sociodemographic and pregnancy details.

Available case files were reviewed for suspected cause of death and contributing maternal conditions identified. In the Solomon Islands verbal autopsy or detailed diagnostic tests are not available to confirm cause of death. Deaths were deemed preventable if they were over 28 weeks estimated gestation, above 1500g birth weight and excluding those with congenital anomalies.

There are several international classification systems that aim to accurately determine the primary cause of stillbirths and risk factors that may inform public health and policy interventions.¹¹ In 2016 the World Health Organization (WHO) developed the tenth revision of the International Classification of Diseases (ICD-10) and applied it to the perinatal period (ICD-PM).^{11, 12} The ICD-PM first identifies the timing of perinatal death (antepartum, intrapartum or unknown), then the assigns the main cause of death, and links each stillbirth with the main maternal condition contributing to the stillbirth (Table S1 in appendix). In this study, we used the ICD-PM to classify causes of stillbirth at the National Referral Hospital. Given there was no comparison group, descriptive statistics were used to describe the data. Statistical analyses were performed using STATA 15-IC.

Role of the funding source

The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report. MD and RH had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Over two years, 341 stillbirths were documented at the National Referral Hospital. During the same period, there were 11,056 live births, giving an institutional incidence of stillbirth of 30.8 per 1,000 births. Of 341 recorded cases, suspected cause of death was available for 198 and 142 maternal full case files were available for full review (Table 1). Among the 142 case files available, 72% were thought to be preventable and there were five associated cases of maternal death.

Characteristics of the study population and care

Women who experienced a stillbirth had a median age of 28 years (IQR 11), 62% were multiparous and 9% grand-multiparous ([?] 5 five prior births). 79% were married or co-habiting and 73% had at least a primary school-level of education, with 40% having a secondary school education and only 4% having no school education. The majority of women were unemployed or homemakers (67%), with 28% either employed or studying. Most mothers resided on the main island of Guadalcanal (60%). 29% of mothers with a stillbirth were referred to the National Referral Hospital for their care. The majority of stillbirths were delivered by midwifery or nursing staff (70%, n=100/142). Prior to discharge, 65% of mothers received formal debriefing with local counselling services.

The presence of risk factors for stillbirth

Previously reported and common risk factors for stillbirth were present within our cohort. 26% of mothers were anaemic (haemoglobin <100 g/L), however, haemoglobin levels were only recorded in 56% of total cases and information regarding timing of haemoglobin testing was not available in most records. The median haemoglobin was 108 g/L for these women. 52 women were not tested for syphilis. Of the 90 women who were tested for syphilis, 25% were positive (n=23/90) and only seven of these women completed treatment. Only 2 case files had documentation of partner treatment. Sixteen women (11%) had experienced a prior stillbirth. The majority of mothers had at least one antenatal visit prior to their stillbirth (78%). 20% were obese (body mass index>30), however body mass index was only recorded for 47% of the cases. All but one mother received an ultrasound during the course of her care, however only 25% received an ultrasound in the first or second trimester. Reduced fetal movements were reported prior to attendance in 67 cases (47%). Discussion of common danger signs, such as reduced fetal movements or vaginal bleeding, were not documented for 50% of cases.

Most women had a spontaneous vaginal birth (83%). There were seven inductions, two instrumental births and 14 emergency caesarean sections (two of which were failed inductions). Birthweight was not documented for 18 stillbirths. Of those with a recorded birthweight, low birthweight (<2500g) was present in 59% of cases, with a median birthweight of 1920g (range 500g to 4984g, IQR 1668.5g) and 32% extremely low birthweight (<1500g).

Time and cause of stillbirth

The estimated median gestational age of stillbirth was 34 weeks (range 20 to 43 weeks, IQR 9), with 80% occurring in the third trimester (n=114/142). The majority (62%, n=88/142) of stillbirths were preterm (<37 completed week gestation), 16% were <28 weeks completed gestation and 4% were >41 completed weeks gestation.

Of the 198 stillbirths with a recorded cause of death, 170 occurred antenatally (86%) and 28 (14%) were intrapartum (Table 2). 42% of stillbirths were macerated and 31% were fresh, however appearance of the fetus at delivery was not documented in 26% of cases. Table 3. demonstrates the primary cause of death associated with maternal conditions, such as maternal complications of pregnancy, labour and delivery.

There were 12 cases (6%) of congenital malformations, with the majority being hydrocephalus and one fetus showing signs of Trisomy 21.

Antenatal deaths

Among the antepartum stillbirths, cause of death was unspecified according to the ICD-PM for 40% (68/170) of cases (Table 3). Five were associated with maternal deaths, with three of these secondary to puerperal sepsis, one secondary to fulminant liver failure and one secondary to liver and renal failure resulting from severe preeclampsia. 53% of antenatal stillbirths were not associated with a documented concurrent maternal condition (Table 3). 25% (n=43) of cases were associated with low birthweight and among this group, there was also a co-existing hypertensive disorder in 28% of cases (n=12/43). Maternal infection was present in 19 (11%) antenatal stillbirths, with 53% (n=10/19) of the fetuses showing signs of congenital syphilis. There were 19 cases of antepartum hypoxia, most of which were associated with complications of the placenta, cord and membranes (n=12/19), with nine secondary to placental abruption and the remainder to trauma. Four deaths were due to termination of pregnancy via maternal use of misoprostol at between 20 and 37 weeks estimated gestation.

Intrapartum deaths

Of the 28 intrapartum stillbirths, 46% were due to an acute, preventable event, such as fetal asphyxia, which was evidenced by non-reassuring fetal heart rate patterns (where recorded) or loss of fetal heart rate in labour. Concurrent maternal medical or surgical conditions were present in three (11%) cases, with the most common being hypertensive disorders of pregnancy (n=4). Of these intrapartum deaths, three had complications of the cord, placenta or membranes (two with acute cord prolapse), and three were due to extreme prematurity. Low birthweight was present in five cases and fetal heart rate monitoring during the second stage of labour was not documented or performed for the 92% of cases.

Discussion

Main findings

Our study is the first to investigate the causes of stillbirth in the Solomon Islands. The incidence of stillbirth at the National Referral Hospital was 30.8 cases per 1,000 births. This is almost two-fold greater than the most recent WHO estimate for the Solomon Islands (17.6 per 1000 total births).⁷

Many stillbirths in LMICs may be prevented through improved antenatal care.^{3, 13} Whilst most mothers had at least one antenatal visit, we found significant gaps in the quality of care received. A third of our cohort were living outside of the main island and, again, one third were referred for care. This highlights the challenges of delivering high quality antenatal care in peripheral and remote settings. Recent global studies have shown that many cases of stillbirth considered secondary to fetal growth restriction or preterm birth, in particular, may be preventable through improved antenatal monitoring and interventions.^{3, 13, 14} Early ultrasound assessment is vital for dating and diagnosis of potential fetal growth restriction^{14, 15}, however only 25% of mothers received an early ultrasound in our cohort. Of the 85% of stillbirths occurring antenatally, suspected growth restriction was common, with almost 60% were born at a low birthweight. Over 60% of stillbirths occurred at preterm gestations. Of these, 80% were over 28 weeks gestations and many of these could have been potentially preventable if there was early detection of the low birthweight. Whilst access to ultrasound examination is particularly challenging in this setting, our study has highlighted the potential to reduce stillbirths if services were expanded.

Routine antenatal testing for syphilis (a major cause of stillbirth globally.^{2, 3, 16}) is also recommended as part of antenatal care. A deficiency in testing of syphilis was evident in our cohort, with 53% (10 babies) of the 19 antenatal stillbirths associated with infection showing overt signs of congenital syphilis infection, however only one third of women were tested. Point of care syphilis testing is cost-effective and a potential resource in LMICs, particularly in rural and remote settings where laboratory services are not readily available.^{16, 17} Once diagnosed, complete treatment and clearance of syphilis in the woman and partner can decrease the risk of stillbirth. However, in the present study only seven women completed treatment and there was minimal

data on partner testing, which may be attributed to multiple factors, including lack of penicillin and poor patient and partner understanding.

Education regarding family planning, prevention and danger signs of pregnancy, such as reduced fetal movements, and birth preparedness are also vital aspects of antenatal care. However, almost half of the women within our study did not have documentation regarding discussion of danger signs during antenatal care. Provided with this information these women may have presented earlier and some cases may have been prevented. The late terminations of pregnancy and high parity within our cohort also point to a significant unmet need for family planning.¹⁸ Abortion is illegal in the Solomon Islands, which highlights the complexity of this issue. This emphasizes the demand for improved patient and community education and access to reproductive services to reduce unwanted pregnancy.^{13, 14}

The largest proportion of stillbirths were unclassified (or cause unknown), which is in keeping with other studies in LMICs and largely due to lack of diagnostic tools and inadequate documentation.^{19, 20} We found 14% of stillbirths occurred during labour and almost half of these were due to an acute, preventable intrapartum event. Fetal heart rate monitoring was not documented in the majority of these stillbirths. Whilst this is challenging due to limitations in number of healthcare workers, this highlights the urgent need for improvement in training and provision of resources to enable safer intrapartum care. Additionally, our intrapartum stillbirth rate was lower than previous studies^{1-3, 21}, with a recent study in Timor-Leste showing an intrapartum stillbirth rate of 33%.²¹ The significant number of missing case files may have led to an underrepresentation of intrapartum deaths. This is certainly plausible given the majority of intrapartum stillbirths had severe suboptimal care. This may be also be attributable to inaccurate classification of some stillbirths as antepartum in those where case files were available, as a quarter of cases in our study did not have adequate documentation of maceration. Overall, we found the incidence of stillbirth in the Solomon Islands to be higher than the average stillbirth rate for its two closest neighbours, Papua New Guinea and Fiji (rates of 15.9 and 11.9 per 1000 births, respectively).^{7, 21} This may be due to referral bias; however, the proportional causes of stillbirth are still likely to reflect the national rate.

Whilst there is much progress to be made, it is promising that some of the gaps highlighted by our study are being addressed in a recent updated Antenatal Care Package, launched by The Solomon Islands Ministry of Health and the World Health Organisation. This package incorporates focussed health worker education and resource provision, such as improved access to antenatal ultrasounds and point of care syphilis and haemoglobin testing. This initiative acknowledges the socioeconomic return of investing in stillbirths² and is a fundamental step in reducing the burden of perinatal death in the Solomon Islands.

Strengths and Limitations

This was the first study investigating causes of stillbirth in the Solomon Islands. We were also able to successfully apply ICD-PM classification system to the stillbirths recorded in our study, demonstrating its potential for utilisation in this setting.

Our study was limited by its retrospective nature and incomplete data. Second, this study is an underrepresentation of all stillbirths that occur at a national level as we have only included data from the hospital-setting and did not include those which within the community or peripheral centres. Third, the accuracy of gestational age was limited due to the lack of routine dating ultrasounds. Finally, adequate registration of stillbirths relies on ascertainment of cause of death, which remained unspecified in many of our antepartum deaths due to inadequate and incomplete documentation.

Interpretation

The true magnitude of perinatal deaths remains under-reported and under-investigated. Similar to many of its Pacific neighbours, The Solomon Islands currently does not formally register stillbirths. There is a need to optimise prospective documentation of all birth outcomes and to adopt classification of all perinatal deaths, in a similar to maternal deaths through the maternal death surveillance system. The WHO has recommended verbal autopsy as a tool to assist in determining cause of perinatal death in LMICs by gathering

collateral data from mothers and clinicians.^{19, 22} This may be utilised to reduce the number of “unclassified” deaths. Whilst many classification systems have been used in LMICs²³, we successfully utilised the ICD-PM classification system. There is a critical need for further research and formal classification into why mothers and babies are suffering in the Solomon Islands and more broadly, in the Asia-Pacific region. COVID-19 has significantly disrupted health systems and diverted funding from maternal and child health programs. This is likely to result in further adverse perinatal outcomes and maternal and infant death.²⁴

Conclusion

This study revealed a high incidence of stillbirth at the National Referral Hospital and many cases deemed preventable. Our findings highlight the urgent need for increased focus on perinatal deaths in the Solomon Islands with universal classification and targeted training, improved quality of obstetric care and community awareness. Effective public health interventions to tackle this preventable global issue can only be implemented when accurate data are obtained, and thus a national registry of stillbirths is vital and should be considered region wide.

Disclosure of interests

We declare no competing interests.

Contributors

MD conducted the literature search. MD, LP, RH and LM conceived and designed this study. MD, LP, CH and S Taragwanu completed data collection. MD conducted the data analysis and data interpretation and drafted the of final manuscript and prepared the tables. RH, SW, ST and AL, SB and DO provided critical analysis and made revisions of the manuscript and important intellectual contributions. All authors reviewed the manuscript before final submission.

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