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Perinatal care in Sri Lanka – the past, present and future

Sri Lanka presently boasts of impressive perinatal statistics; our Maternal Mortality Ratio (MMR) has reduced from 61 in 1995 to 12.5 per 100,000 live births in 2020. The Neonatal Mortality Rate (NMR) has also reduced from 25 in 1995 to 6.4 per 1000 live births in 2020. These are significant reductions which are now on par with those of more developed countries, having a higher per capita income than ours. The reasons of this success story are multifactorial; A firm foundation and network of community health care services, along with free universal health care and education, improved female literacy rates and firm political commitment by successive governments have all contributed to these achievements.

Even in the 1990's the majority of births occurred in hospitals, but the maternal and neonatal mortality rates were high. The major causes of maternal mortality then were post partum haemorrhage and maternal sepsis, while neonates died mainly due to congenital anomalies, prematurity, and sepsis, in that order. There was no hope for extremely preterm babies. While maternal care was already fairly well established during this era, the neonatal care was rather rudimentary. In the larger hospitals, the Premature Baby Units(PBU) consisted of a nursery with some cots and a couple of incubators, while in the smaller institutions the latter was substituted by improvised ''boxes'' with lights fixed as warming devises. Ventilation for sick neonates was almost nonexistent, while many babies died of neonatal tetanus. The mainstay of neonatal care was basic incubator care, intravenous fluids and available antibiotics. Beyond this it was a matter of "survival of the fittest".

Sri Lanka has come a long way since then; The main causes of maternal mortality now are post partum haemorrhage and heart disease while in neonates it is congenital anomalies, prematurity and sepsis.

Maternal care has improved greatly; over 95% mothers receive complete antenatal care and nearly 90% of deliveries occur in hospitals with specialist cover. However, preventable causes of maternal deaths such as post partum haemorrhage (which should only rarely occur in a hospital setting), still remain as a major cause. Heart disease in pregnancy is another cause where pre-pregnancy counseling appears to have failed; these are mothers who should not have become pregnant in the first place. Maternal suicides are still not accounted for in calculating the Maternal Mortality Ratio. If this were the case, the mortality figures would most certainly increase; rather than be complacent with the present figures, these statistics will be vital to improving mental health for mothers.

Over the last few decades, neonatal care has also improved tremendously; neonatal tetanus and congenital rubella have been eliminated due to the success of the Expanded Immunization Programme (EPI). Survival of extremely preterm neonates are now a reality. For neonates, today we have over 17 fully fledged neonatal intensive care units(NICU's) in the country offering advanced neonatal care such as high frequency ventilation(HFOV), Nitric Oxide(NO2) therapy for pulmonary hypertension and total body cooling for term babies with severe birth asphyxia, the latter two being the results of pioneering efforts by members of the perinatal society. Many of these units are now manned by specially trained neonatologists who are well versed in these advanced techniques. These as well as other advances in NICU care such as the availability of Surfactant for premature infants, use of newer technology and

equipment and successful promotion of exclusive breast feeding has brought down the neonatal mortality figures to the present status.

Sri Lanka has now reached a milestone in perinatal care, with maximum gained from utilizing cost effective methods. Hence we now need to emphasize on improving quality of care for both mother and baby; For mothers reducing, preventable maternal deaths should be a priority while finer issues such as respectful labor and mental health should be addressed. In neonatal care, we have now reached the "last mile" in our quest, which proverbially is the hardest. If we are to improve further, we need to invest on strengthening our NICU care; measures to improve survival and outcome of extreme preterm babies such as providing Total Parenteral Nutrition (TPN), should be addressed. Not only survival, but ensuring a good quality of life for the NICU survivors should be of utmost importance. Providing formal training in NICU care for both medical officers and nurses should be prioritized. This issue is being addressed at present by the Perinatal Society, with the ongoing development of an NICU training module for doctors and nurses working in NICU's of the country.

The Sustainable Development Goals (SDG) require us to reduce our MMR and NMR to less than 10 and 2.2 respectively by 2030. Therefore we now have to take perinatal care to the next level, by investing wisely and guiding the pathway to maternal and newborn care for the future.

Prof Dulanie Gunasekera
Editor in Chief

Presidential Address - 2021

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'Excellence in Perinatal Care through Research, Training and Audit'

Sri Lanka being a middle-income country with per-capita GDP of 3852 US$ in 2019, has indicators that reflect satisfactory overall health status of the population. The infant mortality rate and the maternal mortality rate in Sri Lanka are among the lowest in South East Asian region. For the Year 2019, Neonatal mortality rate (7.0 per 1000 live births), Infant mortality rate (10.5 per 1000 live births), under-five mortality rate (11 per 1000 live births). Maternal Mortality Rate (32.0 deaths per 100,000 live births in 2018) [28.8 deaths per 100,000 live Births in 2019 (Provisional)]. The population growth rate has reached 0.6% in 2019 with a total fertility rate 2.2 per woman which is close to the population replacement level.

In ancient Sri Lanka, the health system that prevailed for safeguarding the health of people was based on the traditional systems of medicine including Ayurveda. According to Mahawamsa, king Pandukabhaya has established lying-in-homes in various parts of the country. King Buddhadasa had mastered midwifery as well and said to have performed a surgery on a woman to deliver her child.

The allopathic system of medicine was introduced by the Portuguese in 1505. The British established military hospitals and dispensaries which provided medical care to the civilian population.

Maternal and Child health services in Sri Lanka has a long history. The first organized effort towards providing care and attention to childbearing women was made in 1879 with the establishment of the De Soysa Lying-in-home, now known as De Soysa Maternity Hospital (DMH) for women.

The ***Maternal and Child Health (MCH) Department*** **of the** ***Colombo Municipality*** was established in 1906. Since then the number of hospitals with facilities for delivery has increased rapidly. The need for developing preventive and promotive services was recognized by the government as early as 1920's. ***Health Unit system*** was initiated with the establishment of the first Health Unit in Kalutara in 1926**.** This system provided domiciliary as well as clinic-based services during pregnancy, trained assistance at delivery and domiciliary services for the postnatal mother and the infant. By 1950, 91 Health Units were established and by 2003 there were 280 units, which are termed Medical Officer of Health areas now.

Since 1989, the country's administration has been decentralized with devolution of administrative power to nine Provincial Councils.

There are 6785 PHM areas, and PHMs work as front-line health worker providing domiciliary care to mothers and children within the community. She has a well demarcated geographic area

with an average population of 3,000 to 5,000. The PHM is a member of the team providing services at field and institutional clinics and links the domiciliary services to clinics and institutional care.

Parallel to the expansion of the health unit system throughout out the country, curative care services were developed through the establishment of a network of healthcare institutions ranging from Central Dispensaries at the lowest level to the General Hospital, now known as the National Hospital of Sri Lanka, in the capital city of Colombo at the highest level. Total number of 192 hospitals units and 6785 number of Primary Medical Care Units in the country at present.

There is no record of the commencement of Premature Baby Units in this country. As far as we know, most of the hospitals with maternity units had a space for premature baby units (PBU). Although it is named as PBU, all low-birth-weight babies, premature and sick infants, asphyxiated and abandoned babies were admitted to these units. All what was offered in these units for the babies was warmth through incubators or other methods, oxygen through head box or hood, IV fluid, NG feeding and IV antibiotics. Regular blood sugar facilities were not available. Hand washing was not done according to universal precautions.

By 1985, around 20% of live births in Sri Lanka were low birth weight. Yet 60-70% of the deaths that occur in this group of low-birth-weight babies, around 50% were pre-term babies. The year 1985 was a landmark for neonatology services in this country. With the establishment of the Medical Intensive Care Unit at Lady Ridgeway Hospital in 1985, mechanical ventilation was started. Before that newborns were sent to the National Hospital for ventilation. Sri Jayawardanepura General Hospital (SJGH) went into commission in the year 1985 and the NICU started functioning in 1987 with the JICA grant. This is the first recorded fully equipped Neonatal intensive care unit in the country.

Respiratory support to the ill newborns was commenced in July 1988 with the availability of the CPAP system and ventilation of babies was commenced in late 1988 with the availability of two Baby Bird ventilators. Technical support was provided by the KEIO University of Japan and local JICA office coordinated this activity. Initially, neonatal care was supported by Japanese nurses for a few years. Dr. D.A.Sonnadara took an untiring lead to establish both NICU's at Sri Jayawardenapura and Lady Ridgeway Hospital. Improvement of Maternal and childcare was not possible without the contribution of local non-governmental organizations like the Perinatal Society of Sri Lanka, Sri Lanka College of Paediatricians, Sri Lanka College of Obstetricians & Gynaecologists and the College of Community Physicians Sri Lanka.

The Perinatal Society of Sri Lanka (PSSL) was inaugurated on 29th April 2001 under the auspices of Sri Lanka College of Paediatricians, Sri Lanka College of Obstetricians & Gyanaecologists, Sri Lanka College of Community Physicians and UNICEF at the Lady Ridgeway Hospital for children in Colombo.

The inaugural meeting was attended by fifty-four participants with the founding President Prof. Indraji Amarasnghe who I am happy to see you in the audience along with other founding members like Dr. Srilal De Silva. The perinatal society started with nineteen life members and eight ordinary members who joined the society at this meeting. A council representing all specialties involved in perinatal care was appointed. The first annual session was held in 2003 at the Lady Ridgeway Hospital.

Professional colleges of this country has contributed to improve the perinatal care since its inception. In 2005, at the request of the College of Paediatricians, Post-Graduate Institute of Medicine recognized and commenced in sub-specialization in Neonatology. **Master Training on Neonatal Advanced Life support** was held from the 12th to the 15th of September 2006 at the Lady Ridgeway Hospital the first time in this country, by the Resuscitation council of UK. A workshop of **Master Training on Advanced Neonatal Ventilation** was held on the the 7th, 8th, 9th and 10th of April 2008 at LRH Colombo by Prof Ashok Deorari, Prof of Neonatology and his faculty from India. **Workshop on Perinatal and Neonatal Post Mortem** was held jointly by the College of Pathologists and the College of Forensic Pathologists on 23rd of February 2007 to sensitize the memberships about the need for perinatal postmortem.

Many activities were started by the Perinatal society such as neonatal hearing Screening programme in 2008, CPAP ventilation in 2009, ROP screening and treatment in 2008 and Congenital hypothyroidism screening in 2008. Concepts of brain cooling in was introduced at the annual session in 2009 by PSSL and concept of pulse oximetry was introduced by SL College of Paediatricians in 2013 at its annual session.

Members of SLCOG helped to establish MS in Gynaecology and Obstetrics through the PGIM in 1984 which was changed to MD in 2001. With increased intake of the trainees the MS in Obstetric by PGIM has resulted in expansion of services upto to Base Hospital and upwards.

The Safe Motherhood Initiative which was launched in Nairobi in 1987, is being rolled out in outstation hospitals to improve the quality of obstetric emergencies. SLCOG conducted its first Safe motherhood programme in Anuradhapura in 1991. The second in Matale sponsored by UNICEF in 1992. SLCOG has continued to conduct safe motherhood programmes every year regularly across the country and facilitate the policy dialog with the health administrators at a local level. SLCOG is proud to have sustained a good practice initiated by a Global Programme. The technical and financial support was from UNICEF, IPPF & FIGO in collaboration with Family Health Bureau.

Registration of births and deaths became compulsory as early as 1897, and since 1921 the administrative report of the Registrar General devoted a special section to maternal mortality. The ready availability of statistics facilitated the evaluation of MCH services

The target was to reduce child mortality indicators by 2/3 between 1990 and 2015. Starting at a baseline of 21.5/1,000 live births in 1990, the country has made progressed to 9.6/1,000 live births in 2010, very slightly off track to meeting the goal of 7/1,000 for 2015.

Sri Lanka's initial maternal mortality ratio of 85/100,000 live births in 1990 decreased to 35/100,000 by 2010. This was on track to meeting the MDG target of 21/100,000 maternal deaths by 2015. Unfortunately, these MDGs were not achieved by Sri Lanka. Few countries in the region achieved health indicators of MDG goals

It is interesting to find out why this was not achieved in our country, despite having well-structured health system.
The role of non-governmental international organizations are to support the improvement in maternal and newborn care programmes. They may also decide on strategies, policies, identify bottle necks and minimize inequities in the deprived segment of the service. They also provides technical support and capacity building to improve perinatal activities in the country.

We are thankful to the Ministry of Health for facilitating Maternal and Newborn Review in 2007. The objective was to identify the gaps and make recommendation for further improvement of maternal and newborn health in the country. This review clearly identified that there is provision to further improvement of maternal and newborn care in the country both at the institutional level and the field level. There is a need to plan for high quality newborn care in all hospitals and at field level to ensure accessibility to quality services in all parts of the country.

Based on these recommendations of Maternal and Newborn Review in 2007, Ministry of Health has implemented almost all these strategies. Over the period, Ministry of Health was able to publish recommendations made by the Maternal and Newborn Review in 2007.
Unfortunately, Maternal and newborn healthcare workers receive ad hoc nature of in-service training. This is one of the barriers for poor quality of the patient outcome. Therefore, this review report recommended to improve the training to these categories
Same is with medical officers and specialist in Paediatrics and Obstetrics and Gynecologists.

Although they are subject specialist their understanding on Maternal and Newborn policy is poor. This is simply because no Maternal and Newborn specialist in this country. Community Physicians obtain their degree by thesis and then specialize the subjects they are assigned to.
The 2030 agenda for Sustainable Development, which has 17 Sustainable Development Goals, was adopted by countries in 2016. Out of the 17 goals, mainly SDG 3 is concerned with maternal and child health. Under SDG 3, there are 13 core indicators and 38 health indicators related to maternal and child health.

According to the updated sustainable development goals, MMR, NMR and under 5 mortality, rates are on track or maintaining SDG achievement. obstetricians, paediatricians and neonatologists have to work hard to achieve these targets.

Over the years we see an improvement of national statistics. Whether it is driven by Ministry of Health or by the Consultants in the respective field or as a college is question that needs to be explored. Anthony Leo quoted, I quote "Healthcare delivery has worked as well as it has developed to date because **clinicians are bright, hardworking, and well-intentioned** – **not because of good system design or systematic data use"**.

This remark applies in our context, as I strongly feel, members of professional colleges contribute to improve the national statistics. And it is not data driven improvement. The Ministry publish "Maternal and child health policy" and National Strategic Plan documents from time to time. According to the Ministry of Health, "This gives guidance to achieve national goals based on the challenges faced demographically as well as changes in expectation of the people. Such a documented policy provides the much-needed direction to strategic planning, implementation, monitoring and evaluation of MCH programme to address such issues effectively". Various documents have been published by Ministry of Health, utilizing the resources of donor agencies to improve the national statistics.

In order to reduce MMR, various strategies have been introduced by the Ministry of Health. The following are some activities undertaken by the Ministry of Health towards improvement of maternal and childcare in the country:

- The first ever 5-day Master training course on "Essential Newborn Care" was conducted in Myanmar, organized and sponsored by WHO in 2006. Few consultant paediatricians and community physicians in the FHB participated in this programme.
- The SAARC Development Fund MCH Project is mainly focusing on improving neonatal care. One component of this project is to introduce a training module on "Facility Based Care of Sick Neonate at Referral Health Facility" to improve the quality of care for the newborn.
- The Technical Advisory Committee on newborn and child Health has recommended undertaking this Master training Programme following which, with necessary revisions these modules can be used for in-service training of the neonatal care unit staff. This programme was held in 2012.
- In 2010, Members of the PSSL collaborated with the FHB in development of the Feto-Infant Mortality Surveillance system. The formats developed and are ready for pilot testing. On 21st November 2013 Ministry of Health issued a circular initiated by the FHB (FHB/EH/26/2013) on Pilot Implementation of the Feto-Infant Mortality Surveillance System. The number of equipment needed for Maternal and child care received by SDF/ MCH project were distributed through the Bio-Medical Engineering Service to create a newborn corner in each labour room and make essential equipment available

During the COVID-19 pandemic, there have been substantial shifts in the way that maternity care is delivered. Care provision has had to be modified and maternity units have faced many new issues. The effects of these changes on maternity outcomes have not yet been measured, and it is unclear whether these changes have widened or narrowed existing inequalities.

Health department should take the lead to update the staff and improve the maternal and child health services. Professional colleges should formulate the modules depending on the need. They should play the advocacy role. Clinical leaders with the support of Director of the hospital and quality assurance department should facilitate these modules. All the benefits should go to junior staff in the hospital who needs clinical training and these interventions will support them to improve the quality of care. Team dynamic training is the focus now, not individual training.

Improvement in health care should happen at the institutional level, not at field level. Therefore we as clinicians who are members of the colleges, have a bigger role to play if we are to achieve these targets.

Scientific analysis of morbidity and mortality by the professional colleges by the way of confidential inquiries will help to identify the root cause analysis and to decide on the strategies. Very often these problems are based on geography, hospital based, or unit based. The Ministry should empower the colleges in order to achieve these targets. Regular review meetings should be organized by the Ministry.

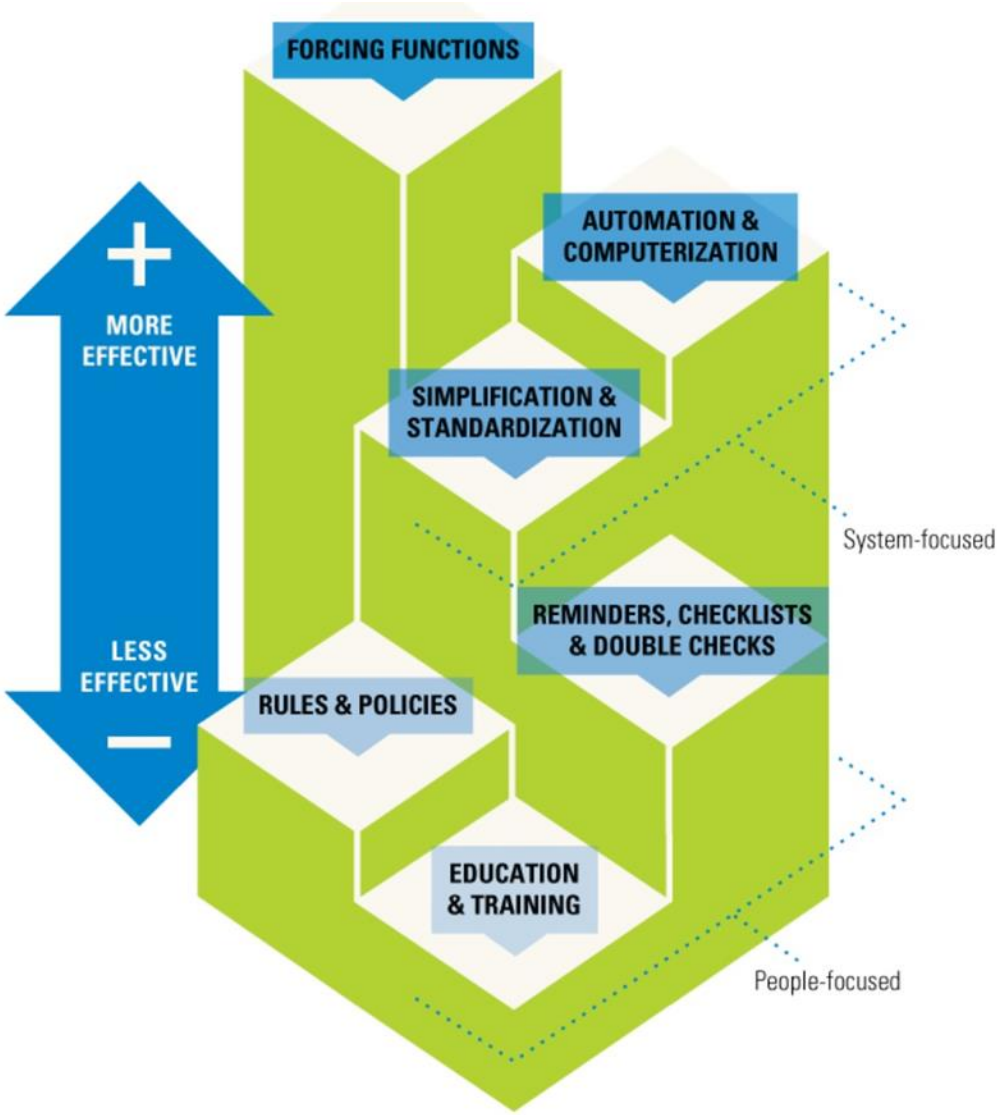

Figure 1: **Hierarchy of Intervention Effectiveness**
(Source: National center for patient safety, US department of Veterans' Affairs)
(Source: patientsafe.worldpress.com : courtsey Cassie Mcdaniel)

I would like to bring your attention now, to the hierarchy of Intervention effectiveness. (Figure 1). This is very important for policy makers, clinicians and politicians. The place occupied by education and training is the foundation of an effective intervention. But in order for it to be effective at the ground level you need to have rules, policies, reminders, check lists and double checks, automation or computerization and forcing functions. Forcing functions are not possible without a strong political commitment. Unless, clinicians, professional organizations, policy makers together with commitment by politicians, adhere to a hierarchy of effective Intervention, it would not be possible to achieve the SGD goals. Personal egos and boundaries kill this opportunity

Shortcomings in the form of failing to empower the professional colleges and absence of regular review meetings was one of the many reasons we were unable to achieve these Millennium Development Goals.

In 2019, in another Induction Program two game-changing innovative programs were introduced in neonatology by Dr Surantha Perera, Past President of PSSL. It is one of the most advanced comprehensive programs to improve neonatal care in Sri Lanka. It was the establishment of Therapeutic hypothermia and Nitric Oxide therapy Program at national level. Already these machines were distributed to the level III Neonatal Intensive Care Units following in house training programs.

PSSL goals for 2021

- **Strengthening labour room services by providing equipment and 24/7 cover.**
- **Organizing a neonatal life support course and awarding certificates in collaboration with SLCP**
- **Advocacy and promoting the CEMD process**
- **New innovations and advanced care**
- **Strengthening the established hypothermia and Nitric Oxide therapy programmes in level 3 and 3+ NICU units**
- **Promoting research, audit and training in perinatal medicine**

As the 20th President of PSSL I pledge my fullest support for these advanced programs during my tenure and I will help to launch these at national level.

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Leading Article

Focus on the fetus through enhanced maternal care: the way forward for diabetes and cardiovascular disease prevention

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Keywords: Pregnancy outcomes, Hyperglycaemia in Pregnancy, Diabetes, Prevention, Women's Health.
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Introduction

Type 2 diabetes is considered the 'mother of all diseases' due to its macrovascular and microvascular complications negatively impacting on quality of life. It has a huge impact on well-being of South Asian populations being number one cause for premature disability and death. Its impact on economic development of lower and middle-income countries being significant, saw heads of states pledge at the UN general assembly 2011 to pay special attention in enhancing healthy lifestyle. This initiative has been unable to stem the tide in the next decade. The global prevalence of diabetes and related metabolic disease has risen exponentially. Worldwide trends of age-standardized diabetes prevalence increased from 4.3% in 1980 to 9.0% in 2014 in men, and from 5.0% to 7.9% in women, with women surpassing men with advancing age. In 2019, a total of 463 million people was estimated to be living with diabetes, representing 9.3% of the global adult population (20–79 years). This is projected to increase to 578 million (10.2%) in 2030 and 700 million (10.9%) in 2045. The prevalence of diabetes in women in 2019 was estimated to be 9.0%, and 9.6% in men. The increase in diabetes prevalence with age leads to a prevalence of 19.9% in people aged 65–79 years. It is well accepted that women are not far behind men in prevalence and also recognized to suffer from more severe complications. World Diabetes Day is observed on 14th November, since 2006. More recently the internationally agreed themes include 'Healthy Women- Healthy Nation' and 'Diabetes and the Family'. Many countries struggling with the rise of type 2 diabetes have focused on the affliction of pre-diabetes and diabetes in young women.

Women's health – a step in the right direction?

'Women and diabetes' is a special problem. This aspect of women's health is often overlooked and ill addressed by health systems throughout the world. Women with diabetes are at greater risk of cardiovascular outcomes of diabetes [1,2]. South Asian countries joined hands since 2013 in addressing diabetes among women, particularly in and around pregnancy (SAIDIP). Hyperglycemia in pregnancy (HIP) is the focus of attention today in maternal care as gestational diabetes mellitus (GDM) of varying degrees of severity, detected during pregnancy has shown a parallel rise with the worldwide epidemic of type 2 diabetes and cardiovascular risks. GDM is a form of diabetes occurring during pregnancy which can result in short- and long-term adverse outcomes for women and their children. More recent data confirms that the offspring of pregnancies with metabolic complications have a greater risk for early onset

obesity and diabetes [3,4]. Hence, it is extremely important that policy makers and care givers join hands and pay special attention to upscale the amalgamation of vertical programs in MCH and NCD.

The American Diabetes Association (ADA) defines GDM as "glucose intolerance of any degree with the onset or first recognition during pregnancy, and irrespective of whether or not insulin is required, or the condition persists after pregnancy". The need for a multi-disciplinary and a life course approach with a holistic outlook to seek answers to many research questions that arose in this aspect was widely endorsed by WHO (World Health Organization), IDF (International Diabetes Federation) and FIGO (International Federation of Gynaecology and Obstetrics). Currently GDM affects approximately 7% of all pregnancies and up to 14% of pregnancies in high-risk populations while pre-gestational diabetes mellitus is estimated to affect about 1.3%. South India reported the incidence of GDM to be 16.55%, while in Sri Lanka the incidence in the community was 10.3 %, in 2006 and 13.9% in 2016. The IDF estimates that globally 20.9 million (16.2% of live births) in 2015 had some form of maternal hyperglycaemia. GDM accounted for 85.1%, with other types of diabetes first detected during pregnancy being 7.4% and pre-pregnancy glucose intolerance 7.5%. South Asian ethnicity is a known non-modifiable risk factor for GDM.

Most recent Sri Lankan data

Pregnancy, maternal and offspring outcomes of women with gestational diabetes

We determined adverse pregnancy outcomes, maternal and offspring outcomes of the Sri Lankan women with GDM [5,6].

The study consisted of two components [5,6].

A community based longitudinal study conducted in 2014/2015 among pregnant women with GDM selected by probability proportionate to cluster sampling method, tested with fasting 75g oral glucose tolerance test (75g OGTT) in Gampaha district, having excluded those with early pregnancy detected abnormal glucose tolerance.

This was followed by a prospective cohort study to determine pregnancy, maternal and offspring outcomes among pregnant women with and without GDM. (N=132 in each arm). All study participants diagnosed with GDM were included as the exposed group and a comparable group as the non-exposed group. Both cohorts of women and their offspring were followed up till one year postpartum (2 months and 12 months).

Sociodemographic, economic, family history of diabetes, pregnancy related and offspring related data with maternal and offspring anthropometry measured. International Physical Activity Questionnaire short version (IPAQ) ascertained maternal activity level and a three-day diet record on nutritional intake at one year post-partum were recorded.

Recruited numbers were GDM=194 and non GDM=194. Response rates were: GDM 169(87.1%) and non GDM 178 (91.8%). At 2 months postpartum the GDM group adjusted odds ratios (aOR) (and 95% CI) were; Obstetric and/or medical complications during pregnancy =1.8(1.1-2.7); Pregnancy induced hypertension = 3.1(1.5-6.5); vaginal candidiasis= 4.9(1.4-17.4); breast engorgement= 2.6(1.02-6.4); birth weight >3.5kg= 2.8(1.4-5.5); PBU admission for prematurity= 5.1(1.2-22.2); maternal impaired glucose tolerance= 6.1(2.7-13.8); abnormal glucose tolerance= 7.7(2.9-20.6).

At one year postpartum only 68 with GDM and 70 without GDM participated (40% of the initial responders). aOR (95% CI) were: exclusive breast feeding for six months= 0.3(0.1-0.7); maternal diabetes mellitus= 4.1(1.1-15.7); impaired glucose tolerance= 5.8(1.5-21.8); abnormal glucose tolerance= 7.7(2.9-20.6).

Focus on the foetus through enhanced maternal care

Long-term adverse health outcomes reported among infants born to mothers with abnormal glucose tolerance include sustained impairment of glucose tolerance, early life obesity, and increased risk for cardiovascular morbidity as an adult and impaired intellectual achievement [1,2]. For women, DIP is a strong risk factor for developing hypertension and pre-eclampsia, renal impairment and nephropathy, diabetic retinopathy, diabetic gastropathy and diabetic ketoacidosis and Type 2 diabetes in the future[7].

Hyperglycemia in Pregnancy (HIP) is a medical condition in which pre- existing diabetes or the development of Insulin resistance during pregnancy leads to increased blood glucose levels in a pregnant woman. Gestational Diabetes Mellitus (GDM) is defined as "any degree of glucose intolerance with onset or first recognition during pregnancy" and reported in 2 to 9 percent of all pregnancies worldwide [1]. Diabetes in Pregnancy (DIP) includes type 1 and type 2 diabetes, GDM and other specific types of diabetes related to a variety of genetic-, drug-, or chemical-induced hyperglycaemia affecting pregnancy[7].

HIP is associated with an increased risk of adverse perinatal outcomes including large for gestational age (LGA), macrosomia (usually defined as birthweight of over 4 kg), induction of labor and cesarean section. Other perinatal risks include shoulder dystocia, birth injuries such as bone fractures and nerve palsies, and hypoglycemia. In preexisting diabetes with microvascular and macrovascular complications, fetal growth restriction and preeclampsia contributes to a significant increase in maternal morbidity and mortality. Glucose is a known teratogen in excess and periconception hyperglycaemia leads to fetal structural anomalies.

Long-term adverse health outcomes reported among infants born to mothers with DIP include sustained impairment of glucose tolerance, subsequent obesity, and increased risk for cardiovascular morbidity as an adult and impaired intellectual achievement [1,2,8]. For women, DIP is a strong risk factor for developing hypertension and pre-eclampsia, renal impairment and nephropathy, diabetic retinopathy, diabetic gastropathy and diabetic ketoacidosis and Type 2 diabetes in the future [7].

Currently DIP is diagnosed and managed following the National guidelines endorsed by Sri Lanka Medical Association (SLMA), Sri Lanka College of Obstetricians and Gynecologists (SLCOG) and Family Health Bureau [9]. This states that all pregnant women should be screened for diabetes at the first visit unless they are already known to have Diabetes (Pre- Gestational (PGDM)). This should be performed as early as possible, preferably before 12 weeks, in order to diagnose previously undetected diabetes. In Sri Lankan practice, Fasting Blood Sugar (FBS) ≥126mg/dl, or Random Blood Sugar (RBS) >200mg/dl, or HbA_{1c} >6.1% is diagnosed as having pre-pregnancy diabetes [10].

Following the diagnosis, management of HIP is essential for a satisfactory obstetric outcome. Management of women with established diabetes generally includes pre pregnancy care, antenatal care through the first visit and antenatal appointments, Medical Nutrition Therapy

(MNT) and exercise. Glycemic control and monitoring also plays a vital part in the management process with the aim to achieve optimum glycemic control throughout the day for the duration of the pregnancy avoiding hypoglycemia. These women with DIP are considered as having a high-risk pregnancy. Therefore, their delivery is scheduled and labor care is provided with the best considerations by the obstetrician. During the post-partum period, the neonatal care and the immediate post-partum care for the mother is performed simultaneously. At discharge the woman is given the health education and the follow-up visits are planned for both having PGDM and GDM. At 6 -8 weeks postpartum, all women with GDM are screened for diabetes mellitus. The test of screening is ideally the 75g OGTT. Family planning is also given attention during this management period (SLCOG) [7].

Satisfactory treatment and management of DIP is found to have benefits in reducing maternal and neonatal complications. We have consistently reported good maternal and fetal outcomes in women treated at a tertiary care setting in Sri Lanka [11]. Glucose screening of pregnant women would assist in reducing future health risk of Type 2 DM. Also improved glycemic control has remarkable maternal and neonatal-perinatal benefits including normal mode of delivery for the mother, as well as normal weight gain during pregnancy, and reduced shoulder dystocia, bone fracture and nerve palsy in the baby [12]. These facts highlight the importance of effective management of DIP.

Glucose is a known teratogen in excess and its effect on epigenetic modifications are still under scrutiny. Babies born to mothers with GDM are at increased risk of developing obesity [13] and diabetes [14]. GDM and foetal macrosomia have considerable impact on increasing the offspring's risk for metabolic syndrome in childhood. A cohort study conducted in Brown Medical School and Hasbro Children's Hospital, USA among children at age 6, 7, 9, and 11 years (LGA: n = 84 and AGA: n = 95) revealed that risk of developing metabolic syndrome with time was not significantly different between LGA and average gestational age (AGA) offspring in the control group but was significantly different between LGA and AGA offspring in the GDM group (NDDG criteria). This study revealed that LGA offspring of diabetic mothers were at significantly high risk of developing metabolic syndrome in childhood [15].

The metabolic milieu of GDM could have long-term effects on the metabolic profile and future risk of diabetes in the offspring. This complex interaction between environmental, genetic and perinatal factors leads mothers with GDM as well as their offspring to an increased risk of diabetes and metabolic syndrome, hence, setting up a vicious cycle of "diabetes begets diabetes" [16]. Intrauterine exposures to maternal diabetes and obesity are shown to be strongly associated with future type two diabetes in youth [17] and increased risk of GDM in girls [18]. In utero hyperinsulinemia was associated with a 17-fold increase in metabolic syndrome and a 10-fold increase in overweight at adolescence, independent of birth weight and mother's BMI [19]. A follow up study conducted by Tam et al (2008) showed that maternal GDM increases the offspring's cardio metabolic risk. Total 164 Chinese children (63 with maternal GDM and 101without maternal GDM) were evaluated at a median age of 8 years (range: 7–10 years). After adjustment for age and gender children exposed to maternal GDM had significantly higher systolic (94+/-1.2 vs. 88+/-0.9 mmHg) and diastolic (62+/-0.8 vs. 57+/-0.6 mmHg) blood pressure values and lower high-density lipoprotein cholesterol (1.58+/-0.04 vs. 1.71+/-0.03 mmol/L) levels compared to children not exposed to maternal GDM. Further, this study revealed that high ($\geq 90^{th}$ percentile) umbilical cord insulin level at birth was associated with abnormal glucose tolerance in the offspring. In utero hyperinsulinemia is an independent predictor of abnormal glucose tolerance in childhood [20].

Women with HIP have a higher risk of developing type 2 diabetes mellitus within five years postpartum and the risk doubles after the first five years [15]. They are also at increased risk of developing metabolic syndrome postpartum and the risk is higher in women from South Asian descent [16-18,21].

Thus, it is evident that HIP, and resulting altered metabolism affecting the pregnancy can continue to affect the mother long term and more importantly, the fetus carries its burden starting from prenatal period (womb) followed by birth, growth and adult life till death (tomb)

Although DIP is found to have numerous risks on the pregnancy, women after delivery and the offspring, the effect of screening, diagnosis and treatment of DIP is still debated. Crowther *et al*. states that it remains uncertain whether screening and treatment to reduce maternal glucose levels reduce these risks. Hence long term follow up studies are essential and urgent requirement in advancement of the knowledge in this field.

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Current Practice

Guideline on management of Persistent pulmonary hypertension (PPHN) of the newborn using inhaled Nitric Oxide therapy

Surantha Perera[1], Amit Gupta[2]

1. Introduction

This guideline is prepared based on the available evidence to provide optimum care for newborns with persistent pulmonary hypertension (PPHN) and ensure that inhaled nitric oxide (iNO) is used in a safe, effective, appropriate and cost-effective way for newborns with PPHN in the neonatal intensive care unit.

Persistent Pulmonary Hypertension [PPHN] is a failure of pulmonary vascular resistance to fall post natally at any gestation. It is characterized by right to left shunting of deoxygenated blood at atrial, ductal and pulmonary levels resulting in severe hypoxaemia.

Its aetiology may be classified by normal or abnormal pulmonary vasculature development.

- Conditions with normal pulmonary vasculature include meconium aspiration, asphyxia states and congenital pneumonia, which tend to respond more quickly to treatment and may tolerate more aggressive measures. Abnormal transition without parenchymal lung disease rarely requires inhaled nitric oxide.
- Conditions with abnormal pulmonary vasculature include chronic foetal hypoxia, oligohydramnios and congenital diaphragmatic hernia, which tend to be less responsive to pulmonary vasodilators and may benefit from lung protective ventilation strategies. Most cases of idiopathic PPHN probably belong to this group.

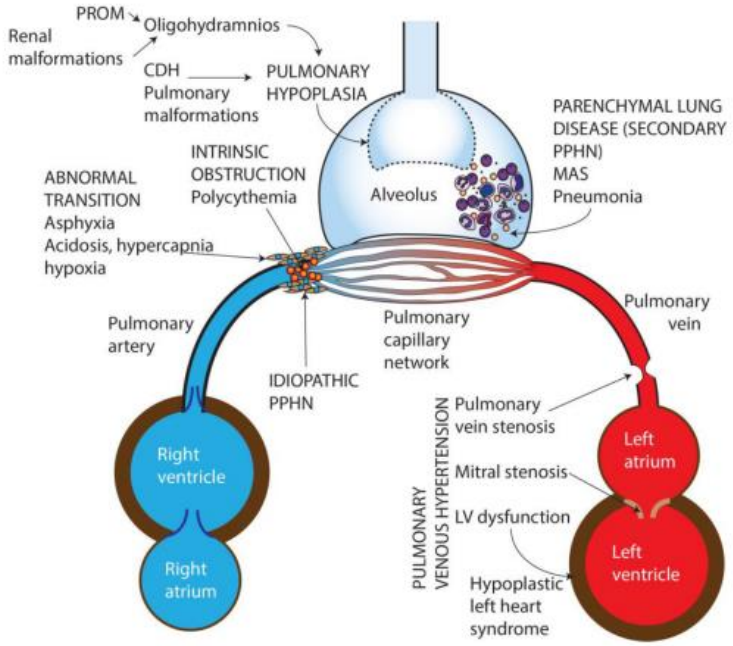


Figure 1. Causes of persistent pulmonary Hypertension in the newborn. PROM—Premature rupture of membranes, CDH—Congenital diaphragmatic hernia, MAS—Meconium aspiration syndrome, PPHN—Persistent pulmonary hypertension of the newborn, LV—Left ventricle. Copyright Mathew and Lakshiminurusimha, 2017

2. Key Clinical Features:

- Hypoxia despite 100% oxygen and structurally normal heart
- Hypoxia disproportionate to underlying lung disease
- Pre- and post-ductal saturation discrepancy (>5%, often 10-15%)

3. Investigations:

- Continuous central blood pressure and pre- and post-ductal saturation monitoring
- Serial arterial blood gases and calculation of Oxygenation Index (OI). (Severity of hypoxic respiratory failure: mild 40)
- CXR – rule out pneumothorax, atelectasis/pneumonia and provide adequate lung inflation

$$OI = \frac{FiO_2(\%) \times MAP\ (cm\ H_2O) \times 100}{PaO_2\ (kPa) x\ 7.5}$$

- Echocardiogram: establish cardiac anatomy and evidence of PPHN to guide treatment. Serial echo may guide treatment during the clinical course. If OI>20 and unresponsive to iNO, urgent formal assessment by Cardiology is required
- Screen and treat for sepsis
- Cranial ultrasound if considering ECMO
- Starting Prostaglandin E2 is usually indicated in equivocal cases until definite diagnosis is established

4. Treatment Strategies:

4.1 General management principles - These points are very important and can prevent further unnecessary escalation of therapy.

- Ensure secure and well-positioned ETT, with leak 30%
- Central venous access and arterial access (ask for assistance if required)
- Correct metabolic acidosis with bicarbonate. Aim to keep pH 7.35-7.45 in the early phase of management.
- Aim for normal temperature unless cooling treatment is required
- Electrolyte correction
- Treat for sepsis
- Strict fluid balance and consider nutritional needs

(Refer Figure 2 for treatment sequence)

4.2 Optimize Ventilation/Oxygenation

CO2, pH and O2 are the most important determinants of pulmonary vascular resistance. Optimal lung inflation is essential when iNO is used.

- Early liberal oxygen use – wean when stabilized. The optimal saturation target range for patients with PPHN is not known. Targeting a lower limit of preductal SpO2 of 92% provides a buffer to hypoxic pulmonary vasoconstriction and an upper limit of 97% ensures the optimal balance of pulmonary vasodilation and minimizes adverse effects from oxidative stress.
- Consider surfactant
- Optimize ventilation settings to achieve target PaCO2 4-6 kPa and PaO2 8-12 kPa. Oxygenation is defined by mean airway pressure (MAP) and FiO2. Higher PEEP and longer inspiratory time yields higher MAP in conventional ventilation.
- If high PIPs required (> 28 cmH2O), consider starting HFOV
- If using HFOV, repeat CXR to monitor inflation and guide MAP settings (aim diaphragms at 9 ribs). Term infants may require MAP >16 cmH2O. Inform consultant if needing MAP >20 cmH2O.
- Increased sedation and often muscle relaxation may be required for appropriate minute ventilation. Consider prone positioning.

4.3 Sedation

- Morphine or Fentanyl bolus and infusion for initial sedation
- Add Midazolam if required
- Muscle relaxation if ongoing difficulty with ventilation – Pancuronium bolus +/- Vecuronium infusion. Vecuronium infusion is preferred, as Pancuronium can cause tachycardia.
- Monitor blood pressure closely. give saline bolus if BP decreases with sedation.

4.4 Blood Pressure Support

- Aim for high-normal BP (MAP≥ 45-50 for term neonates).
- Consider starting inotropes early for hypotension.
- Dopamine first-line (max 10-15 mcg/kg/min to prevent tachycardia)
- Consider fluid resuscitation (max 20ml/kg 0.9% NaCl) if there is evidence of hypovolemia.
- Then consider Noradrenaline/Adrenaline infusion followed by Hydrocortisone depending on echo finding or BP values if echo is not available:
    - **Adrenaline** if echo demonstrates decreased LV function or when systolic BP is low with narrow pulse pressure on BP monitor.
    - **Noradrenaline** if echo demonstrates relatively maintained LV function or when diastolic BP is low with wide pulse pressure on BP monitor. Consider Vasopressin in case of catecholamine resistant hypotension or when oxygenation significantly improves at higher BP values.

4.5 Pulmonary Vasodilators

- **Echo** prior to commencement if possible but treatment should not be delayed.

4.5.1 Inhaled Nitric Oxide: First line therapy (after general management steps)

- Exclusion criteria: Cyanosis secondary to congenital heart disease and preterm infants with hypoxic respiratory failure
- Contraindications to iNO therapy:
  Bleeding diathesis should be corrected prior to commencing iNO

  Note: No clear benefit has been demonstrated in babies with diaphragmatic hernia

4.5.1.2 Starting treatment, maintenance and monitoring

- Consultant Neonatologist/ Paediatrician must decide on commencing iNO
- Start at 20ppm and slow wean when stabilized to prevent rebound hypoxemia
- Monitor for thrombocytopaenia and coagulopathy.
- Methhaemoglobin should ideally be monitored if facilities are available.
- Response must be assessed in 20-40 mins by ABG and calculation of OI or less preferably by response in pre- and post-ductal saturations and FiO2 requirement. These must also be documented in notes.
- When the baby is stable on 20 ppm, start weaning of oxygen slowly.

4.5.1.3 Weaning iNO

- There is a high risk of rebound PPHN and therefore iNO should be weaned slowly, especially in infants with abnormal vasculature development or significant parenchymal disease
- Consider weaning iNO when clinical stability achieved and FiO2 requirements ≤0.6
- Decrease iNO by 5ppm every 4 hours as tolerated, until 5ppm reached. Slower decrease by decrements of 1ppm every 4 hours until ceased.
- A faster wean (decrease iNO hourly) may be tolerated in low-risk infants.
- Stop and increase iNO back to last effective setting (≥5ppm) if signs of weaning failure.

Weaning failure if:
- FiO2 requirement increases ≥0.2
- Pre- and post-ductal saturation difference >10%

- After stability re-achieved, attempt wean again more slowly
- If signs of recurrent weaning failure, consider adjunctive oral Sildenafil after discussion with Cardiology.
- Repeat echo soon after successful weaning from iNO to identify persistent signs of PPHN and right ventricular failure (as clinical features might be initially subtle).
- Discuss follow up and length of Sildenafil treatment with cardiology before discharge home.

4.5.1.4 Documentation

- The time of starting and stopping iNO therapy should be entered in the neonatal BHT. The prescribed dose of iNO with the duration for each dose should be entered in the monitoring chart.
- NO2 and methhaemoglobin (if facilities available for measuring) concentration should be recorded).
- Summary of iNO therapy must be recorded in 'Neonatal Monthly Return H 1168'

4.5.2 Milrinone and Sildenafil

- Consider in consultation with Neonatologist or Cardiologist
- Milrinone has inotropic and vasodilator effects and is useful in myocardial dysfunction. Consider a saline bolus prior to commencement to prevent hypotension.
- Sildenafil (IV) may be useful in cases with good cardiac function. Oral Sildenafil is preferred during weaning of iNO.
- Prostaglandin E2 (Dinoprostone): may be indicated to re-open the duct if RV failure on echo

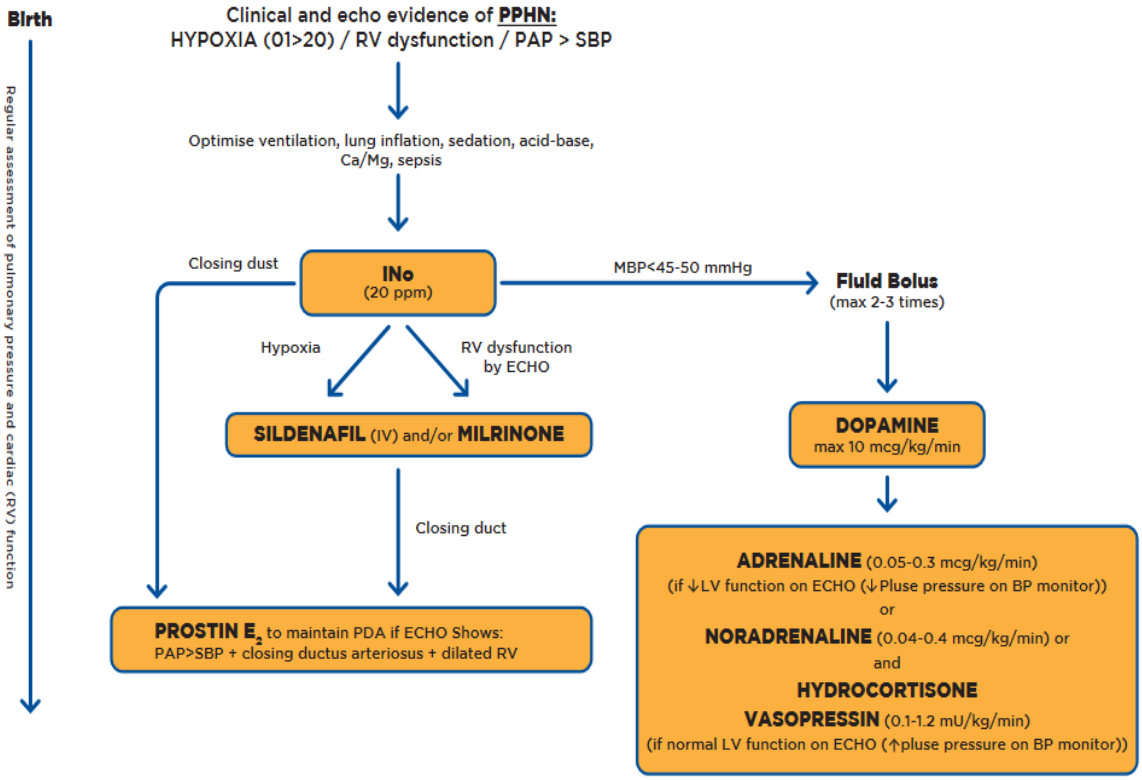
4.6 ECMO

- Eligibility
    - term, reversible respiratory failure in absence of congenital abnormality and IVH
- Significant risks
    - haemorrhage, mortality 20%, morbidity up to 46% in selected groups

5. Postoperative management of pulmonary hypertension associated with heart or lung surgery in infants

- The development of right ventricular failure secondary to pulmonary arterial hypertension is a serious postoperative complication in children.
- The selective pulmonary vasodilatation produced by inhaled nitric oxide is a therapeutic option in certain cardiac lesions.
- Such examples are obstructed Total Anomalous pulmonary venous return (TAPVD), Atrio-ventricular septal defects, and large Ventricular septal defects with Pulmonary hypertension

FLOWCHART FOR TREATMENT SEQUENCE in PPHN



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Orginal research

A survey of Knowledge and concepts of Public Health Midwives on Exclusive Breast Feeding, in three districts of Sri Lanka

(Guruge MR[1], Suthesan S[2])

Key words – exclusive breast feeding, midwives, Baby Friendly Hospital Initiative

Word Count – 2268

Abstract

Baby Friendly Hospital Initiative which was introduced by WHO introduced to Sri Lanka in 1992. Main mission of this program was to promote exclusive breast feeding (XBF) under which all health care staff had multiple training sessions. Public Health Midwives (PHM) are pivotal in this mission both in fields as well as in hospitals. And their knowledge on breast feeding is crucial since they are directly involved in health education and management of lactating mothers. Despite measures undertaken to disseminate and update knowledge on XBF, mis-concepts and ill practices still prevail and is a major hindrance to achieve above goal. This descriptive cross-sectional study was planned to assess knowledge and concepts of XBF among a cohort of PHMs in the government sector.

234 midwives attending CME sessions in 3 districts were assessed based on a questionnaire regarding exclusive breast feeding(XBF). Despite the satisfactory overall performance, results revealed gaps in basic knowledge and concepts of breast-feeding practices among midwives. PHMs showed satisfactory knowledge on important properties of colostrum and breast milk, management of common breast conditions during lactation and indications for EBM. However, participants knowledge on practical aspects of XBF such as frequency of breast feeding was unsatisfactory and the 45.7% did not appreciate the concept of demand feeding.

This study revealed that important aspects of mis-concepts still prevail among PHMs which needs to be addressed in order to promote XBF among mothers.

Introduction

Benefits of exclusive breast feeding (XBF) for both mother and baby has been proven beyond doubt for decades [1,2]. It has been shown to have multiple beneficial effects beyond nutrition such as a protective effect against infections such as respiratory infections diarrhea and otitis media, reduced incidence of atopy and improved IQ in children. XBF reduces mortality and morbidity significantly of infants specially in low socioeconomic settings globally.

The Baby friendly hospital initiative program (BHFI), introduced by WHO to promote and sustain XBF globally, was introduced to Sri Lanka in 1992. Under this programme all health

care staff including public health midwives (PHM) are trained in a structured manner to promote XBF. The PHM plays a pivotal role in educating, promoting and sustaining XBF among pregnant and lactating mothers in Sri Lanka. There is anecdotal evidence (from queries from BF mothers), that in spite of their BFHI training, some outdated advice and misconceptions regarding XBF are still being disseminated by PHM. This misinformation is extremely detrimental to the promotion of XBF, and undermines the entire programme of the BFHI.

Therefore, we undertook this study to assess the current knowledge and perceptions of PHM on XBF.

Objectives –

To assess the knowledge and perceptions of Public Health Midwives on XBF in 3 districts of Sri Lanka.

Method –

This was a descriptive cross sectional study
Over a 6 month period, PHM's attending 3 CME seminars on maternal and early new born care, (planned by the Family Health Bureau) in 3 districts – Colombo , Hambantota and Ampara, were enrolled into the study. The total number of participants were taken as the whole population for study purposes. None of the participants were working directly under the resource persons, who were senior neonatologists, Paediatricians and Obstetricians from Colombo Teaching hospitals.

Sample size and selection:
Convenience sampling was used, and all participants attending the seminars were considered as the total population.
Study period: June 2019- December 2019
Inclusion and exclusion criteria: all PHMs currently employed by the Ministry of Health and working as community or labor ward midwives who attended above mention seminars and consented to the questionnaire were included in the study.

Study tool: A pre tested self-administered questionnaire was administered to consenting PHM's before the commencement of the seminar. The questionnaire was constructed in English, translated to Sinhala and Tamil languages and back translated to ensure the accuracy. Participants' knowledge and concepts were tested on the following areas; composition and advantages of breast milk and colostrum, BF techniques, contraindications for BF, management of common BF problems and indications and storage of expressed breast milk(EBM). The document in all three languages were available to the participants.
Ethical Approval was obtained from Ethical Review Committee of Colombo South Teaching Hospital.

Results

This study assessed the knowledge and perceptions on breast feeding among public health midwives in 3 districts, using a self-administered questionnaire. 234 consenting PHMs in Colombo, Ampara and Hambantota districts were enrolled into the study. 6 non consenting midwives were excluded.

Univariate analysis was performed to analyze the data using SPSS 19 package.

Table 1: demographic data

Socio demographic variable	No. (n=234)	Percentage (%)
Age		
• <30 years	28	11.9
• 30-40 years	42	17.8
• > 40 years	51	21.8
• Not responded	113	48.5
District		
• Colombo	95	40.6
• Ampara	62	26.5
• Hambantota	77	32.9

Table 2 tested the knowledge of breast milk and its comparison with colostrum.

Table 2: Knowledge on composition of breast milk*

Composition of breast milk	**n (%)**	**n (%)**	**n (%)**
1. Regarding breast milk	**Correct**	**Incorrect**	**Don't know(DK)**
1A. Breast milk composition varies from mother to mother T	53 (22.6)	171(73.2)	10(4.2)
1B. Foremilk has higher calorie content than hind milk F	170(72.6)	58(24.9)	6(2.5)
1C. Is easy to digest than formula milk T	222(94.9)	2 (0.8)	10 (4.3)
1D. Protects baby from infection T	234 (100)	0 (0.0)	0(0.0)
2. Regarding colostrum			
2A. Should be discarded F	230(98.3)	4 (1.7)	0 (0.0)
2B. Has a different composition to breast milk T	168(71.8)	58 (24.8)	8 (3.4)
2C. It is low in nutrition compared to breast milk F	220(94.0)	11 (4.8)	3(1.2)
2D. It is not suitable as EBM for sick babies F	221(94.4)	9(3.9)	4(1.7)

Table 3 tested participants knowledge on initiation of XBF and breast feeding technique,

Table 3: Knowledge on initiation of breast feeding and technique

Initiation of breast feeding and technique	n (%)	n (%)	**n (%)**
	Correct	**Incorrect**	**DK**
3. Initiation of breast feeding			
3A. Should be done within one hour of birth T	228(97.4)	6 (2.6)	0(0.0)
3B. Need to be delayed in LBW babies F	217(92.7)	17(7.3)	0(0.0)
3C. should be delayed in well preterm babies of 28-30 weeks gestation F	171(73.1)	51(21.8)	12(5.1)
3D. Should be started as EBM if mother and baby are separated T	227(97.0)	7(3.0)	0(0.0)
4. Regarding correct positioning when breast feeding			
4A. Sitting position is better than lying down position F	75 (32.1)	134(57.3)	25(10.6)
4B. Baby's whole body should rest on mother's forearm T	196(83.8)	31(13.3)	7(2.9)
4C.There is risk of nasal obstruction when putting to breast F	180(76.9)	43(18.4)	11(4.7)
4D. Nasal obstruction should be prevented by pushing breast back F	162(69.2)	57(24.4)	15(6.4)
5. In a correct attachment to the breast			
	217(92.7)	14(6.1)	3(1.2)
5A**.** baby's chin should touch the breast T	227(97.0)	7(3.0)	0(0.0)
5B. mouth should be wide open T	198(84.6)	28(12.0)	8(3.4)
5C. more areola should be visible below the lower lip F	200(85.5)	24(10.3)	10(4.2)
5D. lip should be turned inside F			

Table 4 checked the knowledge of frequency, adequacy and long term duration of BF;

Table 4: **Regarding Frequency and adequacy of breast feeding**

Breast feeding frequency, adequacy and duration	**n (%)**	**n (%)**	**n (%)**
	Correct	**Incorrect**	**DK**
6. Breast feeding should be			
6A. done every 2-3 hourly F	66(28.2)	123(52.6)	45(19.2)
6B. done for 20 minutes on each side F	60(25.6)	135(57.8)	39(16.6)

6C. avoided immediately after the mother has had a head bath F	208(88.9)	26(11.1)	0(0.0)
6D. started with offering the comfortable side first F	114(48.7)	101(43.2)	19(8.1)
6E**.** offered whenever baby sucks the fingers or near by objects T	127(54.3)	97(41.5)	10(4.2)
7. Breast feeding/breast milk is adequate if			
7A. baby will sleep comfortably for about 2 -3 hours after a feed T	218(93.2)	16(6.8)	0 (0.0)
7B. frequency of urine output is more than 5 times in 24 hours after 1st 3 days T	181(77.4)	47(20.1)	6(2.5)
7C. there is a 12% weight loss within 1st 10 days F	105(44.9)	114(48.7)	15(6.4)
7D. milk flows freely when nipple is squeezed F	71(30.3)	141(60.3)	22(9.4)
8. True regarding long-term duration of Breast feeding			
8A. Should be continued exclusively up to 6 months T	222(94.9)	12(5.1)	0(0.0)
8B. Breast feeding on demand should be continued up to 1 year F	176(75.2)	58(24.8)	0(0.0)
8C. weaning can't be started before 6 months F	51(21.9)	103(44.1)	18(7.6)
8D. should be encouraged up to 2 years T	221(94.4)	11(4.8)	2(0.8)

Table 5 checked the participants knowledge of managing common breast problems in lactation;

Table 5: **Management of breast conditions during lactation**

Management of common breast conditions	**n (%)**	**n (%)**	**n (%)**
9. Management of sore nipples	**Correct**	**Incorrect**	**DK**
9A. Avoid breast feeding from that side F	203(86.8)	27(11.5)	4 (1.7)
9B. Continue EBM from that side F	74(30.4)	149(63.7)	11(5.9)
9C. should give formula feeds until nipples heal F	229(97.9)	5(2.1)	0 (0.0)
9D. breast feeding should continue with correction of attachment and positioning T	226(96.6)	8(3.4)	0 (0.0)
10. Management of engorged breasts			
10A. is due to incomplete emptying of milk T	222(94.9)	12(5.1)	0(0.0)
10D. frequent feeding is encouraged F	21(9.0)	213(91.0)	0 (0.0)

Table 6 checked knowledge of indications for use and storage of EBM;

Table 6: **Knowledge on expressed breast milk**

Expressed breast milk and cup feeding	**n (%)**	**n (%)**	**n (%)**
11. Milk expression and cup feeding should be trained for	**correct**	**Incorrect**	**DK**
11A. mothers with a sick baby T	212(90.6)	22(9.4)	0(0.0)
11B. working mothers T	227(97)	7(3.0)	0 (0.0)
11C. babies not gaining enough weight T	208(88.9)	26(11.1)	0(0.0)
11D. mothers with twin babies T	186(79.5)	45(19.3)	3(1.2)
12. Expressed breast milk can be stored			
12A. at room temperature for 4 hours T	112(47.9)	102(43.6)	20(8.5)
12B. in a refrigerator for 72 hours T	132(56.4)	88(37.7)	14(5.9)
12C. in the freezer compartment for 6 months T	123(52.6)	87(37.2)	24(10.2)
12D. and reheated in a microwave before a feed F	191(81.6)	38(16.3)	5(2.1)

*(The expected correct responses are given as T/F after the stems)

On knowledge on digestibility and infection protection and properties of breast milk; 222 and 234 midwives (94.9 and 100%) respectively had correct knowledge. However, regarding the composition of breast milk, 171(73.2%) did not appreciate the variation in composition among individual mothers, while another 10(4.2%) did not know the answer. In addition, 170(72.6%) of participants were not aware about the difference of calorie content between fore milk and hind milk(tables 1 &2).

Regarding colostrum, more than 90% acknowledged that it should be given to babies as a direct feed or EBM and it was more nutritious than BM. However, 58 (24.8%) thought that colostrum is not different to breast milk in composition(table 2).

228 (97.4%) of participants correctly responded on initiation of breast feeding within the first hour of birth and 227(97.0%) knew to use EBM to start feeding if mother and baby were separated. However, on breast feeding preterm babies, 51(21.8%) incorrectly thought that breast milk should be delayed in well pre term babies(28 to30 weeks gestation), while another 12(5.1%) did not know the answer(table 3).

196(83.8%) of participants had correct knowledge on proper positioning of the baby during breast feeding. However, on the position of the mother during a feed,134 (57.3%) of PHMs thought lying down position was inferior to the seated position. 43(18.4%) incorrectly thought that there is a risk of nasal obstruction of the baby during positioning onto the breast while 57(24.4%) thought this could be prevented by pushing the breast backwards (rather than altering baby's position), during the feed. Over 85% knew the correct method of attachment to the breast(table 3).

Surprisingly, on frequency of breast feeding, 123(52.6%) of the participants thought the correct way to breast feed was on a fixed schedule of every 2-3 hours, while 45(19.5%) "did not know". In addition, the majority of 135(57.8%) also thought that the baby should be fed on a fixed schedule of 20 minutes on each breast(table 4).

On checking for adequacy of breast feeding, 141(60.3%) erroneously thought squeezing the nipple and checking the flow of breast milk gave a proper indication of mothers' milk production. Only 114(48.7%) of the responders knew that a 12% weight loss in first 10 days of life was not acceptable while 105(44.9%) mistakenly thought it was within normal limits. On commencement of weaning, most knew that XBF should continue for 6 months and BF should be encouraged for 2 years. However, 44.1% thought that weaning should not be commenced for any baby before 6 months of age. Further 24.5% thought that demand feeding should be continued for one year(table 4).
Considering the management of common breast problems, for cracked nipples 203(86.8%) of PHMs knew breast feeding should be continued (with correct attachment) on the affected side(table 5).

On storage and supplemental feeding of EBM over 80% of PHM knew the correct indications for expressing breast milk but on preservation of EBM only 112(47.9%) and 132(56.4%) knew about the correct duration that EBM could be preserved at room temperature and refrigerator respectively.

Discussion

Our survey showed that although almost all PHMs in the survey had satisfactory knowledge on BF composition, some basic feeding advises(eg. attachment) and management of common BF problems, there were misconceptions prevailing in other basic areas in a significant proportion. These included the position of mother during a feed, assessing adequacy of a breast feed and frequency and long term duration of breast feeding.

Most participating PHMs had satisfactory knowledge on important aspects of breast-feeding promotion such as properties and advantages of breast milk and colostrum, and correct initiation and techniques of breast feeding. However, there were mis-concepts in a significant number regarding basic advice on XBF; Surprisingly, nearly 2/3 of PHM thought that lying down position was inferior to the sitting position to breast feed the baby. Only half of

participants promoted the concept of demand feeding, while nearly 2/3recommended 'clock' feeding every 2-3 hours with a fixed timing of 20 minutes on each breast. It is disappointing to note that over half of participating PHM still thought that BF should be conducted on a fixed schedule(2-3 hourly with 20 minutes on each breast), with the mother in a fixed seated position. Although a minority, it is also of concern that nearly 20% of participants had the idea that nasal obstruction of the baby could occur during attachment and that pushing the breast back was the correct remedial action These are fundamental concepts of XBF and misinformation in these areas is undoubtedly detrimental to its promotion. They are also directly in opposition to the current guidelines of the BFHI training and therefore is counter productive. It also causes confusion in mothers who receive conflicting advice from different strata of health care personnel.

On managing common BF problems participants had acceptable knowledge of management of cracked nipples and engorged breasts, but some still recommended EBM to be obtained and given for cracked nipples. This is contrary to the teaching received during their training. On EBM, although most knew about the indications to give EBM, only about half the participants were knowledgeable about methods of preservation of EBM.

We could not find any published data with regards to the knowledge of PHMs on breast feeding practices either in Sri Lanka or in the region. Therefore a comparison of the same was not possible. However, a recent study done in 6 MOH areas of the Kandy district revealed that the prevalence of XBF up to 6 months is just 50.8% [(5)]. Although this study is not comparable to our survey, it is nevertheless of much concern, since the contributory factors may be similar to above issues, although others (such as the unavailability of adequate maternity leave for working mothers who are breast feeding their infants) may also play an important role.

PHM,s are primary care health workers who are in constant contact with pregnant and lactating mothers specially in suburban and rural settings, who play a major role in promoting XBF in Sri Lanka. Thus wrong advise from them will be far reaching and become deep rooted in mothers.

Conclusion and recommendation

This survey shows that while PHMs were knowledgeable on many aspects of breast feeding, but 21 year after the initiation of the BFHI, they still have several significant gaps in their basic knowledge and perceptions, with outdated and wrong information still being disseminated.

The community PHM is held in very high esteem by our mothers who follow their advice diligently. While they form the first contact for mothers with BF problems, regular home visits further strengthen the messages conveyed by them to the community. Therefore, wrong information disseminated by them will make a significant impact and will undermine the promotion and sustainability of XBF in Sri Lankan mothers. Thus, it is vital that we identify the origin of these misinformation and correct them without delay.

In summary we recommend that;

- Steps be taken to identify the gaps in knowledge and sources of the misinformation and how and why it is perpetuated.
- To conduct regular CME programmes as well as initiate monitoring/evaluation mechanisms to ensure that the knowledge and concepts of midwives on XBF remain updated.

These are mandatory steps for stake holders to note, if we are to promote and sustain XBF in Sri Lankan mothers.

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Case report

Neonate with Aplasia Cutis Congenita Associated with Foetus Papyraceus

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Introduction

Aplasia cutis congenita (ACC) is a rare dermatological condition seen in newborns characterized by localized congenital absence of skin. It is subdivided in to many categories out of which ACC associated with foetus papyraceus presents with multiple symmetrical involvement of scalp, chest, flanks, axillae or extremities. We report a case of ACC in a newborn of a twin pregnancy, where the other twin was diagnosed as a 'vanishing twin' with foetal demise in the early 2nd trimester leading to foetus papyraceus.

Case report

A Sri Lankan baby boy weighing 3100g was delivered at term by an elective Caesarean section to healthy non-consanguineous parents. The antenatal ultra sound scan (USS) done at 7 weeks of period of gestation had revealed a mono-chorionic di-amniotic twin pregnancy. However a repeat scan at 16 weeks had revealed spontaneous demise of one twin leading to 'vanishing twin' phenomenon. The anomaly scan done at 20 weeks did not reveal any foetal anomalies in cardiac, renal or gastrointestinal systems of the surviving twin. The pregnancy was not complicated with maternal diabetes mellitus or hypertension.

A foetus papyraceus (Figure 1) was delivered along with the surviving twin who was noted to have lesions with absent skin in the lateral aspects of the trunk and extensor surfaces of lower extremities (Figure 2). The lesions were well demarcated, symmetrical, and involved a large area of bilateral chest, abdominal wall and thighs. These areas consisted of stellate shaped transparent non inflammatory membranes. There was no associated bleeding or herniation from the skin defects. The baby did not have any dysmorphic features and the skin over the rest of the body appeared normal. The hands and feet appeared normal with no evidence of nail dystrophy or clubbing.

A clinical diagnosis of aplasia cutis congenita associated with foetus papyraceus was made. The baby passed meconium on day one itself and there was no evidence of gastrointestinal atresia. 2-Dimensional echocardiography and ultrasound scan of the brain, abdomen and kidneys did not reveal any structural anomalies.

The skin lesions were treated with local application of Fusidic acid and barrier nursing to prevent infection. Dermatological and plastic surgical referrals were arranged and a collective decision was made to manage the lesions conservatively without active intervention. The baby was followed up periodically every week to assess the lesions and spontaneous resolution of the lesions was seen (Figure 3).

Discussion

Aplasia cutis congenita (ACC) is characterized by multiple congenital skin defects, of which 84% are located in the scalp1. Frieden has categorized ACC into 9 distinct subtypes, each characterized by the location, pattern of skin absence, associated malformations, and the mode of inheritance2,3. Although many cases of ACC has been recorded, only 50 cases of ACC associated with foetus papyraceus has been reported up to now6,7.

According to Frieden's classification, ACC associated with foetus papyraceus is classified as 'Type 5.' In this subtype, the lesions are usually large with linear or stellate morphology and distributed bilaterally and symmetrically in the scalp, chest, flanks, axillae or extremities. The common associations in this subtype are gastrointestinal atresia, intracranial haemorrhage, renal cortical necrosis, cardiac and arterial anomalies3. However the baby in this case report did not have any of the above abnormalities.

The precise aetiology of ACC is yet to be determined. Some postulate that midline lesions are due to incomplete closure of neural tube defect, while lateral membranous lesions are a result of incomplete closure of embryonic fusion lines. Type 5 ACC is thought to be due to vascular insufficiency resulting from either thromboplastic material from a foetus papyraceus or due to placental insufficiency2,8. The baby in this case report had clear evidence of foetus papyraceus. Other possible aetiologies include intra uterine infection, vascular coagulation defects, maternal ingestion of certain drugs and amniotic membrane adherence1,2.

There are reports of antenatal identification of ACC by ultrasonography by the absence of the usual strong signal which is generated from normal skin4. But most cases are diagnosed after birth. Early diagnosis may be helpful in antenatal counseling of parents. The optimal management of non-scalp ACC has not been well established. Although most small lesions heal spontaneously, larger lesions with significant deformity may need surgical excision later on5. Very large lesions including stellate scalp lesions may need early surgery and skin grafting3. There are reports of defects as large as 8*12 cm which has been successfully managed conservatively5. Defects associated with fetus papyraceus are known to heal well leaving hypo-pigmented scars2,3. They usually do not require surgical intervention5. Local application of antimicrobial agents and petroleum gauze in affected areas and the use of dry wraps may prevent infection, electrolyte imbalance and ulceration.

Figure 1: fetus papyraceus

Figure 2: Bilateral symmetrical skin lesions noted on day 1

Figure 3: Spontaneously healing skin lesions

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