



BATTICALOA MEDICAL JOURNAL

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CONTENTS

Editorial	Preventing Untimely Deaths in Teenagers	Angela Arulpragasam Anthony	<i>page - 04</i>
Original Articles	Phenotypic Congenital Anomalies, Fetal Sex and Gestational Age among Stillbirths in Kandy District, Sri Lanka - a Descriptive Study	Alahakoon AMSS Ratnayake C Karunakaran KE Tennakoon S	<i>page - 06</i>
	Comparison of a Locally Produced Nutrient Mix, Thenahaposha and a Conventional Nutritional Supplement, Thripasha	Sukunan G Dharshini M	<i>page - 12</i>
	Characteristics of Children with Autism Spectrum Disorder Attending Theeraniyam Open School and Learning Center, Batticaloa, Sri Lanka.	Rashanth R Madushani PPW Madanayaka HMSH Sanjeev R	<i>page - 16</i>
	A Successful Measles Supplementary Immunization Activity (SIA) among Vaccine-Hesitant Groups in Navithanveli area, Kalmunai – a Short Report	Silmy MBM Ashmah AFF Rizfin MH Arulpragasam AN	<i>page - 21</i>
	Phlebotomy Practices in Hospitals of Kalmunai Health Region, a Clinical Audit	Shaikila R Issadeen Mahir MCM Hamthun MIM ² Fathima Ikrima R	<i>page - 25</i>
	Causes for Admission, Mortality and Sepsis Profile of Babies Admitted to Special Care Baby Unit of Teaching Hospital Batticaloa, Sri Lanka	Shihab, A.M.F Hennayake, K.M.A.S Ekanayaka, E.M.D.P Francis, V.R	<i>page - 29</i>
Featured Article	Prehabilitation: The Way Forward in Resource Poor Settings	Mathanalagan S Nafla M N F	<i>page - 34</i>
Quiz Page	Quiz 1. A Rapidly Growing, Bleeding Facial Nodule	Dr. Thanushah Balendran	<i>page - 39</i>
	Quiz 2. A young girl with ongoing fever	Dr Angela Arulpragasam Anthony	<i>page - 40</i>
Case Reports	A Silent Threat Behind a Chronic Areolar Plaque; the Subtle Face of Paget's Disease of the Mammary Gland	Thanushah B Ranmohottige USN Thamilvannan N Manchuthan B	<i>page - 41</i>

	Amyand's Hernia with Perforated Caecum Necessitating Right Hemicolectomy: A Rare Surgical Emergency	Muneer ALM Imjad DM Branavan S	<i>page - 44</i>
	Obstructed Spigelian Hernia in a 60-Year-Old Female	Abarajithan T Nimalaranjan TR	<i>page - 46</i>
	Renal Artery Variation Encountered During A Deceased Donor Organ Surgery	Kugapiragash R Arudchelvam J	<i>page - 48</i>
	Accidental Strangulation by Mother's Hair, a Rare Risk of Co-Sleeping	Vishnu Sivapatham Joseph C Tam Herath Wataliyadda	<i>page - 51</i>
Review Article	A Healthcare Leadership Perspective on Cleaner Production in Sri Lankan Hospitals - From Policy to Practice	Sukunan.G Dharshini.M	<i>page - 53</i>
Short Communication	Emergency Management of Convulsions due to Acute Poisoning from an Unknown Substance	Rajavarman R	<i>page - 56</i>

**EDITORIAL****Preventing Untimely Deaths in Teenagers**

In recent years, Batticaloa witnessed a significant rise in teenage suicides. The unspoken fear and prayer of a parent here are, “Whose child would be next?” and “Please let it not be mine!” Almost all victims were in the GCE Ordinary Level or Advanced Level age groups, suggesting that these major examinations may have influenced their decision to end their lives. These life-defining exams appear to place immense stress on adolescents, driving them toward harmful behaviors. Unlike adult suicides, which are often the culmination of prolonged depressive illness, most teenage victims were not identified as having psychiatric disorders. This highlights the interplay of stress, impulsive thoughts, and actions in vulnerable individuals with incomplete emotional and intellectual maturity (Kithulagoda et al., 2024).

Studies also show that the urge for self-harm declines with age, making it crucial to safeguard adolescents during their most stressful developmental phase. From a neurodevelopmental perspective, the limbic and prefrontal systems develop asynchronously, with delayed prefrontal maturation and relatively rapid limbic growth. This imbalance reduces “top-down” executive control, leading adolescents to exhibit greater impulsivity and poorer emotional regulation (Steinberg, 2010).

It is heart wrenching to hear that these young people often express willingness to live at the last moments of their lives. When speaking to people who have had the near-death experience due to suicide in their teenage, most state that they were not sure what came into them at the time, and well into their adulthood, there is no history of deliberate self-harm or suicide. This strongly underscores the importance of preventive measures focusing school-aged children. What brings about this sense of hopelessness? How can we adults as parents, health professionals or teachers help teenagers overcome this desperate feeling which is bad enough to push them to end their lives?

First of all, adults should acknowledge that teenagers are not mere adults with less experience. They are individuals who are in the process of transitioning from childhood to adults. The process of transitioning can be challenging. They experience major changes in their body, sexuality, thought process and relationships. They are in the process

of developing their personality. They may try out different airs and styles; seem arrogant and vulnerable at the same time! Their attitude and behavior may seem unacceptable by most adults, including their parents, leading to conflicts. To make it more complex, they are at a point where they have to make serious decisions for the future, and sit for the most difficult examinations in their life.

Therefore, generating awareness should first focus on the adult population. We should learn to understand the teenage child and provide appropriate support. As parents we want our children to achieve what we could not, which by itself is commendable. However, parents’ expectations should be realistic to the child’s potential. Setting undue goals can be stressful to the child, irrespective of whether we force the child to perform better or not. A meaningful open conversation between a teenager and his or her parents, is a rare and precious opportunity to plan the future. A home should be seen by family members as a safe place to share their thoughts.

Parallel to the family, school plays a big part in a teenager’s life. Taking part in extra-curricular activity, especially those involving teamwork and leadership not only helps in molding the individual but serves as means to relieve stress. These activities also give new responsibilities to the adolescent child, building their self-esteem and self-worth. Family and school excursions, expose the child to the various opportunities beyond their educational performances. Meeting and talking to people from different walks of life also helps in the same way. Open, non-judgmental forums to voice their opinions should be available in schools, which can give valuable feedback and provide a place to have a meaningful dialogue, between teachers and students. Openings should be given to all children according to their preference to develop talents like performing arts, sports, speech, debate, creative art, political forum, etc., being mindful of not exerting unnecessary pressure or competition, in and out of schools. Having a counselling unit with dedicated trained counselors is a must in every school.

The Sri Lankan education system is persevering in the correct direction, despite lack of resources. All the afore mentioned concepts are seen in most schools, but many times, they do not go beyond the concept, and merely

happening to tick the boxes in a checklist. Examinations and pass rates overshadow many crucial aspects of cognitive and behavioral development of children. It is high time that we, as a nation, invest in adolescence development by creating a dedicated workforce with special training.

In a broader context, according to Sarala Emmanuel, a researcher and counsellor working with women and young people, teenage suicide is only the tip of the iceberg of the many woes of a teenager. It is a culmination of several external influences leading the adolescent towards a state of isolation and fear. The current teenage population, was exposed to several stressful atmospheres in their childhood like the 2019 Easter bombing, the COVID 19 pandemic and the lockdowns thereof, and the economic and fuel crises which followed. Moreover, the introduction of online learning brought about a sudden increase of exposure of children to social media, giving them access to various disturbing information like climate change, wars, substance abuse, inequity as well as various psychological, psychiatric and health conditions. These factors make them reflect that the world holds no hope for them, and they can no longer trust anyone to look after their needs.

To overcome this sense of hopelessness in youth, we adults should pave the way for them to realize that there is always help and that all problems can be resolved in some way or the other. Parents and adult family members should take a stand and also demonstrate, that they would be there for their child no matter what; the teenage child too should understand that their family will never give up on them in times of need. Children, especially teenagers, should have a person with whom they can share their worries; be it a universal issue like global warming or a personal one like getting into a relationship, someone who can guide them without being judgmental. While the mother or father would be ideal, it need not be so; it could be a counsellor, a doctor or an older family member. As medical professionals, we should always advocate for the youth and help parents and other primary caregivers understand and support their teenage children.

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References

Kithulagoda, A. S., Gunasinghe, U. C. M., Senevirathna, J. M. M. S., Nufail, A. L. M., & Alahakoon, A. M. S. S. (2024). An analysis of attempted suicide cases registered at Teaching Hospital Batticaloa, Sri Lanka. *Batticaloa Medical Journal*. <https://doi.org/10.4038/bmj.v19i1.67>

Steinberg, L. (2010). A dual systems model of adolescent risk-taking. *Developmental Psychobiology*, 52(3), 216–224. <https://doi.org/10.1002/dev.20445>

Bibliography

He, X., Huang, P., Xu, X., Yu, Q., Huang, H., Yang, P., & Yang, B. (2025). Impulsivity and non-suicidal self-injury in adolescents: A systematic review and meta-analysis of longitudinal studies. *Frontiers in Psychiatry*, 16, 1586922. <https://doi.org/10.3389/fpsyt.2025.1586922>

Joiner, T. (2005). *Why people die by suicide*. Harvard University Press.

Marcello, R., et al. (2025). Adolescent mental health and suicide risk: A systematic review. *Journal of Adolescent Health*, 76(2), 145–153. <https://doi.org/10.3390/healthcare13091039>

World Health Organization. (2021). *Suicide worldwide in 2021: Global health estimates*. WHO. <https://www.who.int/publications/i/item/9789240110069> (who.int in Bing)

Original Article

Phenotypic Congenital Anomalies, Fetal Sex and Gestational Age among Stillbirths in Kandy District, Sri Lanka - a Descriptive Study

Alahakoon, AMSS¹, Ratnayake, C², Karunakaran KE³, Tennakoon S⁴¹ Senior Lecturer, Department of Supplementary Health Sciences, Eastern University, Sri Lanka² Department of Obstetrics and Gynaecology, University of Peradeniya, Sri Lanka³ Department of Clinical Sciences, Eastern University, Sri Lanka⁴ Department of Community Medicine, University of Peradeniya, Sri Lanka**Abstract:****Introduction:** Congenital anomalies have often been seen among stillborn infants than live births.**Objectives:** This study aimed to explore the distribution of externally observable congenital anomalies among stillborn babies according to their sex and the gestational age and to estimate risk of preterm delivery.**Methods:** Stillbirths occurred at or after 22 weeks of gestation for one year from April 2017, in hospitals of Kandy were examined for notable structural congenital anomalies and sex. Identified anomalies were classified according to the ICD 10. Complete enumeration sampling was done. Descriptive statistics were used to assess the prevalence of congenital anomalies. Risk estimate was used to detect risk to be preterm stillbirth.**Results:** Total of 241 stillbirths were assessed. Of them, 36 (14.9%) presented congenital anomalies. Majority were females (n=23, 63.9%) and preterm (n=30, 83.3%). Mean gestational age was 31 weeks (SD=5.3). The 95% confidence interval (0.261-1.170) of risk estimate indicates no statistically significant association between fetal sex and having congenital anomalies. The risk of preterm stillbirth was 2.447 times higher (OR = 2.447) in fetuses with visible structural congenital anomalies compared to those free of anomalies.**Conclusions:** These results suggest that female fetuses are at a higher risk of developing congenital anomalies. Moreover, the presence of congenital anomalies increases the likelihood of preterm stillbirths.**Keywords:** congenital anomalies, fetal sex, period of gestation, stillbirths**Introduction**

Stillbirth is a traumatic experience for mothers, families, and society. World Health Organization (WHO) defines stillbirth as the delivery of a fetus with no sign of life at or after 28 weeks of gestation or weighing 500g or more [1].

The global stillbirth statistics show that stillbirths are common in low- and middle-income countries [2]. In 2021, there were about 1.9 million stillbirths occurred globally with a rate of 13.9 per 1000 total births. Furthermore, approximately three fourths of them happen in two regions in the world, sub-Saharan Africa (21 per 1000 total births) and central and southern Asia (16 per 1000 total births), reporting the highest rates worldwide [3].

Stillbirth rate in Sri Lanka significantly declined from

8.5 to 5.9 per 1000 live births between the years of 2007 to 2013, followed by fluctuations between 5.9 to 6.6 per 1000 live births? from 2014 to 2023 [4]. Stillbirth rate of Kandy district showed a downward trend with fluctuations which increased in 2017 (Medical Statistics Unit, 2017) [5,6]. This instability motivated the researchers to select the Kandy district for the study.

Causes for stillbirths are multifactorial. Among them, congenital anomalies are a crucial contributing factor, significantly influencing the likelihood of fetal death during pregnancy and as well as neonatal and infant death under 5 years [7].

Identifying the types of congenital anomalies among stillbirths facilitates the health care personnel to recognize preventable circumstances before stillbirths occur, since, the Sustainable Development Goals (SDGs) target to

reduce stillbirth rate to 12 or less per 1000 live births [8]. Moreover, this study would support the health system in Sri Lanka to bring stillbirth research forward.

Materials and Methods

This descriptive, cross-sectional study was implemented prospectively, where the data was collected from April 2017 to May 2018. Mainly, the four major hospitals of Kandy district were included. Teaching Hospitals, Kandy, Peradeniya and, Gampola and General Hospital, Nawalapitiya were the major resources of data collection.

The minimum period of gestation (POG) used to select stillbirths was 22 weeks. The sample size was 246 and calculated according to the tables of minimum sample size for health studies, estimating the population proportion with specified absolute precision where confidence interval (CI) was 95%, absolute precision (d) was 0.05 and 0.2 of the anticipated population (P) [9,]. All consecutive cases of stillbirths were included in the study from the beginning until the required sample size was obtained.

The study was approved by the Ethics Review Committee, Faculty of Medicine, University of Peradeniya.

POG at the death of the fetus was obtained from the bed head tickets where the ward doctor had determined it using ultrasonography (USG) for mothers who were admitted to the hospital before delivery of the stillborn baby. For those who were not diagnosed using USG, the degree of maceration of the fetus POG at death was calculated after the delivery [10]. The degree of maceration was determined by observing the stillborn fetus after the delivery. Intrauterine duration of retention of the fetus, according to the degree of maceration was deducted from the POG at the delivery of the stillborn fetus to estimate the approximate time of death.

The stillborn baby's body was examined by the principal author to identify phenotypic congenital anomalies and to determine the degree of maceration, within six hours after the delivery. The fetuses were kept either in the labour rooms or the mortuary where cold environment was maintained that minimizes the deterioration after the delivery. To enhance the accuracy of the anomalies identified, confirmation of the diagnosis was obtained from the consultant pediatricians the relevant hospitals. Subsequently, the anomalies were classified according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD 10) for congenital malformations, deformations, and chromosomal abnormalities [9].

The distribution of the stillbirths with anomalies was grouped according to the POG. The categories were "extremely preterm" (<28 weeks); "very preterm" (28-<32 weeks); "moderate to late preterm" (32-<37 weeks); and

"term" (≥ 37 weeks). All the collected data were entered into the SPSS version 19 datasheet and analyzed using descriptive statistics and crosstab. The mean, standard deviation (SD), and 95% Confidence Interval (CI) of POG, were calculated for the stillbirths with congenital and chromosomal abnormalities and according to the sex of the fetus separately. Odds ratio (OR) was calculated to ascertain significance between the presence of congenital anomalies (present or absent) and sex of the fetus (male and female) and the POG of less and equal or greater than 37 weeks (<37 and ≥ 37). One sample t test was done to see whether there is a significant difference between the mean POGs of stillbirths with and without congenital anomalies.

Results

A total of 246 stillborn babies were examined. Due to extreme pre-maturity where the physical examination was unattainable, 05 stillbirths were excluded. Among the remaining 241 stillbirths, phenotypic congenital anomalies were detected among 36 (14.9%) infants. Of them, 34 (14.1%) fetuses were recognized with observable structural congenital malformations and deformations while chromosomal abnormalities were found in 2 (0.8%) stillbirths. Female, male and unidentified fetal sex prevalence were 23 (9.5%), 12 (5.0%) and 1 (0.4%) respectively. The mean POG of all stillbirths with congenital anomalies was 217 days (31 weeks) with $SD \pm 36.975$. For stillbirths that did not show congenital anomalies, mean POG was 228.19 days with $SD \pm 39.156$. The mean difference between these two POGs was -10.246 and significance (2-tailed) was 0.105. The 95% CI of the difference ranged between -22.76 and 2.26. Thus, the values revealed that there is no statistical significance between those two means of POGs.

Further, box and whisker plot illustrated the comparison between the distribution of POGs among male and female stillbirths with congenital anomalies. (Figure 1)

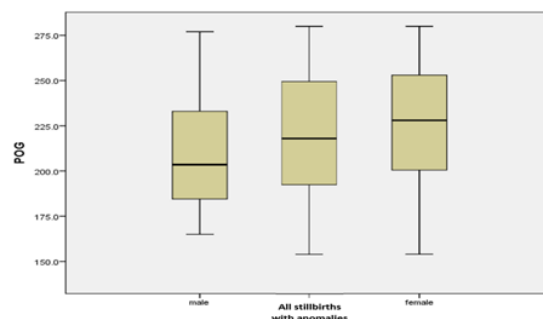


Figure 1. Box and whisker plot of distribution of the POG (days) among the stillbirths with external structural congenital anomalies according to the fetal sex

According to the figure 1, POG was distributed within a vast difference of days among female babies with congenital anomalies than male stillborn infants, and the mean POG of them was higher than of males and the whole stillborn babies with congenital anomalies. The mean POG for male stillbirths with congenital anomalies was 213.42 (± 36.736) days and for females it was 223.09 (± 35.715) days.

The presence of congenital anomalies according to the fetal sex was calculated. The results are presented in Table 1.

Female stillborn babies suffered from congenital anomalies than males (Table 1).

Risk estimate was calculated between the presence or absence of congenital anomalies and the fetal sex being male or female (Table 2).

The odds of having of congenital anomalies 1.825 times greater for female stillbirths compared to male stillborn babies (Table 2). Relative risk for outcome as congenital anomalies presents among stillbirths is 1.682 while relative risk for outcome as absent congenital anomalies was 0.918.

Stillborn fetuses with phenotypic congenital anomalies were categorized according to their POG at death (Table 3).

The least number reported from gestational age of 37 weeks or greater where the stillborn fetuses reached the term pregnancy (Table 3). The highest proportion of the stillbirths fell into the preterm category (N=30, 12.1%).

To describe this distribution further, OR was calculated between the POG (preterm and term) and the presence of congenital anomalies (present or absent) (Table 4).

The risk of preterm stillbirth for the fetuses with phenotypic congenital anomalies was 2.537 times greater than the stillbirths without them (Table 4).

The congenital anomalies identified with their frequencies, were presented in Table 5.

The most frequent type of anomaly was anencephaly which represented 3.7% of stillbirths, followed by spina bifida and CTEV (each n=6, 2.4%). Majority of the congenital anomalies affected female fetuses. Three types of chromosomal abnormalities were observed. They were achondroplasia, Down, and Treacher-Collin syndromes.

Discussion

The results revealed nearly 15% of stillbirths presented with either congenital malformations, deformations, or chromosomal abnormalities. This study also revealed that a higher proportion of female fetuses had congenital anomalies during intrauterine life leading to stillbirths. Globally, 2.4% of births have been found to have congenital anomalies whereas it was 14.6% among stillbirths in our study which indicates a higher percentage of congenital anomalies among stillborn [7].

According to Sunethri et al., (2011) male stillbirths are more prone to congenital anomalies than female stillbirths [11]. In Pat Doyle et al., (2004) study males tend to have congenital malformations than females [12]. However, our study disclosed the opposite where the frequency of congenital anomalies was about two-fold in females compared to males. The OR was two times greater in females with congenital anomalies than male stillbirths with congenital anomalies.

In our study, 8.4% of the stillbirths had CNS anomalies, which was higher compared to 2.1% in a study by Rankin et al [13]. Anencephaly was the most frequent anomaly at 4% among all the cases and the majority was female.

Another fact through our research discovered was that the majority of the congenital anomalies of stillborn babies belonged to the musculoskeletal system. However, in many studies most anomalies are from CNS, heart, and Down syndrome [7].

Regarding the POG of stillbirths, this research study revealed that fetuses with congenital anomalies are more prone to turn into preterm stillbirths. According to the results, the risk was about 2.5 times higher than the stillbirths which did not have observable external structural congenital malformations and chromosomal abnormalities.

Conclusion

Externally observable congenital malformations, deformations, and chromosomal abnormalities lead to preterm stillbirths. Anencephaly is the most frequent anomaly observed. The number of musculoskeletal malformations and chromosomal abnormalities are greater than other systemic structural anomalies among stillbirths. Female fetuses are at high risk to acquire congenital anomalies than male fetuses.

Table 1. Presence of congenital anomalies according to the fetal sex

Sex of the stillborn baby	Congenital anomalies		Total
	Present	Absent	
Female	23 (18.0%)	105 (82.0%)	128 (100.0%)
Male	12 (10.7%)	100 (89.3%)	112 (100.0%)
Total	35 (14.6%)	205 (85.4%)	240 (100.0%)

Table 2. Risk estimate for fetal sex and presence of congenital anomalies

	Value
Odds Ratio for fetal sex (Female / Male)	1.825
For cohort congenital anomaly = Present	1.682
For cohort congenital anomaly = Absent	0.918
N of Valid Cases	240

Table 3. Frequency of stillbirths with congenital anomalies in relation to POG at death and fetal sex

POG (weeks)		Sex of the fetus			Total number of stillbirths (%)
		Female-n (%)	Unidentified – n (%)		
Preterm	<28	6 (2.4)	5 (2.0)	-	11 (4.5)
	28 to <32	3 (1.2)	6 (2.4)	-	9 (3.7)
	32 to <37	1 (0.4)	8 (3.3)	1 (0.4)	10 (4.1)
Term	≥ 37	2 (0.8)	4 (1.6)	-	6 (2.4)
Total		12 (4.9)	23 (9.4)	-	36 (14.6)

Table 4. Risk Estimate between the presence of phenotypic congenital anomalies and the POG

Presence of congenital anomalies	POG (weeks)		OR	95% CI	
	<37 (Preterm)	≥37 (Term)		Lower	Upper
Present	30 (18.1%)	6 (8.0%)	2.537	1.008	6.386
Absent	136 (81.9%)	69 (92.0%)			

Table 5. Frequencies of reported phenotypic congenital anomalies and their distribution according to the sex of the fetus

Block (N, %)	Congenital malformation, deformation, and chromosomal abnormality	Number (%)		Total Number (%)
		Male	Female	
The nervous system (n=19, 7.7%)	Anencephaly	1	8	9 (3.7)
	Craniorachischisis	-	1	1 (0.4)
	Occipital encephalocele	-	1	1 (0.4)
	Congenital hydrocephalus	-	2	2 (0.8)
	Spina bifida	-	6	6 (2.4)
Eye, ear, face and neck (n=2, 0.8%)	Anophthalmos	1	-	1 (0.4)
	Macrophthalmos	1	-	1 (0.4)
The circulatory system (n=1, 0.4%)	Ectopia cordis	-	1	1 (0.4)
Cleft lip and cleft palate (n=4, 1.6%)	Cleft soft palate	1	-	1 (0.4)
	Cleft lip, bilateral	-	1	1 (0.4)
	Cleft lip, unilateral	1	-	1 (0.4)
	Cleft hard palate with unilateral cleft lip	1	-	1 (0.4)
Other congenital malformations of the digestive system (n=1, 0.4%)	Unspecified malformation of the anus (relatively large anal diameter)	1	-	1 (0.4)
Genital organs (n=5, 2.0%)	Hypoplasia of penis	2	-	2 (0.8)
	Malformations of vulva	-	1	1 (0.4)
	Undescended testicle, bilateral	1	-	1 (0.4)
	Indeterminate sex, unspecified	1	-	1 (0.4)
Congenital malformations and deformations of the musculoskeletal system (n=26, 10.6%)	Facial asymmetry	2	-	2 (0.8)
	Congenital Clubhand	-	1	1 (0.4)
	Phocomilia, upper limb	-	1	1 (0.4)
	Congenital shortening of upper limbs	-	3	3 (1.2)
	Congenital scoliosis	-	2	2 (0.8)
	Congenital malformation of the bony thorax (very narrow rib cage)	1	-	1 (0.4)
	Omphalocele	1	3	4 (1.6)
	Congenital shortening of lower limbs	-	3	3 (1.2)
	Congenital talipes equinovarus (CTEV)	2	4	6 (2.4)
	Achondroplasia	1	1	2 (0.8)
	Treacher-Collins syndrome	-	1	1 (0.4)
Other congenital malformations (n=1, 0.4%)	Micrognathia	-	1	1 (0.4)
Chromosomal abnormalities, not elsewhere classified (n=3, 1.2%)	Down syndrome	2	1	3 (1.2)

Reference

1. Askew, I. (2016). True magnitude of stillbirths and maternal and neonatal deaths underreported. World Health Organization. <http://www.who.int/mediacentre/news/releases/2016/stillbirths-neonatal-deaths/en>
2. Blencowe, H., Cousens, S., Jassir, F. B., Say, L., Chou, D., Mathers, C., et al. (2016). National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: A systematic analysis. *The Lancet Global Health*, 4(2), e98–e108. [https://doi.org/10.1016/S2214-109X\(15\)00275-2](https://doi.org/10.1016/S2214-109X(15)00275-2)
3. Bhati, D. K. (2013). A high magnitude public health issue in India. *South East Asia Journal of Public Health*, 3(1), 3–9. <https://doi.org/10.4103/2224-3151.116662>
4. Ghimire, P. M., Agho, K. E., Renzaho, A., Christou, A., Nisha, M. K., Dibley, M., et al. (2017). Socio-economic predictors of stillbirths in Nepal (2001–2011). *PLOS ONE*, 12(6), e0179633. <https://doi.org/10.1371/journal.pone.0179633>
5. World Health Organization. (2016). International statistical classification of diseases and related health problems, 10th revision: Volume 1. World Health Organization. <https://icd.who.int/browse10/2016/en#/XVII>
6. Medical Statistics Unit, Ministry of Health, Sri Lanka. (2018). Annual health statistics – 2016. Ministry of Health, Sri Lanka.
7. Bhide, P., & Kar, A. (2018). A national estimate of the birth prevalence of congenital anomalies in India: Systematic review and meta-analysis. *BMC Pediatrics*, 18, 175. <https://doi.org/10.1186/s12887-018-1122-0>
8. World Health Organization. Acceleration towards the Sustainable Development Goal targets for maternal health and child mortality: report by the Director-General [Internet]. Executive Board 154th session, Provisional agenda item 12, EB154/12. Geneva: World Health Organization; 2023 Dec 20 [cited 2025 Apr 28]. Available from: https://apps.who.int/gb/ebwha/pdf_files/EB154/B154_12-en.pdf
9. Ehrhardt, J., & Urquhart, K. (2014). Stillbirths and birth defects: Michigan 2004–2011. Michigan Department of Community Health, 1–4.
10. Barness, E. G., & Spicer, D. D. (2004). Embryo and fetal pathology. Cambridge University Press.
11. Sunethri, P., Ramakrishna, D., Jijiya, B. P., & Ramana, P. V. (2011). Pattern of distribution of congenital anomalies in stillborn: A hospital-based prospective study. *International Journal of Pharma and Bio Sciences*, 2(1), 604–610.
12. Doyle, P., Maconochie, N., Davies, G., Maconochie, I., Pelerin, M., Prior, S., et al. (2004). Miscarriage, stillbirth and congenital malformation in the offspring of UK veterans of the first Gulf war. *International Journal of Epidemiology*, 33(1), 74–86. <https://doi.org/10.1093/ije/dyg007>
13. Rankin, J., Pattenden, S., Abramsky, L., Boyd, P., Jordan, H., Stone, D., et al. (2005). Prevalence of congenital anomalies in five British regions, 1991–99. *Archives of Disease in Childhood: Fetal and*



Original Article

Comparison of a Locally Produced Nutrient Mix, Thenahaposha and a Conventional Nutritional Supplement, Thriposha

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Abstract:

Background: Sri Lanka's 2022 economic crisis disrupted food supply chains and threatened the sustainability of centrally produced supplementary nutrition programs.

Objective: To compare the nutritional composition and feasibility of government-produced Thriposha and community-based Thenahaposha.

Methods: A preliminary comparative analytical study assessed macronutrients and selected micronutrients of both products using standard laboratory methods.

Results: Energy content was comparable between the two products. Thenahaposha demonstrated higher levels of certain nutrients due to the use of locally sourced legumes and whole grains, while Thriposha maintained consistent composition through standardized fortification.

Conclusion: Locally produced supplementary nutrition flour such as Thenahaposha shows potential as a resilient, nutritionally acceptable complement to national programs during economic crises. Integrating community-based production models may strengthen food security and public health preparedness in Sri Lanka.

Keywords: Locally produced food supplement, nutritional composition, sustainable nutrition programme

Background:

Sri Lanka experienced severe economic crisis beginning in 2022, marked by acute foreign exchange shortages, high inflation, disruption of food supply chains, and reduced access to essential imports [1,6]. These conditions had profound consequences for food security and nutritional status, particularly among vulnerable groups such as infants, preschool children, pregnant women, and lactating mothers [3,4,7]. Supplementary nutrition programs, which traditionally depend on centrally produced and distributed food products, were especially affected.

Thriposha, a government-funded supplementary nutrition flour, has long served as a cornerstone of Sri Lanka's maternal and child nutrition strategy [2,8]. Distributed through public health services, it targets nutritionally vulnerable populations. However, during the economic crisis, interruptions in raw material imports, production delays, and logistical challenges raised concerns regarding the sustainability of this centralized model [1,6].

Community Based Production of Nutrition Supplements

In response, several communities initiated locally produced supplementary nutrition alternatives using indigenous crops and locally available raw materials. In Batticaloa one such initiative, Thenahaposha, emerged as a community-based nutritional flour aimed at addressing immediate nutrition needs while reducing reliance on imports. A committee comprising doctors and nutritionists was formed to develop an alternative solution. With support from community stakeholders and technical assistance from an engineering team, a grinding mill was established at a rehabilitation center, producing a locally formulated nutritional flour named "Thenahaposha". This flour was distributed, at 1 kg per recipient, every month, to underprivileged pregnant women and malnourished children identified through Kiran Medical Officers Health (MOH) area Maternal and child care data. Since the launch nearly 285 beneficiaries benefited from the project. They utilized the flour for their routine nutritional supply in addition to their normal daily diet.

This study presents a preliminary comparative analysis of Thriposha and Thenahaposha, focusing on nutritional composition, feasibility of local production, and potential public health implications during periods of economic instability.

Public Health Implications:

Malnutrition remains a persistent public health challenge in Sri Lanka, with undernutrition and micronutrient deficiencies exacerbated during economic crises [3,7]. Disruptions in national supplementation programs can have immediate and long-term effects on child growth, cognitive development, maternal health, and population productivity [5].

Locally produced supplementary nutrition flour offers several public health advantages. It enhances food system resilience by reducing dependence on imported raw materials and centralized production facilities [6]. Community involvement promotes ownership, cultural acceptability, and sustainability of interventions [11]. Furthermore, local production can stimulate livelihoods by increasing demand for indigenous crops and supporting small-scale producers [6,12].

Comparative evaluation of government-produced and community-based supplements is essential to ensure nutritional adequacy and safety. Evidence generated through such assessments supports informed decision-making on integrating local innovations into national nutrition strategies without compromising health outcomes [2,9].

Literature Review:

Previous studies in Sri Lanka and other low- and middle-income countries demonstrate the effectiveness of supplementary feeding programs in reducing childhood undernutrition and micronutrient deficiencies [3,5,8]. Thriposha has been extensively evaluated for its positive impact on nutritional outcomes among preschool children

and pregnant women, particularly in food-insecure settings [8].

The literature also highlights the vulnerability of centralized food systems during economic and political crises [6,7]. Evidence from humanitarian emergencies indicates that locally sourced, culturally acceptable foods can effectively substitute conventional supplements when supply chains are disrupted [11]. Community-based nutrition interventions utilizing locally available grains, legumes, and plant-based micronutrient sources have shown favorable nutritional profiles [11,12]. Ingredients such as finger millet, legumes, oilseeds, and leafy plant powders contribute significantly to protein, iron, calcium, and dietary fiber intake [9,12].

However, systematic comparisons between government-produced supplementary foods and locally developed alternatives in Sri Lanka remain limited. This study contributes preliminary evidence to address this gap during an acute economic crisis.

Methodology:

Study Design:

A preliminary laboratory based comparative analytical study was conducted to evaluate the nutritional characteristics of Thenahaposha at the Industrial Development board of Ceylon Food Analytical Lab, Galle Road, Katubedda, Moratuwa.

Sample Collection: Thenahaposha samples were collected directly from a community-based production unit. Five (05) number of sample packets were randomly selected and sent for analysis.

Nutritional Analysis:

Thenahaposha was analyzed for macronutrients (energy, protein, fat, and carbohydrates) using standard laboratory methods under controlled conditions to ensure comparability. [9].

Table: 1 Analysis of Thenahaposha

Test	Protocol	Results
Moisture	IDB/FL/ANA/SOP/006	6.4%
Ash	IDB/FL/ANA/SOP/007	2.1%
Total fat	IDB/FL/ANA/SOP/003	10.8%
Protein	IDB/FL/ANA/SOP/004	19.4%
Total sugar	IDB/FL/ANA/SOP/001	1.3%
Salt (as NaCl)	IDB/FL/ANA/SOP/002	0.15%
Carbohydrate	IDB/FL/ANA/SOP/005	61.3%
Energy	IDB/FL/ANA/SOP/008	420 Kcal/100g

Data Analysis:

Nutritional values were compared descriptively and interpreted in relation to recommended dietary allowances for target population groups. [9,10].

Results:

The comparative analysis revealed both similarities and differences between the two products. Thenahaposha demonstrated higher levels of certain nutrients, particularly protein and selected micronutrients, attributable to its use of legumes, oilseeds, and whole grains [12]. Energy content was comparable between the two products, indicating similar caloric contributions.

Thriposha showed consistent nutrient composition due to quality assured raw materials and standardized processes which was started many decades ago. [8,9], while Thenahaposha exhibited some variability related to raw material availability. Despite this variability, Thenahaposha met key nutritional requirements for supplementary feeding among vulnerable populations.

Exact ingredient quantities of Thriposha are proprietary and not publicly available. Values presented are approximate estimates derived from published reports and government nutrition program descriptions.

Discussion:

The findings indicate that locally produced supplementary nutrition flour can serve as a nutritionally acceptable alternative during periods of economic instability. Thenahaposha's reliance on indigenous crops enhances nutrient density while supporting sustainable and resilient food systems [6,12].

Although Thriposha benefits from national-level quality assurance and standardized fortification [8,9], its dependence on centralized production and imported inputs presents vulnerabilities during crises [1,6]. In contrast,

community-based production models demonstrate adaptability and rapid response capacity. These findings support a complementary approach, where locally produced supplements strengthen and augment national programs rather than replace them [11].

Sustainability of the local products depends on the smooth funding of this project. Since it was implemented during crisis period many well-wishers from local area supported the project. RDHS Batticaloa has already submitted proposals to few Non-Government Organizations (NGOs) locally and internationally and they have shown green signal to continue this project in addition to government Thriposha supplements.

Challenges:

Key challenges identified in local production include limited quality assurance mechanisms, variability in raw material supply, absence of formal regulatory pathways, and financial and technical constraints for scaling up production [11]. Addressing these challenges requires coordinated collaboration among public health authorities, academic institutions, and community organizations [2,6].

Conclusion:

Sri Lanka's economic crisis highlighted the fragility of centralized food supplementation systems and emphasized the importance of locally driven solutions [1,6]. This preliminary comparative study suggests that Thenahaposha demonstrates promising nutritional potential when compared with government-produced Thriposha. Local production of supplementary nutrition flour can support food security, enhance community resilience, and ensure continuity of nutrition interventions during crises. Further large-scale studies and policy support are recommended to validate these findings and explore integration into national nutrition frameworks [2,7].

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Table 2. Nutritional Composition of Thriposha (per 100 g) – As mentioned in the pack

Nutrient	Amount
Energy	401.8 kcal
Carbohydrate	61.9 g
Protein	20.0 g
Fat	7.8 g
Iron	18.0 mg
Vitamins & minerals	As per international standards

Table 3. Ingredient Composition of Thriposha (per 750 g pack. – approximate formulation) - As mentioned in the pack

Ingredient	Approximate proportion (%)	Approximate quantity (g)*
Maize	55–60	410–450
Soya flour	20–25	150–190
Milk powder	5–8	38–60
Sugar	5–7	38–53
Vitamin & mineral premix	<1	<8

*Quantities are estimated based on publicly available formulation descriptions and published literature; exact proportions are not officially disclosed.

Table 4. Nutritional Composition of Thenahaposha (per 100 g)

Nutrient	Amount
Energy	439.9 kcal
Carbohydrate	59.5 g
Protein	17.85 g
Fat	14.5 g
Calcium	186.9 mg
Iron	4.3 mg

Table 5. Ingredient Composition of Thenahaposha (per 750 g pack)

Ingredient	Quantity (g)
Red rice	250
Bengal gram	125
Green gram	125
Black gram	125
Gingelly seeds	62.5
Peanuts	62.5

References

- World Bank. Sri Lanka economic update: protecting the poor and vulnerable. Washington DC: World Bank; 2023.
- Ministry of Health Sri Lanka. National nutrition policy of Sri Lanka. Colombo: Ministry of Health; 2010.
- Jayatissa R, Gunathilaka MM. Nutrition status of children under five years in Sri Lanka. Ceylon Med J. 2019;64(2):45–52.
- De Silva A, Samarasinghe D. Impact of food insecurity on maternal and child nutrition in Sri Lanka. Asia Pac J Clin Nutr. 2018;27(5):1012–9.
- United Nations Children's Fund. Improving child nutrition: the achievable imperative for global progress. New York: UNICEF; 2013.
- Gunaratne LH, Tularam GA. Food security challenges in Sri Lanka during economic crises. Food Secur. 2016;8(3):653–67.
- FAO. The state of food security and nutrition in the world. Rome: FAO; 2022.
- Wickramasinghe VP, Lamabadusuriya SP. Nutritional supplementation programs in Sri Lanka: achievements and challenges. Sri Lanka J Child Health. 2017;46(2):97–103.
- Allen L, de Benoist B, Dary O, Hurrell R. Guidelines on food fortification with micronutrients. Geneva: WHO; 2006.
- Kennedy G, Ballard T, Dop MC. Guidelines for measuring household and individual dietary diversity. Rome: FAO; 2011.
- Gupta S, Sahoo S. Community-based nutrition interventions in low-income settings. Nutr Rev. 2015;73(9):596–609.
- Liyanage C, Hettiarachchi M. Use of indigenous grains and legumes in supplementary foods. J Natl Sci Found Sri Lanka. 2020;48(4):379–87.



Original Article

Characteristics of Children with Autism Spectrum Disorder Attending Theeraniyam Open School and Learning Center, Batticaloa, Sri Lanka.

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Abstract:

Background: Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by persistent impairments in communication, social interaction, and repetitive behaviors. In par with global tendency, the prevalence of ASD is on the rise in Sri Lanka.

Objectives: To describe the common clinical features, perinatal and environmental associated factors, parental perceptions of therapeutic interventions, and socioeconomic challenges associated with ASD in children attending Theeraniyam Open School and Learning Center in Batticaloa.

Methodology: A descriptive cross-sectional study was conducted among 41 parents of children diagnosed with ASD, as recruited by complete enumeration. Data were collected using a newly developed and validated, interviewer-administered questionnaire covering sociodemographic details, clinical features, associated factors, parental perception regarding therapies, and socioeconomic issues. Data analysis was performed using SPSS version 25.

Results: Among the 41 children, 85.4% were male, with 58.5% being firstborn. Most parents (43.9%) identified their child's abnormalities after 36 months of age, with speech delay being the most common initial concern (53.7%). Clinical features included poor eye contact (73.2%), hyperactivity (80.5%), and sensory impairments in touch (51.2%). A high prevalence of selected perinatal and environmental associated factors was observed including caesarean delivery (63.4%), abnormal birth symptoms (31.7%), preterm or post-term births (41.5%) and screen time exceeding 4 hours daily (61%). Speech therapy (58.5%) and classroom activities (43.9%) were perceived as the most effective therapy and intervention. 34.1% of parents had financial issues and 41.5% of parents experienced social burdens.

Conclusion: The study emphasizes the importance of early detection and intervention in ASD, focusing on the selected groups which showed high prevalence. The findings support the need for enhanced public awareness, accessible therapy services, and nationwide expansion of specialized educational centers.

Keywords: Autism Spectrum Disorder, Speech Delay, Associated Factors, Parental Perception, Socioeconomic Impact, Sri Lanka.

Introduction

Autism Spectrum Disorder (ASD) is a type of neurodevelopmental disorder, characterized by persistent impairments in communication, social interaction, and repetitive behaviors (1)(2). Globally, the estimated prevalence is approximately 1 in 100 children, with a notable upward trend in recent years (3). In line with the global trend, the prevalence of ASD is increasing in Sri

Lanka (4). The study (5), discovered that red flag signs of ASD present in nearly 7.4% of children aged 18–24 months.

Despite this, comprehensive data on clinical characteristics and risk factors in Sri Lankan children remain scarce. This study was conducted to fill that gap by examining the profiles of children with ASD enrolled at Theeraniyam Open School and Learning Center in Batticaloa. We aimed

to evaluate clinical presentations, perinatal and postnatal associated factors, parental perspectives on therapy, and the socioeconomic impact on families.

Materials and methods

Study Design and Setting: A descriptive cross-sectional study was conducted at Theeraniyam Open School and Learning Center, Batticaloa, Eastern Province, Sri Lanka, from August 2023 to July 2024.

Participants: The study included all 41 parents of children diagnosed with ASD attending the center during the study period. Diagnosis was confirmed using the Modified Checklist for Autism in Toddlers, Revised, with Follow-Up (M-CHAT-R/F).

Study Instrument: A newly developed, interviewer-administered, validated questionnaire was used. It was developed through an extensive review of international and local ASD literature, and the selection of associated factors was based on consistent evidence from prior studies. Content validation was done by a panel of five experts. The questionnaire included five domains:

sociodemographic data, clinical characteristics, associated factors, perceptions of therapy/intervention, and socioeconomic burden.

Ethical Considerations: Ethical approval was obtained from the Ethical Review Committee, Faculty of Health-Care Sciences, Eastern University, Sri Lanka. Informed consent was obtained from all participants.

Statistical Analysis: Data were entered and analyzed using SPSS version 25. Descriptive statistics (frequencies, percentages) were used to summarize the data.

Results

Socio-demographic Details

Out of 41 children, 85.4% were male and 58.5% were firstborn. Most children (83%) were aged between 4–9 years. A majority resided in urban areas (87.8%), Tamil by ethnicity (75.6%) and 87.8% of family's monthly income was more than 50,000/-

Table 1: Socio demographic characteristics of the participants.

Variable (n=41)	n	%
Age group (Years)		
1-3	02	4.9
4-6	17	41.5
7-9	17	41.5
10-12	05	12.2
Gender		
Male	35	85.4
Female	06	14.6
Child's Position		
1 st born	24	58.5
2 nd born	13	31.7
3 rd born	03	7.3
4 th born or more	01	2.4
Place of living		
Urban	36	87.8
Rural	05	12.2
Ethnicity		
Sinhala	00	00.0
Tamil	31	75.6
Muslim	07	17.1
Burgher	03	7.3
Education level of mother		
Unschoolled	00	00.0
Up to O/L	10	24.4
Up to A/L	16	39.0
Diploma	03	7.3
Degree	12	29.3

Educational level of father		
Unschoolled	00	00.0
Up to O/L	16	39.0
Up to A/L	10	24.4
Diploma	03	7.3
Degree	12	29.3
Monthly family income		
< Rs. 20,000	01	2.4
Rs. 20,001 – Rs. 50,000	04	9.8
Rs. 50,001 – Rs. 80,000	19	46.3
> Rs. 80,000	17	41.5
No. of children in the family		
1	14	34.1
2	13	31.7
3	13	31.7
> 3	01	2.4

Parental Observations and Clinical Features

Most parents (43.9%) have identified their child's abnormalities after 36 months of age and the most common initial observation was speech delay (53.7%) (Figure - 1)

Most children (41.5%) began speaking between 13–24 months; 24.4% had not started speaking yet.

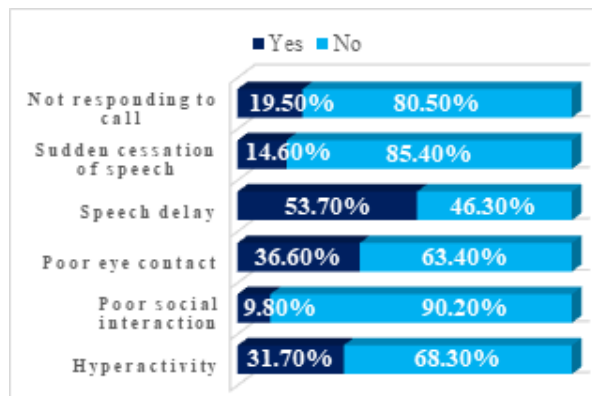


Figure 1: Parent's first observation regarding their child's abnormality

Poor eye contact (73.2%) was the predominant social interactive feature. In behavioral features, 80.5% had hyperactivity, while 68.3% and 65.9% had temper tantrums and stereotyped activities. Most of the children had no complaints regarding sensory issues. But, 51.2% of children had sensory issues in touch, especially hyper-reactivity to touch (46.3%) (Figure - 3)

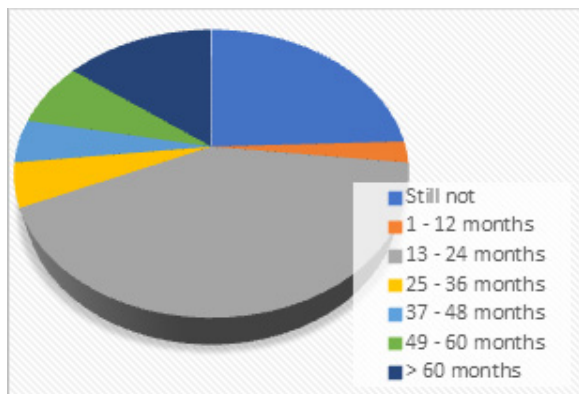


Figure 2: Child's age at start to speak

Associated Factors

A high prevalence of selected perinatal and environmental associated factors was observed, including:

- Caesarean section: 63.4%
- Preterm (<37 weeks) or post-term (>40 weeks): 41.5%
- Abnormal birth symptoms: 31.7% (notably 17.1% had meconium aspiration and 14.6% had jaundice)



Figure 3: Sensory impairments of the children with ASD

In maternal conditions, 41.5% mothers' maternal age was 30–41 years. Chronic maternal illness was reported only in 17.1%, including 7.3% with asthma and used salbutamol. Only 24.4% of children had comorbidities with ASD, including 14.6% had epilepsy and 7.3% had bronchial asthma. Most children (61%) had >4 hours of daily screen time; 19.5% had <2 hours or 2–4 hours.

Parental Perceptions Regarding Therapies and Interventions

Majority of the parents (58.5%) reported speech therapy was most effective therapy and classroom activities were seen as most beneficial intervention (43.9%) for their child in Theeraniyam.

Socio-Economical Issues

Thirty-four percent parents reported financial burden, including increased treatment cost (31.7%), increased transport cost (14.6%) and 9.8% of them resorting to loans while caring the child with ASD.

Social burdens were reported by 41.5%, including backbiting (24.4%), social stigma (22%), exclusion from family events (17.1%), and conflict with relations (12.2%). 39% of parents reported as they were facing challenges to take care of other children because of the child with ASD. Figure 4 outlines parents' responses for how they faced difficulties.

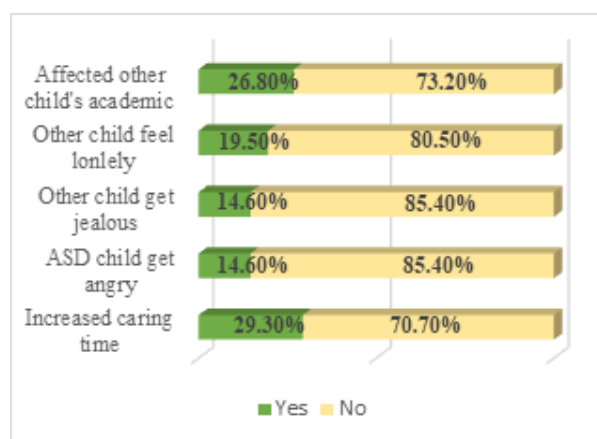


Figure 4: Facing difficulties to take care of the other children

4. Discussion

This study examined the characteristics of children with ASD attending Theeraniyam School in Batticaloa. Among the 41 children, the majority (85.4%) were male, which is similar to the studies from Lady Ridgeway Hospital (6) and the Northern Province of Sri Lanka (4). Additionally, 87.8% were from urban areas in our study, it was supported by the study done in Vietnam (7) with 84.4%. Most children (83%) were aged 4–9 years, and 4.9% were aged 1–3. In contrast, a study at Lady Ridgeway Hospital (6) found 50% were under 3 years. This difference possibly due to different study setting.

In our study, 39% of mothers had A/L education, and 39% of fathers had O/L education. In a study done in Tehran found majority of fathers (34.5%) and mothers (38.8%) had diplomas (2).

As mentioned by the study (3), autism can be diagnosed by 18–24 months; but 43.9% of our parents recognized abnormalities only after 36 months. Moreover, speech delay (53.7%) was commonest first concern, which was similar to the findings of the study from Lady Ridgeway Hospital (58.5%).

Poor eye contact (73.2%) was commonest social issue in our study, which is similar to the findings of the article (4) and it was 87.8%. Hyperactivity (80.5%) was common behavioral feature, followed by temper tantrum (68.3%) in our study, though temper tantrum 65%) was more prevalent in the study done at northern province of Sri Lanka (4).

That same study (4) found that, 56.1% had touch sensory issues, especially hypo-reactivity to touch (38.2%). In

other hand, in our study 51.2% children had touch sensory issues, but in contrast 46.3% had hyper-reactivity to touch. A previous study (8) linked low birth weight and preterm birth to autism. Our study found 41.5% were preterm or post-term births. Additionally, LSCS delivery was reported in 63.4% in our study, similar to 56.1% reported in study (4).

Abnormal birth symptoms were present in 31.7% of our children, including meconium aspiration (17.1%) and jaundice (14.6%), while a study done in Tehran indicated that 41% children with ASD had jaundice and 5.4% had bruising (2).

In our study, in 41.5% the maternal age was 30 – 41 years and 17.1% mothers had chronic diseases, and of them 7.3% had bronchial asthma. Similarly, a study conducted in Algeria found that advanced maternal age, the presence of maternal chronic pathologies, were associated with ASD (9).

Same study (9) stated that 58% of children spending time >3 hours on screen (smartphones, laptops, TV, etc.). In other hand our study found that 61% of children spending >4 hours' time on screen.

Children having associated health conditions was 24.4% including epilepsy (14.6%) and asthma (7.3%). In contrast, a study in Iran (10) mentioned that 26.1% of children had asthma, 7% epilepsy, and 7% microcephaly.

A study in Southeastern America, found behavioral therapy was commonest (78.9%) therapy among children with ASD (11). Similarly, 92.7% of parents in our study reported that behavioural therapy was the most common mode of treatment for their children at Theeraniyam. Additionally, a systematic review highlighted the benefits of music therapy (12), and 34.1% of children in our study receive it at Theeraniyam.

Conclusion

Children attending Theeraniyam Open School commonly presented with delayed speech, poor eye contact, hyperactivity and sensory impairments. Notably, a significant proportion of parents failed to identify symptoms until after 36 months of age, underlining the need for community-level education on early signs of ASD. A high prevalence of selected perinatal and environmental associated factors was observed including caesarean delivery, pre-term or post-term birth, abnormal birth events, and prolonged screen time.

Most parents believed that speech therapy and classroom interventions were effective for their child. However,

families face notable financial and social challenges, emphasizing the need for public health strategies that promote early diagnosis, intervention, equitable service access and improve awareness regarding ASD at society level.

Recommendations

- Strengthen public education on early signs and risk factors of ASD.
- Improve access to diagnostic and therapeutic services across regions.
- Expand centers like Theeraniyam nationally.
- Provide financial and psychological support systems for affected families.

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References

1. J., & Jia, F. Y. (2021). Correlation Between Screen Time and Autistic Symptoms as Well as Development Quotients in Children With Autism Spectrum Disorder. *Frontiers in Psychiatry*, 12(February), 1–8. <https://doi.org/10.3389/fpsy.2021.619994>
2. Razjouyan, K., Etemadi, N., & Miri, M. A. L. I. (2020). A Study of the Prevalence of Risk Factors Associated with Autism Spectrum Disorder among Affected Individuals in Tehran. *Pakistan Journal of Medical and Health Sciences*, 14(2), 1381–1384.
3. Zeidan, J., Fombonne, E., Scoriah, J., Ibrahim, A., Durkin, M. S., Saxena, S., Yusuf, A., Shih, A., & Elsabbagh, M. (2022). Global prevalence of autism: A systematic review update. *Autism Research*, 15(5), 778–790. <https://doi.org/10.1002/aur.2696>
4. Sivayokan, B., Sivayokan, S., Thirunavukarasu, K., Sathiadas, G., & Sivapathamoorthy, T. (2023). The Characteristics of Autistic Children Attending a Neuro-Developmental Center in Northern Sri Lanka. *Cureus*, March. <https://doi.org/10.7759/cureus.35970>
5. Perera, H., Wijewardena, K., & Aluthwelage, R. (2009). Screening of 18-24-month-old children for autism in a semi-urban community in Sri Lanka. *Journal of Tropical Pediatrics*, 55(6), 402–405. <https://doi.org/10.1093/tropej/fmp031>
6. Dahanayake, D. M. A., Rohanachandra, Y. M., & Wijetunge, G. S. (2015). Factors affecting age at presentation of Autism Spectrum Disorders: A descriptive survey from a child mental health clinic at Lady Ridgeway Hospital. *Sri Lanka Journal of Psychiatry*, 6(1), 9. <https://doi.org/10.4038/sljpysc.v6i1.8054>
7. Nguyen, P. M., Tran, T. T., Van Tran, T., Pham, L., Van, Do, D. Van, Le, T. K., Ngo, T. P., Diep, H. G., & Nguyen, T. (n.d.). Clinical characteristics and associated socio-demographic factors of autism spectrum disorder in Vietnamese children. www.currentpediatrics.com
8. Lampi, K. M., Lehtonen, L., Tran, P. L., Suominen, A., Lehti, V., Banerjee, P. N., Gissler, M., Brown, A. S., & Sourander, A. (2012). Risk of autism spectrum disorders in low birth weight and small for gestational age infants. *Journal of Pediatrics*, 161(5), 830–836. <https://doi.org/10.1016/j.jpeds.2012.04.058>
9. Mehida, H., Meziani, S., Mehida, W., Zemri, K., Bekhaled, I., & Bendahmane, M. (2020). Research of the Causes and Risk Factors of Autism in the Western Region of Algeria. *Journal of Drug Delivery and Therapeutics*, 10(6), 91–98. <https://doi.org/10.22270/jddt.v10i6.4563>
10. Malek, A., Farhang, S., Amiri, S., Abdi, S., Rezaii, A. R., & Asadian, M. (2019). Risk factors for autistic disorder: A case-control study. *Iranian Journal of Pediatrics*, 29(3). <https://doi.org/10.5812/ijp.80935>
11. Hock, R., Kinsman, A., & Ortaglia, A. (2015). Examining treatment adherence among parents of children with autism spectrum disorder. *Disability and Health Journal*, 8(3), 407–413. <https://doi.org/10.1016/j.dhjo.2014.10.005>
12. Gold, C., Wigram, T., & Elephant, C. (2006). Music therapy for autistic spectrum disorder. *Cochrane Database of Systematic Reviews*, 2. <https://doi.org/10.1002/14651858.cd004381.pub2>



Original Article

A Successful Measles Supplementary Immunization Activity (SIA) among Vaccine-Hesitant Groups in Navithanveli area, Kalmunai – a Short Report

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Abstract:

Background: Despite previous measles elimination, Sri Lanka experienced a resurgence possibly due to decreased vaccination rates during the COVID-19 pandemic, necessitating a nationwide Supplementary Immunization Activity (SIA) targeting children aged 6-9 months. Vaccine hesitancy and a negative attitude toward vaccination among a portion of the population in the Navithanveli MOH area in Kalmunai health district were identified during the field visits done by Public health midwives (PHM). This posed a major challenge to this new SIA programme.

Case Description: This case study describes the successful implementation of the measles SIA in Navithanveli. According to the data collected from the birth and immunization register, there were 98 eligible children who had to be vaccinated on the given date by the Epidemiology unit. A multi-pronged approach was used to address vaccine hesitancy including healthcare provider education, community outreach through antenatal and postnatal clinics, home visits by multidisciplinary teams, engagement with Mother Support Groups, and broad information dissemination. Significantly, the campaign established strong multi-sectoral partnerships with the Divisional Secretariat, schools, preschools, and local government bodies. This collaboration facilitated community engagement, built trust, and ensured efficient resource allocation.

Discussion: The Navithanveli SIA achieved a remarkable 97.9% (96 out of 98) vaccination coverage among eligible children, with minimal missed cases. This success demonstrates the effectiveness of targeted strategies to combat vaccine hesitancy.

Conclusion: High vaccination coverage can be achieved even in the face of hesitancy through community engagement, multi-sectoral collaboration, and robust implementation plans. The Navithanveli experience provides valuable lessons for future immunization initiatives, contributing significantly to measles outbreak control and improved public health outcomes.

Keywords: Measles, Supplementary Immunization Activity (SIA), Vaccine Hesitancy, Public health

Introduction

Measles, a highly contagious viral infection, remains a significant global health challenge despite the availability of effective vaccines. Effects of measles infection include acute malnutrition and immune suppression in infancy, and later in life, the risk of developing the potentially fatal complication, subacute sclerosing panencephalitis (SSPE).

Sri Lanka, which once had eliminated measles (1,2), was experiencing an outbreak due to decreased vaccination rates during the COVID-19 pandemic (3). The outbreak affected both unvaccinated and partially vaccinated children. To address this, the Ministry of Health, Sri Lanka, proposed a Supplementary Immunization Activity (SIA) to vaccinate vulnerable children and control the spread of measles (4).

However, in the village of Navithanveli, vaccine hesitancy was a commonly encountered issue and implementing this new programme was perceived as a challenge. This vaccine hesitancy was evidenced through the field visits done by Public health midwives (PHM). Moreover, a negative attitude towards vaccination programme too was noted in the Medical Officer of Health (MOH) area.

Navithanveli is a rural Divisional Secretariat in the Ampara District of Sri Lanka's Eastern Province, with a population of around 25,000. The area is predominantly agricultural, with livelihoods depending on paddy cultivation, livestock, and small-scale industries such as rice mills and local businesses. The population includes approximately 4,500–5,000 families, and educational facilities are mostly limited to government primary and secondary schools, with fewer opportunities for higher education within the division. According to the 2012 census, Sri Lankan Tamils form the largest ethnic group in Navithanveli, followed by Sri Lankan Muslims, with smaller numbers of Sinhalese and others. Most are Hindu and Muslim, with smaller Christian and Buddhist communities. The DS division shows strong rural characteristics, with socioeconomic challenges and migration for education or work being common among youth.

This case study presents a successful SIA for measles conducted by the Office of the Medical Officer of Health Navithanveli, Sri Lanka, with the collaborative efforts of Divisional Secretariat, and other sectoral partners. The SIA targeted children aged 6-9 months as of January 6, 2024. This age group was chosen based on higher rates of measles cases, increased risk of complications, and the potential to break the transmission cycle (5). In addition, the special catch-up vaccination campaign of the country targeted the population aged 9 months to 15 years who would have missed their routine Measles Containing Vaccine (MCV). The SIA vaccine was to be considered as an additional dose, while the routine MMR vaccinations would still be required at 9 months and 3 years of age with an 8-week interval (4).

Justification

Measles surveillance data from Sri Lanka, revealed an increase in the number of laboratory-confirmed measles cases from May to December 2023. The first case was reported on 23rd May 2023 through the routine disease surveillance system from the Colombo Municipal Council (CMC) area (6,7). Transmission of the disease was initially observed predominantly among vaccine

refusal groups in the CMC area followed by Kolonnawa, Gothatuwa and Dehiwala MOH areas in the Colombo district. As of mid-November, there were 710 confirmed measles cases reported across the island affecting 150 MOH areas out of a total of 358 MOH areas. Majority of the cases were reported from Colombo district (42%) and Gampaha district (18.6%) followed by Jaffna district (11.3%) (4). Out of the total positive cases, 17% were less than 9 months old age, while nearly 35% of patients belonged to the 20 to 30 years age category, those born, before introduction of the 2nd MCV.

As two doses of the MCV in routine immunization (EPI programme) is given at the ages of 9 months and 3 years, the Advisory Committee on Communicable Diseases decided to go for a Supplementary Immunization Activity (SIA) with MMR vaccine targeting 6-9 months old infants in selected high-risk districts in Sri Lanka, based on the available epidemiological evidence of measles disease burden. The main purpose of the campaign is the rapid reduction of the susceptible age group who are highly vulnerable for complications of measles (7).

Since we expected vaccine hesitancy and refusal in the Navithanveli MOH area, we decided to implement a multi-sectoral motivation strategy to execute the SIA, and the catch-up measles vaccination in view of the seriousness of the outbreak.

Objective

To plan, implement and evaluate the effectiveness of the Supplementary Immunization Activity (SIA) programme in Navithanveli MOH area.

Methodology

The families of the target population of children aged 6 – 9 months were identified from the Birth and Immunization Register maintained by the Office of the MOH. The total number of the target population was 98. Further four children between the ages of 9 months to 15 years who had missed their MCV were identified.

Several activities to find out the concerns of the community on vaccination and to create awareness on vaccination were organized. Some specifically focused on the families of the target population and others on the whole community. Table 1 gives the details of the activities undertaken to overcome vaccine hesitancy and Table 2 gives some of the identified reasons against vaccination in the community.

Table 1. Activities undertaken to handle vaccine hesitancy

	Type of Activity	Implementation
1.	Healthcare Provider Education	Awareness programs for MOH staff to enhance their knowledge and skills in addressing vaccine hesitancy, conducted by the Regional Epidemiologist
2.	Community-Based Outreach	Awareness sessions at antenatal, postnatal and polyclinics, to provide information about measles vaccination benefits and address concerns, conducted the MOH & PHMs
3.	Home Visits	To directly engage with families and address their specific questions and concerns regarding vaccination, the PHMs visited the families
4.	Mother Support Group (MSG) Education	Awareness sessions for MSG to promote vaccine uptake among mothers and caregivers, conducted by MOH & PHMs
5.	Multidisciplinary Collaboration	Home visits conducted by a team of healthcare professionals, including MOH, PHNS, SPHM, SPHI, and PHI, to provide comprehensive information and address concerns collectively
6.	Dissemination of Information	Awareness materials, such as videos and articles, were shared with the public and government workers to raise awareness about measles vaccination
7.	Multi Sectoral Partnerships	Collaborations with the Divisional Secretariat (DS), schools, pre-schools, and Pradeshiya Sabha were established to leverage their resources and reach a wider audience
8.	Gaining Local support	The list of eligible children for vaccination and other details of issues identified handed to the DS to ensure active participation for immunization

MOH – Medical officer of Health, PHM -Public Health Midwife, PHNS – Public Health Nursing Sister, SPHM – Supervising PHM, SPHI – Supervising Public Health Inspector, PHI – Public Health Inspector

Table 2. Identified reasons and misconceptions for vaccine refusal/hesitancy

	Reasons for hesitancy/refusal	Identified Misconception
1.	Personal conviction/ Philosophical reasoning	Natural Immunity is better than vaccine acquired immunity
2.	Fear of foreign/ artificial substance being introduced into the child's body	Vaccines are not “natural” enough
3.	Underestimation of the risk of vaccine preventable infections	A healthy diet & lifestyle alone are protective against contracting childhood infections

The SIA and catch-up immunization were implemented following the activities mention in Table 1, which aimed to increase vaccine acceptance by addressing the concerns of vaccine-hesitant individuals.

Results

A total of 96 out of 98 children aged 6-9 months were vaccinated, representing a coverage rate of 97.9% with only two children (2.08%) missing the vaccine. One child did not receive the vaccine due to fever during the period. Only one child missed the vaccine due to parental refusal.

Three out of four children (75%) who were missed during routine immunization were successfully vaccinated through the catch-up programme.

Discussion

The SIA activity conducted by the Navithanveli MOH office can be seen as a highly successful programme. This accomplishment can be attributed to several factors, such as strong multi-sectoral collaboration community engagement, a sound implementation plan, adequate human and material resources, and a data driven approach.

In this case a strong multi-sectoral collaboration with the involvement of the Divisional Secretariat and other partners provided essential resources, support, and coordination. Effective community mobilization helped to build trust and increase vaccine acceptance. The detailed implementation plan ensured efficient execution of the SIA. Sufficient staffing, training, and supplies were available to meet the needs of the target population. Regular monitoring and evaluation of the SIA allowed for timely adjustments and improvements.

The Supplementary Immunization Activity (SIA) for measles in Navithanveli, Sri Lanka, has had a substantial positive impact on public health. By increasing vaccination coverage, the SIA has directly contributed to controlling the spread of measles, reducing associated morbidity and mortality, and strengthening herd immunity. Additionally, the successful implementation of the SIA has demonstrated the importance of community engagement and addressing vaccine hesitancy in public health initiatives. This successful model can be replicated in other regions to improve overall public health outcomes.

Conclusion

The SIA programme implemented in the Navithanveli MOH area could serve as a model for successful immunization programmes in other areas of Sri Lanka and in the region. By leveraging multi-sectoral partnerships, community engagement, and effective implementation strategies, it is possible to achieve high vaccination coverage and protect vulnerable populations from preventable diseases like measles. The lessons learned from this case study can inform future immunization initiatives and contribute to improving public health outcomes.

Limitations

- **Limited Generalizability (Single Site):** The most significant limitation is that this was a single-site case study in Navithanveli
- **No Long-term Impact:** Our data focuses strictly on the immediate coverage rate. We currently lack data on the long-term epidemiological impact
- **Small Sample Size:** The extremely small target population (98 children) means the high percentage coverage is highly susceptible to change.
- **Insufficient Depth on Hesitancy:** While hesitancy was noted, our study has only minimal qualitative data to fully understand the specific, local root causes of parental refusal or the mechanism by which resistant individuals were ultimately persuaded.

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References

1. Dahanayaka NJ, Pahalagamage S, Ganegama RM, Weerawansa P, Agampodi SB. The 2013 measles outbreak in Sri Lanka: experience from a rural district and implications for measles elimination goals. *Infectious Diseases of Poverty*. 2015 Nov 30;4(1):51.
2. Agampodi SB, Malawaarachchi S, Senevirathne S, Ganegama R, Karunamuni N, Dahanayaka N. Massive outbreak of measles in Sri Lanka, 2013.
3. Kalubowila K, Gajanayake C. Factors influencing the unexpected measles outbreak of 2023 in Colombo, Sri Lanka. *Journal of the College of Community Physicians of Sri Lanka*. 2025 Jan 29;30(4)
4. MMR Supplementary Immunization Activity (SIA) 2024 guideline from Epid unit – SL Premaratna R, Luke N, Perera H, Gunathilake M, Amarasena P, Chandrasena TN. Sporadic cases of adult measles: a research article. *BMC research notes*. 2017 Jan 10;10(1):38.
5. Fernando MA, Chathuranga GP, Abeygunasekara KG, Weligamage DD, Abeynayake JI. Resurgence of measles virus infection in an eliminated country, Sri Lanka. *Asian Pacific Journal of Tropical Medicine*. 2024 May 1;17(5):208-13.
6. Liyanapathirana A. Revisiting measles in Sri Lanka: an epidemiological overview. *Journal of the College of Community Physicians of Sri Lanka*. 2024 Apr 23;30(1)
7. Samaraweera B, Mahanama A, Ahamad AZ, Wimalaratne GI, Abeynayake J. The laboratory investigation of a measles outbreak in the eve of its elimination in Sri Lanka. *Journal of Clinical Virology*. 2020 Jan 1;122:104230.



Original Article

Phlebotomy Practices in Hospitals of Kalmunai Health Region, a Clinical Audit

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Abstract:

Introduction: Errors in phlebotomy during the pre-analytical phase can significantly compromise patient safety, undermine the accuracy of laboratory results, and cause additional discomfort and inconvenience to patients by necessitating repeat venipuncture.

Objective: To assess current phlebotomy practices in the hospitals of the Kalmunai health region and compare them with the established Standard Operating Procedures.

Methods: A cross-sectional, structured observational study was conducted using a checklist aligned with the WHO guidelines on Drawing Blood: Best Practices in Phlebotomy. The study encompassed 19 phlebotomy sites across 17 hospitals, with a total of 60 venipuncture events observed during April to May 2025. Data were analyzed using descriptive statistics, with compliance presented as frequencies and percentages.

Results: The majority of patients were adults (96.7%). Overall compliance across 41 checklist items was 71.3%. Highest adherence occurred in sample transportation (100%), site selection (96.1%), and venipuncture technique (90%). Equipment assembly (81.4%) and filling tubes (83.3%) were generally sound. Post-procedure actions were moderate (61.3%). Marked gaps persisted in patient identification and preparation (53.7%), spill management (50%), skin disinfection (36.7%), and hand hygiene and glove use (20%). The most common lapses were omission of hand hygiene, inadequate skin preparation, and incomplete identification.

Conclusion and recommendations: Phlebotomy practices in Kalmunai Health Region exhibit moderate overall compliance and satisfactory technical performance. However, adherence to infection control and patient identification was poor. Strengthening training on hand hygiene, skin disinfection, patient verification, spill kits, documentation of adverse events, and regular supervision with feedback are recommended to enhance patient safety and laboratory quality.

Keywords: Phlebotomy, Clinical audit, Compliance, Patient safety

Introduction

Phlebotomy is one of the most common invasive procedures in healthcare, serving as the gateway to diagnostic information. However, the pre-analytical phase, to which phlebotomy is central, remains the most vulnerable to errors, accounting for an estimated 60-70% of all laboratory mistakes [1]. A significant proportion of these, over 60%, are directly attributable to phlebotomy procedures [2]. Errors such as misidentification, improper sample collection, and hemolysis can lead to misdiagnosis,

inappropriate treatment, increased hospital stays, and patient dissatisfaction, ultimately compromising patient safety [1, 3].

The challenge of non-compliant phlebotomy practices is a global issue. A study in a NABL-accredited hospital in India found that not a single observed procedure met all WHO quality criteria, with high error rates in tourniquet time, skin disinfection, and sample mixing [4]. Similarly, an audit in Port Sudan, Sudan, revealed a lack of standard operating procedures (SOPs) and critical lapses in glove

use and skin disinfection [5]. In Sri Lanka, studies indicate that up to 70% of laboratory errors occur in the pre-analytical phase, with phlebotomy errors being a major contributor [6].

Within the Kalmunai health region, internal reports and anecdotal evidence suggested frequent pre-analytical errors, including inadequate hand hygiene, improper patient identification, and clotted samples. A systematic assessment was lacking. Therefore, this clinical audit was designed to objectively evaluate the current phlebotomy practices against WHO best-practice guidelines [7], identify key areas of non-compliance, and provide evidence-based recommendations for quality improvement to safeguard patient safety and enhance the reliability of laboratory diagnostics.

Objectives

To assess current phlebotomy practices in the hospitals of the Kalmunai health region and compare them with the established WHO Standard Operating Procedures.

Methodology

A cross-sectional, structured observational study was conducted over two months (April-May 2025). The audit encompassed 19 phlebotomy sites across 17 hospitals under the Kalmunai Regional Directorate of Health Services.

A total of 60 venipuncture events were observed. The patients were predominantly adults (96.7%, n=58). The phlebotomists observed were the Nursing Officers employed at these sites, who performed their duties as part of routine care.

Data were collected using a structured observation checklist meticulously aligned with the WHO guidelines on drawing blood [7]. The checklist comprised 40 items across ten critical domains: Equipment Assembly, Patient Identification and Preparation, Site Selection, Hand Hygiene and Gloves, Skin Disinfection, Venipuncture Technique, Filling Tubes, Post-Procedure Actions, Sample Transportation, and Spill Management.

Trained observers directly and discreetly observed the phlebotomy procedures from start to finish, recording compliance for each item on the checklist as 'Yes' or 'No'.

Data Analysis

The data were entered into a Microsoft Excel spreadsheet. Analysis was performed using descriptive statistics. Compliance for each item and domain was calculated as a percentage of the total observed procedures (n=60). The overall compliance rate was calculated as the average compliance across all assessed items.

Ethical Considerations

The audit was conducted as a quality improvement activity under the auspices of the RDHS Office, Kalmunai. Patient and staff confidentiality was strictly maintained. The observations were non-intrusive and did not interfere with patient care.

Results

The audit revealed an overall compliance rate of 71.3% with WHO phlebotomy guidelines across the 40 observed criteria. However, this aggregate figure masked stark variations in performance across different domains, as illustrated in Figure 1.

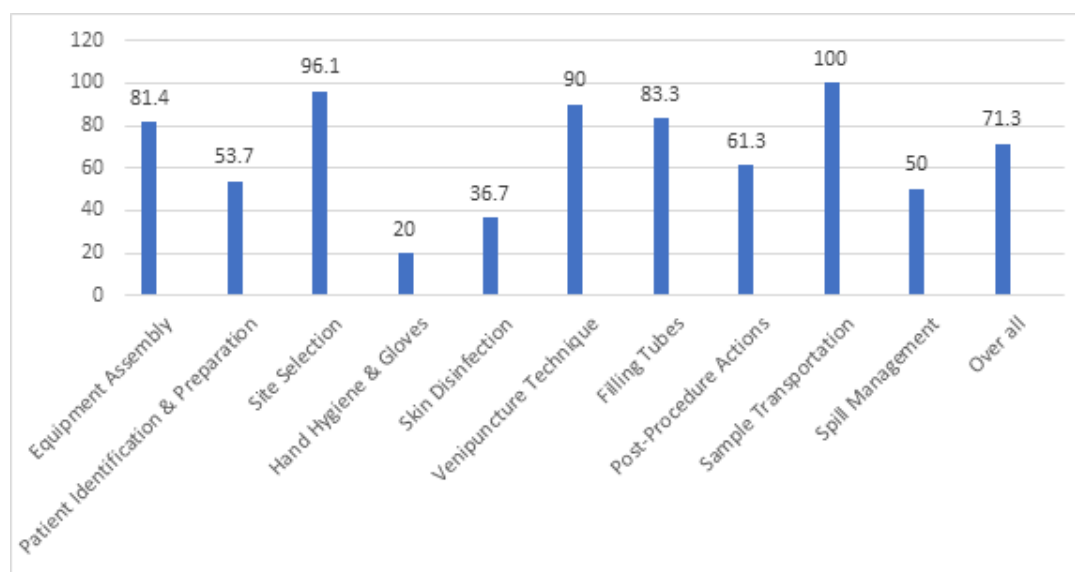


Figure 1: Compliance Rates by Phlebotomy Practice Domain

Table 1: Key Compliance Gaps and Lapses Identified in the Audit (n=60 observations)

Domain	Specific Lapse	Frequency (n)	Percentage (%)
Hand Hygiene & Gloves	Hand hygiene not performed before gloving	60	100
	Well-fitting, non-sterile gloves not worn	36	60
Skin Disinfection	70% alcohol swab not used for 30 seconds	60	100
	Site not allowed to dry for 30 seconds	54	90
Patient Identification & Preparation	Performer did not introduce themselves	47	78.3
	Patient identity not verified against lab form	34	56.7
	Patient not asked about allergies/phobias	34	56.7
	Sterile tray or trolley not used	50	83.3
Spill Management	Spill kit not available	36	60

Areas of strong performance included the correct application and release of the tourniquet (100%), appropriate vein selection (100%), safe needle disposal (100%), and proper sample packaging (100%). The technical execution of the venipuncture itself, including needle insertion angle and vein anchoring, was also highly compliant (>80%).

Conversely, the most critical deficits were concentrated in infection control and patient-centered communication. No observed procedure included hand hygiene before patient contact. Skin disinfection was grossly inadequate, with no phlebotomist performing the recommended 30-second scrub, and 90% not allowing the site to dry. Patient identification was often bypassed by relying solely on the prescription form rather than active verification with the patient. Furthermore, essential materials like spill kits and adverse event registers were frequently unavailable (Table 1).

Discussion

This clinical audit provides a sobering insight into the state of phlebotomy practices in the Kalmunai health region. The overall compliance of 71.3% indicates a system with functional processes but severe, specific vulnerabilities that directly threaten patient safety. The findings align with a global pattern of pre-analytical fallibility, yet the

specific nature of the lapses offers a clear roadmap for local intervention.

The most alarming finding was the universal neglect of hand hygiene (0% compliance), a fundamental tenet of infection prevention. This mirrors the situation in Port Sudan, where 33.3% of phlebotomists did not wear gloves at all, and 69.2% did not use new gloves for each patient [5]. This failure, combined with profoundly inadequate skin disinfection (overall domain compliance 36.7%), dramatically increases the risk of both healthcare-associated infections for the patient and bloodborne pathogen exposure for the phlebotomist. The practice of not allowing the alcohol to dry (90% of procedures) negates its microbiocidal effect and can cause hemolysis, a common pre-analytical error noted in other studies [4, 6].

The deficiencies in patient identification and preparation (overall domain compliance 53.7%) are equally concerning. Failure to actively verify patient identity against the requisition form is a high-risk error that can lead to catastrophic misdiagnosis and treatment. Similar high rates of patient identification errors have been reported elsewhere, underscoring this as a pervasive challenge in phlebotomy services [4, 8]. The low rates of introducing oneself, obtaining consent, and assessing for allergies/phobias reflect a gap in patient-centered care, which can increase patient anxiety and reduce trust in healthcare services.

In contrast, the high performance in technical domains like site selection, venipuncture, and sample transportation demonstrates that the phlebotomists possess the core technical skills. This dichotomy suggests that the failures are not due to an inability to perform the procedure correctly, but rather a lack of strict adherence to infection control protocols and patient safety culture, potentially stemming from inadequate training, high workload, or insufficient supervision.

The unavailability of spill kits and inconsistent use of leak-proof transport bags further highlight systemic gaps in safety preparedness and material management. The PDCA (Plan-Do-Check-Act) cycle, which framed this audit, is now poised to move into the "Act" phase to address these identified gaps.

Limitations

This study was conducted in one health region in Sri Lanka, which may limit the generalizability of the findings. Furthermore, the Hawthorne effect, where individuals may alter their behavior when they know they are being observed, might have led to an overestimation of compliance rates. Despite this, the observed rates of critical errors were still unacceptably high.

Conclusion and Recommendations

This audit concludes that while the technical execution of phlebotomy in the Kalmunai health region is largely satisfactory, there are critical and unacceptable deficits in fundamental infection control practices and patient safety protocols. The universal lack of hand hygiene and inadequate skin disinfection represent a clear and present danger to patients. The moderate overall compliance rate masks the severity of these specific, high-risk lapses.

To address these issues and align practices with WHO standards, the following recommendations are made:

Immediate Mandatory Training: Conduct hands-on, mandatory refresher training for all phlebotomy staff, with a laser focus on critical importance and correct technique of hand hygiene, correct procedure for skin disinfection, strict protocols for patient identification using two identifiers and effective patient communication (introduction, consent, post-procedure care).

Resource Provision: Ensure the consistent availability of essential supplies, including spill kits, well-fitting gloves, and leak-proof transport bags at all phlebotomy sites. Make the use of sterile trays or trolleys mandatory for setting up equipment. Implement and enforce the use of an adverse incident reporting register.

Reinforcement of Supervision and Monitoring: Establish a schedule for regular, unannounced spot-checks by

laboratory or nursing supervisors using a simplified version of the audit checklist. Integrate phlebotomy compliance as a key performance indicator for laboratory quality.

Sustained Quality Improvement: Formalize the PDCA cycle by planning a follow-up re-audit in 6-12 months to assess the impact of these interventions and identify new areas for improvement. Create a feedback mechanism to share these findings and subsequent improvements with all staff, fostering a culture of safety and collective responsibility.

Implementing these evidence-based recommendations is imperative to transform phlebotomy from a potential source of harm into a reliable, safe, and patient-centered pillar of diagnostic services in the Kalmunai health region.

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References

1. Plebani M. Errors in clinical laboratories or errors in laboratory medicine? Clin Chem Lab Med. 2006;44(6):750-9.
2. Gabriel L, Gian CG, Gian LS. Is phlebotomy part of the dark side in the clinical laboratory struggle for quality? Lab Med. 2012;43:172-6.
3. McGlynn EA, Asch SM, Adams J, Keesey J, Hicks J, DeCristofaro A, et al. The quality of health care delivered to adults in the United States. N Engl J Med. 2003;348(26):2635-45.
4. Aggarwal K, Bansal R, Mohan S, Bhardwaj P. Assessment of phlebotomy errors by direct observation of sample collection procedure in a NABL Accredited Hospital: An Observational study. Al Ameen J Med Sci. 2022;15(2):154-8.
5. Bashir B, Abdarabo A. Auditing of the phlebotomy system in medical laboratories in Port Sudan City, Sudan. East Mediterr Health J. 2020;26(7):839-45.
6. Dilshika LKM, Gunarathne CD, Fernando SSN. Analysis of pre-analytical errors in a clinical laboratory: A pilot study from Sri Lanka. J Health Sci Innov Res. 2020;1(1):24-30.
7. World Health Organization. WHO guidelines on drawing Carraro P, Plebani M. Errors in a stat laboratory: types and frequencies 10 years later. Clin Chem. 2007;53(7):1338-42.



Original Article

Causes for Admission, Mortality and Sepsis Profile of Babies Admitted to Special Care Baby Unit of Teaching Hospital Batticaloa, Sri Lanka

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Abstract:

Background and Objective:

Special Care Baby Units (SCBUs) offer treatment for babies at high risk for survival. This study targeted to identify causes for admission, mortality and sepsis profile at SCBU of Teaching Hospital Batticaloa (THB), Sri Lanka.

Methods:

A descriptive retrospective cross-sectional study was conducted among 1356 babies admitted to SCBU of THB, Sri Lanka from January/2023 to December/2023. Data on sociodemographic characteristics, indications for admission and mortality were collected from the records. Ethical approval was obtained from Ethics Review Committee, Faculty of Health-Care Sciences, Eastern University, Sri Lanka. Data were analysed using SPSS version 26.0.

Results:

The major reason for admission was suspected sepsis (n=469,34.6%) followed by prematurity (n=171,12.6%) and neonatal jaundice (n=156,11.5%). Most of the babies (n=1265, 93.3%) were discharged while nearly six percentage died (n=80,5.9%). A minority of babies (n=11,0.8%) were transferred to the other institutions for further care. Pulmonary haemorrhage (n=31,14.1%) was the leading cause for mortality followed by birth related complications (n=29,13.2%) and congenital deformities (n=28,12.7%). Among 738 blood cultures collected during the period studied, majority was negatives (n=675,91.5%) while 3.8% revealed a significant positive (n=28). Coliforms (13/28,46.4%) was the major causative organism for sepsis, followed by *Acinetobacter* sp (10/28,35.7%). These findings revealed though sepsis was the common indication for admission to SCBU, only around 4% blood cultures revealed a significant positive growth. Further, pulmonary haemorrhage was the major cause for mortality among neonates.

Keywords: Neonates, Admission, Mortality, Special care baby unit

Introduction

The first 28 days of human life since birth, carries high risk of morbidity and mortality due to various reasons such as, immature immune system and sudden environmental change following birth. Special Care Baby Units (SCBUs) care for the neonates with high risk of morbidity and mortality.

Globally, around 2.6 million neonates are admitted to SCBUs and 30 million neonates require various levels of inpatient care each year. Around 3.7 million admissions are expected globally by 2030 due to the increase in population and preterm births. Worldwide, the most common cause for SCBU admission is prematurity, followed by low

birth weight and birth asphyxia. In Sri Lanka 7 – 28% of new born babies need SCBU admissions. In 2021, 57,061 babies were admitted to SCBUs among the 105 government hospitals in Sri Lanka with the facility. As a result of the government's commitment to enhancing maternal and child health, this number has been gradually rising in recent years. Sri Lanka has over 50 private hospitals with SCBUs, serving affluent clients in urban locations, though the exact number is unknown due to no central registry [1].

Research on SCBU admissions and neonatal mortality and morbidity (NMM) in Sri Lanka is limited, particularly in the Eastern provinces and Batticaloa. The Teaching Hospital Batticaloa (THB), the largest referral and teaching

hospital in Eastern province, offers a wider range of cases and higher patient volume, potentially strengthening research findings' generalizability. Identifying the reasons for admission and mortality among neonates admitted to SCBUs could help to improve the neonatal care, reduce neonatal mortality and improve the quality of neonatal care. Therefore, this study aimed to identify the reasons for admission and mortality of neonates admitted SCBUs at Teaching Hospital Batticaloa (THB), Sri Lanka.

Methods

A descriptive retrospective cross-sectional study was conducted among 1356 babies admitted to the special care baby unit (SCBU) of Teaching Hospital Batticaloa (THB), Sri Lanka using a complete enumeration method from January 2023 to December 2023. Ethical approval was obtained from Ethics Review Committee, Faculty of Health-Care Sciences, Eastern University, Sri Lanka. Permission was obtained from Director, Teaching Hospital, Batticaloa, consultant and nursing in-charge of SCBU for data collection. Babies on re-admission were also considered as new admission and babies with incomplete data on admission were excluded from the study. The details were extracted manually from the records maintained at the units using a data collection sheet.

Data were analysed using Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp; 2019.). Entered data were crosschecked for its completeness and accuracy, and invalid data or missing data were excluded. Categorical data were presented as percentage and frequency, while continuous data were presented as mean $\pm$ SD in normally distributed data and median with interquartile range (IQR) in non-normally distributed data.

Results

Socio demographical characteristics and clinical outcome of study population

Out of 1356 admissions, majority was age of one day (n=688). Average length of stay was 7.54 days, minimum length of stay was one day while maximum was 86 days. Most babies survived at the end of SCBU care (n=1276, 94.1%), and few died (n=80, 5.9%). Eleven babies were transferred to other institutions for advanced treatment which was also considered as survived at the end of SCBU care.

Indications for SCBU admission

Suspected sepsis (n=469, 34.6%) was the most leading cause for admission at SCBU. The indications for admission of babies at SCBU is illustrated by Table 1. Forty-eight admissions (3.5%) were categorized as others which include admissions for judicial purposes, karyotyping, etc.

Causes of death among deceased babies

Among the 80 dead babies, the most common cause of death was pulmonary haemorrhage (n=31, 14.1%), followed by birth related complications (n=29, 13.2%), congenital deformities (n=28, 12.7%) and preterm (n=27, 12.3%). Cause of death for eleven died babies considered as others (n=11, 5.0%) because they were significantly least and different such as tumor lysis syndrome, interstitial lung disease, internal mortality disorder, metabolic acidosis, neonatal convulsion, internal bleeding, cerebral oedema, necrotizing enterocolitis, anaemia and thrombocytopenia

Table 1 - Indications for SCBU Admission

Indications	Number of Babies	Percentage (%)
Suspected Sepsis	469	34.6
Preterm	171	12.6
NNJ	156	11.5
Respiratory Distress	133	9.8
Birth Related Complications	97	7.2
Congenital Deformities	94	6.9
Feeding Purpose	61	4.5
Resuscitated	42	3.1
Further Management	28	2.1
Hypoglycemia	20	1.5
Vomiting	17	1.4
Weight Loss	11	0.7
IUGR	9	0.6
Others	48	3.5
Total	1356	100

Table 2 - Causes of Death

Causes of Death	Number of Babies	Percentage (%)
Pulmonary Haemorrhage	31	14.1
Birth Related Complications	29	13.2
Congenital Deformities	28	12.7
Preterm	27	12.3
Low Birth Weight	26	11.8
Sepsis	24	10.9
Surfactant Deficient Lung Disease	10	4.5
cause of death not identified	10	4.5
Respiratory Distress Syndrome	9	4.1
Coagulopathy	7	3.2
Persistent Pulmonary Hypotension of Newborn	5	2.3
Hypothermia	3	1.4
Others	11	5.0
Total	220	100.0

Note: As many babies had multi causes of deaths, overlapping is seen.

Sepsis profile and ABST of admitted babies to the SCBU During the study period, 738 blood cultures were collected among the babies who admitted to the SCBU. Among them, Majority was negatives (n=675, 91.46%). Twenty-eight cultures were significant positive (3.80%) and 35 were identified as contamination while collecting the samples (4.74%). From the significant positives (n=28), majority was hospital acquired infections (n=19).

The most common causative organism was coliforms (n=13, 46.4%), followed by *Acinetobacter* sp (n=10, 35.7%) and *Staphylococcus aureus* ss. aureus (n=3, 10.7%). Among the antibiotic sensitivity test (ABST) results, coliforms showed 50% susceptibility to co-amoxiclav, 50% to 3rd generation cephalosporins like ceftriaxone while 100% to carbapenems like meropenem, imipenem, amikacin, ciprofloxacin and piperacillin/tazobactam. Additionally, all the three *Staphylococcus aureus* isolates identified were methicillin resistant (MRSA) and resistant to erythromycin and cotrimoxazole while 2 of the isolates were susceptible to clindamycin. Nearly 90% of the *Acinetobacter* sp were resistant to carbapenems while 50% were resistant to Amikacin.

Duration of stay in the SCBU

According to our study, 40.4% of babies (n=548) stayed at SCBU less than 5 days while 43.1% of babies (n=585) stayed 5-10 days, 11.3% of babies (n=153) stayed for 10-21 days and 5.2% of babies (n=70) stayed more than 21 days.

Discussion

Ensuring universal access to safe, effective, high-quality, and affordable care for neonates is needed to achieve the

neonatal survival goals. It also requires understanding the levels of neonatal mortality as well as the indications for admissions, underlying causes of neonatal deaths, and sepsis profile. This study assessed the reasons for admission, causes of death and sepsis profile of babies at the special care baby unit of Teaching Hospital, Batticaloa. Our study was done on 1356 details of the babies who were admitted to the SCBU in THB during January 2023 to December 2023. During the study period of one year, there were 1493 admissions into the SCBU; 137 cases were excluded due to the incomplete records and 1356 were included.

According to our study results, most of the babies admitted to the SCBU were day one old (688 babies. Most research studies show the majority of cases were admitted within the first 24 hours of birth [2]. The study done in teaching hospital Kandy revealed that the median length of hospital stay was 3 days tallying with our observations. [3].

Indications for admission

The most common reason for admission to the SCBU was suspected sepsis (n=469, 34.6%). A study done at a neonatal care unit in Nepal, revealed 36.9% (n=279) of admissions were due to sepsis. A study done at the NICU of University of Gondar referral hospital, Northwest Ethiopia including 769 admissions during the nine-month study period revealed that 67.9% of admissions were due to sepsis. This indicated the wide variation of the incidence of sepsis across the globe [5]. The most leading cause for admission at SCBU from our study was suspected sepsis (34.6%) which was similar to the previous study as

infection (31.48%) which was the second leading cause [2]. Out of 28 significant positive cultures, 19 (67.8%) samples revealed the infections were hospital acquired. Similar finding was observed in a study conducted in the Southern Sri Lanka where 55 episodes of clinically suspected infections were noted including 33 (60%) nosocomial infections during the 4 months of study period. In North America, sepsis was treated for approximately 7% to 13% of neonates. However, only 3% to 8% of these neonates had positive cultures [6]. This revealed the difficulty in identifying the causative agent of sepsis in neonates even in resource rich settings. Moreover, contamination while collecting the sample was a practical problem, and in our study was 4.74% while the benchmark of blood contamination rate should be less than 3% [7].

Coliforms were the major causative agent accounted for 46.4% (n=13) of cases. The Southern Sri Lankan study revealed 13 out of 17 cultures (76%) revealed coliforms [8]. Resistance to 3rd generation cephalosporins which are the commonest antibiotics used are quite high in both studies, more than 50% [6].

Causes of death

The identification for causes of death serves as a guide for implementing actions aimed at minimizing avoidable newborn deaths and lowering overall infant mortality rates.

In our study the overall death rate was 5.9% (n=80) among the babies admitted to the SCBU of Teaching Hospital Batticaloa during the study period. A similar study conducted at the same unit in 2012 revealed a death rate of 13.7% (37/270). It indicates the improvement in the mortality at the unit over the past decade [2].

According to our study, the most common cause of death was pulmonary haemorrhage (PH) 14.1% (n=31). In India, the leading reasons of death were pulmonary hemorrhage 25% [8]. It was higher than our findings. The incidence of PH is 1 to 12 per 1,000 live births, occurring most commonly within the first few days of life. The most common associated factor with PH is prematurity. However, we could not retract the data about gestational maturity on individual babies as the admission and death registries maintained at the units do not have that data.

Following those, common causes of death were birth related complications 13.2% (n=29) which include Meconium Aspiration Syndrome, Intra Cranial Haemorrhage and Hypoxic Ischemic Encephalopathy.

Third leading cause of death according to our study was congenital deformities, accounted for 12.7% (n=28). A similar study conducted in Iraq showed that congenital anomalies been the most common cause of death (39%) [9]. Preterm accounts for 11.8% (n=26) in our study. A study done at Sri Jayewardenepura General Hospital showed most deaths were due to extreme prematurity (46.4%) [10]. The study result at Teaching Hospital Kandy, Sri Lanka showed prematurity was one of the main reasons for mortality [3].

According to our study, we found that 10.9% (n=24) of babies died due to sepsis. Out of 24 babies who died due to sepsis, 10 babies had positive blood cultures. Among the 28 babies with significant positive blood cultures, 11 babies (39.28%) died and 17 (60.72%) survived. The organisms which caused death were Coliforms(n=8), Acinetobacter(n=2) and MRSA(n=1).

Conclusions/recommendations:

Suspected sepsis was leading cause of admissions (nearly 1/3 of admissions) which was 3rd leading cause of death in our study reveals that our study setting provided proper care for neonates in treating sepsis, preventing it from becoming a major cause of death. Pulmonary haemorrhage was the leading cause of mortality in neonates. Considering these findings in neonatal care, routine feedback evaluation and improved infection control practices, targeted trainings and encouragement among SCBU staff while proper resource allocations, constant monitoring and guidance in antenatal units and labour rooms could help in designing and implementing a well-planned care that results in reducing neonatal admissions and mortality to SCBUs.

Tracing with updated infection control policy changes by WHO, the Ministry of Health, Sri Lanka and institutions has greater role on intensive care settings such as SCBU. Improving prenatal care services to identify and manage high-risk pregnancies early, perinatal delivery time sterility maintenance and protocols, developing and implementing standardized criteria for admissions to the SCBU ensuring all high-risk neonates receive timely and appropriate care would provide greater outcomes in neonates. Expanding research to multiple settings and conducting long-term follow-up studies to understand neonatal health trends and challenges, and assessing developmental outcomes of SCBU-admitted neonates would improve neonatal health further.

References:

1. Ministry of Health Department of Government Printing. Annual Performance Report 2022 [Internet]. 2022 [cited 2025 Jun 30]. Available from: <https://www.health.gov.lk/wp-content/uploads/2022/10/1.-Annual-Performance-Report-2022-English.pdf>
2. Angela Arulpragasam, Pragasam G, Gishanthan S. Morbidity and mortality pattern in the Special Care Baby Unit of Teaching hospital Batticaloa. In: Annual Scientific Sessions 2012 Session Manual [Internet]. Batticaloa Medical Association; 2012 [cited 2026 Jan 26]. p. 23–4. Available from: https://www.researchgate.net/publication/383757001_Morbidity_and_mortality_pattern_in_the_Special_Care_Baby_Unit_in_Teaching_Hospital_Batticaloa
3. Gunawardane DA, Dharmaratne SD, Rowel DS. Neonatal outcome of term deliveries in Sri Lanka. South East Asia Journal of Public Health. 2018;7(2):34–9.
4. Awoala WB. Morbidity Pattern, Mortality, and Its' Determinants among Inborn Neonates Admitted in Rivers State University Teaching Hospital. Int J Sci Study. 2020;110(8):110.
5. Demisse AG, Alemu F, Gizaw MA, Tigabu Z. Patterns of admission and factors associated with neonatal mortality among neonates admitted to the neonatal intensive care unit of University of Gondar Hospital, Northwest Ethiopia. Pediatric Health Med Ther. 2017;Volume 8:57–64.
6. Simonsen KA, Anderson-Berry AL, Delair SF, Dele Davies H. Early-onset neonatal sepsis. Clin Microbiol Rev [Internet]. 2014 [cited 2026 Jan 23];27(1):21–47. Available from: <https://doi.org/10.1128/cmr.00031-13>
7. Weerasinghe NP, Vidanagama D, Perera B, Herath HMM, De Silva Nagahawatte A. Re-exploring the value of surveillance cultures in predicting pathogens of late onset neonatal sepsis in a tertiary care hospital in southern Sri Lanka. BMC Res Notes. 2018;11(1):1–5.
8. Chow S, Chow R, Popovic M, Lam M, Popovic M, Merrick J, et al. A Selected Review of the Mortality Rates of Neonatal Intensive Care Units. Front Public Health. 2015;3(October).
9. Albermany S, Abd Alwahab Mahdi N. Death rate and causes of death in the neonatal intensive care unit in the Children Welfare Teaching Hospital (2018-2021). J Fac Med Baghdad. 2023;65(3):146–9.
10. Weerasekera M, Amarasekara S, Siriwardhane HVDN. An analysis of neonatal mortality in a tertiary care hospital over a decade-2008 to 2017. Sri Lanka Journal of Child Health. 2019;48(4):326–33.

Featured Article

Prehabilitation: The Way Forward in Resource-Poor Settings

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Abstract:

Modern surgical care is transitioning from a reactive to a proactive model aimed at enhancing patients' physiological resilience before they enter the operating theatre. Prehabilitation refers to a structured set of pre-operative interventions designed to optimise functional capacity, nutritional status, psychological readiness, and modifiable risk factors, thereby enabling faster and safer recovery after surgery.

Surgical stress triggers complex neuroendocrine, metabolic, and immune cascades that may overwhelm fragile physiological reserves, particularly in frail, malnourished, or comorbid patients. By improving cardiorespiratory fitness, muscle mass, glycaemic control, and mental preparedness, prehabilitation reduces postoperative complications, hospital stay, and readmissions while improving quality of life.

In resource-poor settings such as Sri Lanka's provincial hospitals, prehabilitation offers a cost-effective pathway to improved outcomes through pragmatic, team-based interventions integrated with Enhanced Recovery After Surgery (ERAS) protocols. Early identification of modifiable risks, simple exercise and nutrition programmes, psychological counselling, and community engagement can yield substantial benefits at minimal cost.

This article summarises the physiology, evidence, and implementation strategies of prehabilitation, and outlines practical recommendations for adaptation to low- and middle-income healthcare environments.

Keywords: Prehabilitation, Physical Resilience, ERAS Protocol

Introduction

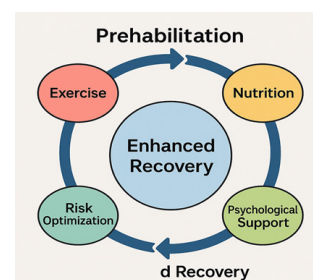
From “Get Through Surgery” to “Train for Surgery”

The ideal surgical outcome extends beyond survival; it is the restoration of pre-operative function. However, surgery imposes major physiological stress: anaesthesia, tissue trauma, fasting, and immobility collectively diminish muscle mass, cardiorespiratory reserve, and psychological well-being. Frail or malnourished individuals often struggle to regain baseline function, leading to prolonged hospitalisation and increased mortality.

Defining Prehabilitation

Prehabilitation comprises multidisciplinary, pre-operative interventions that enhance an individual's functional capacity to withstand the stress of surgery. Its four pillars include:

- Exercise training: aerobics, resistance, and inspiratory-muscle exercises.
- Nutritional optimisation: correction of deficiencies and caloric/protein supplementation.
- Psychological preparation: counselling, anxiety reduction, and motivation.
- Risk modification: smoking and alcohol cessation, and optimisation of anaemia, diabetes, and comorbidities.



While ERAS protocols mitigate surgical stress, prehabilitation builds the physiological resilience to face it, two complementary halves of peri-operative optimisation

Why It Matters in Resource-Limited Settings

In high-income centres, prehabilitation teams include physiotherapists, dietitians, and psychologists. In contrast, Sri Lanka's provincial hospitals face shortages of staff, equipment, and funding. Yet, given the higher prevalence of frailty, anaemia, and malnutrition, even low-cost interventions, walking programmes, protein supplementation, anaemia correction, motivational counselling, can significantly improve surgical recovery and reduce complications.

Surgical Stress Response

Neuroendocrine and Inflammatory Cascades

Surgical tissue trauma triggers intertwined inflammatory and endocrine cascades that together constitute the surgical stress response. Activation of the neuroendocrine axis leads to a surge in cortisol and catecholamines, driving hypermetabolism and catabolism to generate readily available energy substrates for vital organs.

Physiological Targets of Prehabilitation

Simultaneously, the inflammatory cascade releases cytokines and other humoral mediators in proportion to the extent of tissue injury, resulting in immunosuppression and impaired wound healing. Thus, tissue trauma initiates a coordinated metabolic and immune response aimed at survival but often at the expense of physiological reserve. Surgical trauma activates afferent neural and humoral pathways, stimulating the hypothalamic–pituitary–adrenal axis and sympathetic nervous system, with release of catecholamines, cortisol, glucagon, and cytokines such as IL-6 and TNF- α 1. Summary of physiological goals are given in Table 1.

This results in:

- Hyperglycaemia from insulin resistance and increased hepatic glucose output.
- Proteolysis and lipolysis, liberating amino acids, and fatty acids for gluconeogenesis.
- Immunosuppression and impaired wound healing.
- Fluid retention via ADH and aldosterone.
- Increased oxygen demand due to hypermetabolism.

In frail or malnourished patients, these adaptive responses become maladaptive, causing organ dysfunction, infection, and delayed convalescence.

Exercise Prehabilitation

Cardiorespiratory Conditioning

Peak oxygen consumption (VO₂ peak) is the strongest predictor of surgical outcomes².

- Normal adults: 30–40 mL kg⁻¹ min⁻¹.
- High-risk surgical candidates: often < 20 mL kg⁻¹ min⁻¹.

- Critical threshold: VO₂ peak < 15 mL kg⁻¹ min⁻¹ predicts poor outcomes.

VO₂ peak reflects the integrated performance of cardiac output, arteriovenous oxygen difference, haemoglobin concentration, pulmonary diffusion capacity, and muscle oxidative metabolism. Regular aerobic and resistance training for 4–6 weeks can increase VO₂ peak by 15–20%, reducing morbidity and hospital stay by 1–2 days⁴.

Strength and Mobility Training

Muscle mass provides metabolic and protein reserves that buffer surgical catabolism. Skeletal muscle improves glucose utilisation, immune competence, and haemodynamic stability. Simple body weight or elastic-band exercises, sit-to-stand repetitions, and inspiratory-muscle training (IMT) are feasible in primary hospitals. IMT has been shown to reduce pulmonary complications in cardiac and thoracic surgery⁵.

Nutritional Optimization

Screening and Assessment

Malnutrition is common yet correctable. Pre-operative screening using Malnutrition Universal Screening Tool (MUST), Nutrition Risk Score (NRS-2002), or Subjective Global Assessment (SGA) identifies risk⁶.

Red-flags: Weight loss > 10–15 %, BMI < 18.5 kg m⁻², Serum albumin < 30 g L⁻¹. (excluding hepatic/renal disease), NRS > 5, SGA C.

Interventions

- a. Calorie supplementation: small, frequent meals or therapeutic formulae; enteral preferred; parenteral when necessary; should precede protein supplementation to prevent catabolism.
- b. Protein and micronutrients: 1.2–1.5 g protein kg⁻¹ day⁻¹ plus vitamins A–E and zinc; micronutrient correction is crucial in elderly or chronically ill patients.
- c. Immunonutrition: arginine, glutamine, omega-3 fatty acids for 5–7 days reduces postoperative infection⁷.
- d. Carbohydrate loading: 12.5 % maltodextrin (100 g night before + 50 g 2–3 h pre-op) halves insulin resistance⁸, preserves lean mass, and alleviates thirst and anxiety; locally, king coconut water is a practical substitute.
- e. Anaemia correction: Intravenous iron more effective than oral; reduces transfusion and length of stay (LOS)¹³.

Psychological Support

Pre-operative anxiety heightens catecholamine and cortisol surges, exacerbating insulin resistance and pain⁹. Psychological prehabilitation—structured education, relaxation, breathing techniques, and family counselling—reduces anxiety and enhances recovery. Even brief sessions delivered by nurses or counsellors yield measurable improvements in cooperation and postoperative outcomes.

Table 1. Physiological Targets and Functional Correlates of Prehabilitation

System	Mechanism	Functional Marker
Cardiorespiratory	Improves VO ₂ max, stroke volume, oxygen extraction	↑ 6-minute walk distance
Musculoskeletal	Increases muscle mass and strength	↑ Grip strength
Metabolic	Enhances insulin sensitivity	↓ Post-op hyperglycaemia
Neuroendocrine	Attenuates surgical cortisol surge and stress response	Stable haemodynamics
Immune	Limits cytokine storm and preserves host defence	↓ Infectious complications

Table 2. Summary of Recent Key Studies on Prehabilitation (2023–2025)

Study	Design / Population	Key Findings
Molenaar C et al., 2023 ⁷	RCT, n = 204 colorectal cancer patients	Multimodal prehabilitation reduced postoperative complications (OR 0.60), improved 6-MWD (+28 m), and shortened hospital stay.
Rombey T et al., 2023 ⁸	Systematic review of 17 economic evaluations	Prehabilitation is consistently cost-effective; decreased complications, LOS, and improved QALYs.
Hann Soh N et al., 2025 ⁹	Meta-analysis of 27 RCTs (>3,000 oncologic patients)	Reduced complications (OR 0.60), improved 6-MWD (+28 m), and shortened LOS (~1.5 days).
Fang L et al., 2024 ¹⁰	Meta-analysis of 15 RCTs in cardiac surgery	Inspiratory muscle training lowered pulmonary complications (RR 0.56), reduced ventilation time, and ICU stay.
McIsaac DI et al., 2024 ¹¹	Secondary analysis of RCT; 298 frail older adults with cancer	Home-based exercise improved return to intended oncologic therapy (85% vs 70 %) and enhanced functional recovery.
Sathe SV et al., 2025 ¹²	Propensity-matched cohort (n = 1,200) before vs after programme	Department-wide prehabilitation reduced complications (–25 %), LOS (–1.2 days), and improved discharge home rate.

MWD – Minute Walk Distance; LOS – Length of Stay; QALY – Quality Adjusted Life Year; OR – Odds Ratio

Risk Modification

Lifestyle modification represents one of the most cost-effective yet often under-utilised components of prehabilitation, with direct and measurable effects on surgical outcomes.

- Smoking cessation ≥ 2 weeks pre-surgery restores mucociliary clearance, normalises carboxyhaemoglobin and oxygen transport.
- Alcohol abstinence reduces arrhythmias, withdrawal, and hepatic dysfunction.
- Glycaemic and blood-pressure optimisation stabilises microvascular perfusion and wound healing.
- Such measures rely primarily on counselling and follow-up, making them feasible in resource-limited hospitals¹⁰.

Evidence Snapshot

A growing body of high-quality evidence underscores the clinical and economic value of prehabilitation across diverse surgical settings. Collectively, these studies confirm that modest physiological improvements translate into substantial clinical and economic benefits. (Table 2)

Translating Evidence into Practice

The successful implementation of prehabilitation depends on structured planning, early identification of at-risk patients, and pragmatic integration into existing hospital workflows. Evidence from recent studies demonstrates that even modest, well-coordinated interventions can produce measurable improvements in physiological reserve, functional capacity, and postoperative outcomes. Translating these insights into routine clinical practice requires a systematic and multidisciplinary approach.

- Early Risk Stratification:** Every elective patient should undergo structured evaluation: ASA status, frailty index, nutritional (NRS-2002, BMI), and functional capacity (6-MWT, stair-climb). Early recognition allows timely, tailored intervention.
- Tailored Multimodal Programmes:** Individualised combinations of exercise, nutrition, and psychological support, ideally 3–4 weeks before surgery, achieve the greatest impact. Even shorter programmes improve

VO2 and resilience.

- c. **The “One-Stop Prehabilitation Clinic” Model:** Integrating prehabilitation into existing pre-anaesthetic assessment clinics allows single-session evaluation by anaesthetist, physiotherapist, and nutritionist, reducing delay and cost. This model suits general and teaching hospitals.

- d. **Team Coordination and Continuous Quality Improvement:** The cornerstone of prehabilitation is multidisciplinary collaboration. Each team member contributes specialised expertise. Anaesthetists lead physiological optimisation; physiotherapists design training; nutritionists ensure nutritional adherence; psychologists enhance motivation. Regular audit of 6-MWD, LOS, and complication rates sustains quality improvement. Continuous data feedback fosters accountability, refines protocols, and promotes a culture of evidence-based quality improvement.

In essence, translating prehabilitation evidence into practice requires both clinical leadership and adaptive system design. Even in low-resource environments, with thoughtful coordination and interprofessional commitment, hospitals can achieve tangible gains in surgical safety, recovery, and patient satisfaction.

Challenges in Resource-Poor Settings

Implementing prehabilitation in resource-limited healthcare systems poses several practical and structural challenges. While the scientific rationale is well established, the translation of these concepts into routine clinical practice requires navigating multiple constraints related to time, staffing, infrastructure, and patient factors. Understanding these barriers is the first step toward designing realistic and sustainable solutions suited to the local context.

1. **Time and Workflow Constraints:** Limited pre-operative window for elective surgery lists limit 4-week programmes; hence, concise clinic-based sessions are necessary.
2. **Lack of Trained Personnel:** Physiotherapists and nutritionists are scarce; cross-train nurses and junior MOs using simplified protocols.
3. **Patient Adherence:** Address socioeconomic barriers, travel distance, low motivation, and low literacy through culturally tailored counselling and family involvement.
4. **Infrastructure Limitations:** No dedicated space or equipment. Adapt outpatient areas for exercise

demonstrations; use resistance bands, staircases, and corridors as functional training aids.

5. **Data Deficiency:** Weak follow-up and audit mechanisms. Introduce simple audit tools (paper or mobile) to record 6-MWD and LOS for periodic review.

Despite these multifaceted barriers, experience from several low-resource hospitals demonstrates that innovative local adaptations can make prehabilitation both feasible and impactful. Group counselling sessions, community-based physiotherapy, and simplified monitoring tools can be integrated into routine care at minimal expense. The key lies in leveraging existing human resources, fostering multidisciplinary collaboration, and embedding prehabilitation into everyday clinical practice rather than treating it as a separate, resource-intensive initiative. In doing so, even modestly equipped institutions can realise significant gains in surgical preparedness, patient recovery, and long-term functional outcomes.

Implications and Way Forward

Integrating Prehabilitation into Sri Lankan Surgical Pathways

The integration of prehabilitation into Sri Lanka’s surgical care continuum offers a practical and cost-effective opportunity to enhance patient outcomes, reduce postoperative complications, and optimise the use of limited healthcare resources. Given the country’s structured public health system and well-established pre-anaesthetic assessment framework, embedding prehabilitation within existing pathways is both feasible and sustainable.

1. **Early Screening and Referral:** Incorporate prehabilitation screening at the first surgical outpatient review or pre-anaesthetic clinic. Standard forms for nutrition, frailty, and functional status should guide early referral.
2. **Simplified Exercise and Nutrition Packages:** Develop 3–4-week home-based programmes: daily brisk walking, stair climbing, and breathing exercises, combined with affordable protein sources (milk, eggs, legumes) and locally available carbohydrate drinks (king coconut water).
3. **Task-Sharing and Training:** Nurses and medical officers can be trained to deliver exercise instruction and dietary counselling using structured checklists. District-level training under the Ministry of Health can scale the service.

4. **Digital and Community Models:** Tele-counselling, SMS reminders, and PHM engagement can reinforce adherence, particularly in rural areas.
5. **Integration with ERAS:** Align prehabilitation goals with ERAS pathways such as preoperative carbohydrate loading, minimal fasting, early feeding, and early ambulation, forming a seamless continuum from pre- to post-operative care
6. **Audit and Feedback:** Establish hospital-based review teams to measure 6-minute walk distance, LOS, and readmissions quarterly, feeding back data to clinical governance meetings.

By adopting these context-appropriate strategies, Sri Lanka can create a scalable, equitable, and evidence-based prehabilitation model, enhancing both the resilience of patients and the efficiency of the entire surgical system.

Research and Future Directions

Future studies in Sri Lanka should evaluate:

- Cost-effectiveness of simplified prehabilitation bundles.
- Long-term functionality and quality-of-life outcomes.
- Digital or community-led implementation models.
- Additive impact of combined Prehabilitation + ERAS on mortality and resource utilisation.

Conclusion

Prehabilitation represents a paradigm shift from reactive recovery to proactive preparation. By enhancing physiological reserve, through exercise, nutrition, psychological readiness, and risk optimisation, it mitigates the metabolic stress of surgery and accelerates convalescence.

For resource-poor settings, it is not a luxury but a philosophy of training for a surgery as one would train for a marathon. Simple, low-cost, and scalable interventions integrated into pre-anaesthetic clinics can yield measurable gains in safety, recovery, and quality of life. Through multidisciplinary teamwork and continuous audit, hospitals such as Teaching Hospital Batticaloa can lead Sri Lanka in delivering safer and more compassionate surgical care.

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References

1. Cusack B, Buggy DJ. Anaesthesia, analgesia and the surgical stress response. *BJA Educ.* 2020;20(9):321-328.
2. Banugo P, Amoako D. Prehabilitation. *BJA Educ.* 2017;17(12):401-405.
3. Gillis C et al. Prehabilitation, enhanced recovery after surgery, or both? A narrative review. *Br J Anaesth.* 2022;128(3):434-448.
4. Lobo DN et al. Prehabilitation: high-quality evidence is still required. *Br J Anaesth.* 2023;130(1):9-14.
5. van Waart H, Seretny M. Prehabilitation for people with cancer. *BJA Educ.* 2025;25(5):191-198.
6. Blincoe T, Kotwinski D, Densham I. Prehabilitation. In: *Oxford Handbook of Anaesthesia*. 5th ed. Oxford University Press; 2022. p. 49-52.
7. Molenaar C et al. Effect of Multimodal Prehabilitation on Reducing Postoperative Complications and Enhancing Functional Capacity Following Colorectal Cancer Surgery: The PREHAB Randomized Clinical Trial. *JAMA Surg.* 2023 Jun 1;158(6):572-581.
8. Rombey T et al. Cost-effectiveness of prehabilitation prior to elective surgery: a systematic review of economic evaluations. *BMC Med.* (2023) 21:265
9. Natalie Hann Soh et al. Prehabilitation Outcomes in Surgical Oncology Patients Undergoing Major Abdominal Surgery: A Meta-analysis of Randomized Control Trials. *Ann Surg Oncol.* 2025 Feb;32(2):1236-1247.
10. Linqi Fang et al. Effect of Inspiratory Muscle Training on Outcomes After Cardiac Surgery: A Comprehensive Meta-Analysis of Randomized Controlled Trials. *J Cardiopulm Rehabil Prev.* 2024 Sep 1;44(5):324-332.
11. Daniel I McIsaac et al. Home-based exercise prehabilitation to improve disease-free survival and return to intended oncologic treatment after cancer surgery in older adults with frailty: a secondary analysis of a randomized trial. *Can J Anaesth.* 2024 Nov;71(11):1525-1534.
12. Shaleen V. Sathe et al. The benefits of a department-wide prehabilitation program: A propensity score match analysis. *Surgery* 184 (2025) 109489.
13. Froessler B et al. The effect of intravenous iron on preoperative anaemia. *Anesth Analg.* 2016;122:198-205.
14. Heutlingor O et al. Effects of preoperative carbohydrate loading on metabolic response. 2025.

Quiz Page

Quiz 1. A Rapidly Growing, Bleeding Facial Nodule

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A 48-year-old female presented with a solitary nodule on her left alar nasi of 6 weeks' duration. The nodule arose spontaneously and progressed quickly in size. The patient also experiences frequent episodes of bleeding of the nodule after trivial injury, such as when she washed the nodule on the face. There was no associated pain or itching, nor has the patient a history of skin cancer and a systemic illness.

On clinical examination (Figure 1), there was a well-circumscribed, bright red, dome-shaped nodule on the left alar nasi with a smooth surface.

Dermoscopy (Figure 2) showed red homogeneous areas, intersecting white linear structures (white rail lines), and a peripheral collarette.

What is the clinical diagnosis?

Figure -1



Figure -2



- A. Amelanotic melanoma
- B. Basal cell carcinoma
- C. Pyogenic granuloma
- D. Kaposi sarcoma
- E. Squamous cell carcinoma

Quiz 2. A young girl with ongoing fever

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A 13-year-old girl came with a history of fever over the past six months. The fever was intermittent, lasting for a day or two, appearing once or twice a week. During the fever spikes, she was noted to have a generalized erythematous rash. Recently, she developed pain and stiffness in both her hands and feet.

On examination, she had generalized lymphadenopathy, the liver is felt 4 cm below the costal margin and the spleen is felt 3 cm from the left costal angle.

WBC 15,000/mm³, N 80%, L 20%, Haemoglobin 10 g/dL, Platelets 600,000

ESR 100 mm/1st hour

Which of the following deadly complication is likely to happen in her?

- A. Acute renal failure
- B. Cerebral haemorrhage
- C. Coronary artery rupture
- D. Disseminated intravascular coagulation
- E. Macrophage activation syndrome

Case Report

A Silent Threat Behind a Chronic Areolar Plaque; the Subtle Face of Paget's Disease of the Mammary Gland

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Abstract:

Paget's disease of the breast is a rare but critical manifestation of underlying breast carcinoma that may mimic benign dermatoses, leading to delayed diagnosis. We report the case of a 44-year-old woman who presented with a chronic erythematous plaque on her right nipple persisting for four years. The absence of pain, discharge, or a palpable mass led to initial under recognition and ignorance. Clinical examination, imaging, and histopathology confirmed the diagnosis of Paget's disease of the breast with underlying ductal carcinoma in situ (DCIS). This case highlights the importance of maintaining a high index of suspicion for malignancy in persistent nipple lesions.

Keywords: Paget's Disease of the breast, erythematous areolar plaque, ductal carcinoma in situ

Introduction

Paget's disease of the breast is an uncommon intraepidermal manifestation of breast carcinoma, accounting for approximately 1–3% of all breast malignancies [1]. It is characterized by the infiltration of malignant ductal epithelial cells (Paget cells) into the epidermis of the nipple-areolar complex. It is most frequently associated with an underlying ductal carcinoma in situ (DCIS) or invasive ductal carcinoma (IDC) [2].

Clinical presentation often mimics benign dermatological conditions such as eczema, psoriasis, or chronic dermatitis [3]. The absence of the common symptoms such as itching, erythema, scaling, and erosion may result in delayed referral and diagnosis, especially when a palpable mass is not present [4]. Imaging may also be unremarkable in cases with non-invasive underlying disease. Prompt biopsy is therefore essential for early diagnosis and improved outcomes. This case exemplifies diagnostic pitfalls and emphasizes the importance of early histological assessment.

Case Presentation

A 44-year-old female presented to the dermatology outpatient clinic with a 4-year history of a slowly growing erythematous plaque involving almost half of the right breast, initially arising as an eczematous lesion from the nipple. The lesion was asymptomatic, with no pain, discharge, ulceration, or pruritus. The patient reported only occasional mild discomfort. She had no significant medical or family history and had not undergone any prior breast examinations or imaging.

On examination, the nipple-areolar complex of the right breast showed a well-demarcated, eroded erythematous plaque, surrounded by hyperpigmented margins. The nipple was fully retracted and destroyed. No palpable lump was noted in the breast tissue. Examination of the right axilla revealed a few palpable, mobile, soft lymph nodes. The left breast and axilla were clinically normal.



Figure 1. Large erythematous plaque on the right breast with nipple destruction

Investigations included an ultrasound of the breasts, which did not reveal any discrete lesions within the breast parenchyma, nor suspicious solid masses on the right side. The left breast appeared normal. Bilateral axillary ultrasound showed a few lymph nodes with preserved hila, consistent with benign reactive changes. Abdominal ultrasound demonstrated Grade 1 fatty liver with no evidence of focal lesions in the liver or spleen. Mammography revealed prominent fatty breast tissue with skin thickening over the right breast and nipple destruction, but without features suggestive of underlying malignancy. The lesion was classified as BIRADS 1.

A skin biopsy of the nipple–areolar complex demonstrated aggregates of polygonal cells with pleomorphic nuclei and vacuolated cytoplasm within the epidermis, consistent with Paget’s disease. Immunohistochemical staining was positive for HER2/neu, further supporting the diagnosis of mammary Paget’s disease.

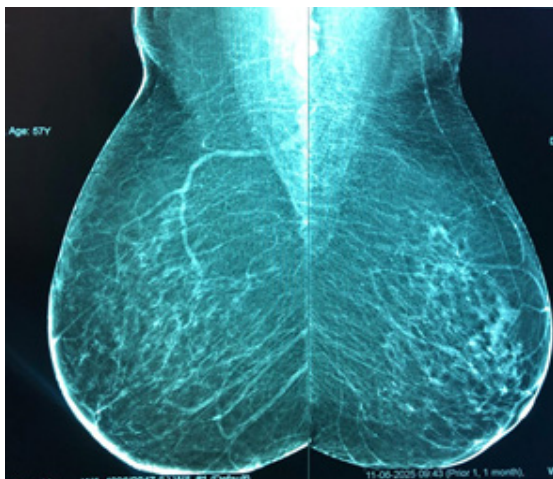


Figure 2. Mammogram with bilateral MLO views showing mild periareolar skin thickening and loss of nipple retraction on the right side. No suspicious parenchymal lesions, microcalcifications or axillary lymphadenopathy and normal left side breast.

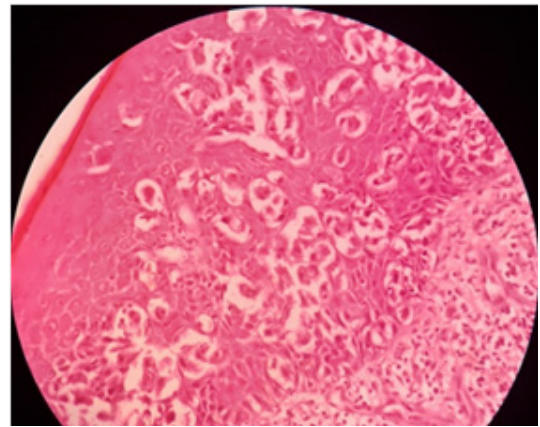


Figure 3. Photomicrograph x 40 (H&E) showing aggregates of polygonal cells (Paget’s cells) with prominent vacuolated cytoplasm and large pleomorphic eosinophilic nuclei within the epidermis.

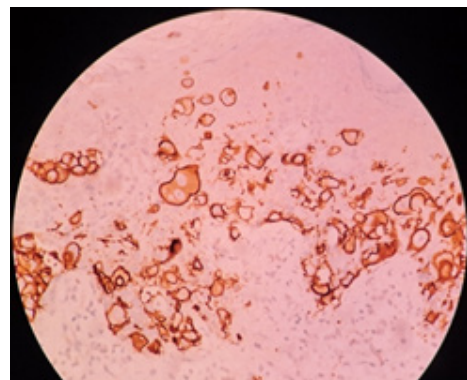


Figure 4. Immunohistochemical staining for HER2 demonstrating strong membrane staining in the epithelial clusters within the epidermis.

A diagnosis of Paget’s disease of the breast, involving the right nipple–areolar complex, was confirmed based on clinical, histopathological, and immunohistochemical findings, with a strong suspicion of underlying ductal carcinoma in situ (DCIS). The patient was promptly referred to a multidisciplinary breast oncology team for further evaluation and management planning.

Discussion

Paget’s disease of the breast was first described in 1874 by Sir James Paget, who noted its association with underlying mammary carcinoma [5]. The pathogenesis is thought to involve migration of malignant ductal epithelial cells into the epidermis via lactiferous ducts [6]. The disease can present with a broad range of clinical features, ranging from subtle erythema to crusting, ulceration, and complete destruction of the nipple.

Most patients present with erythema, scaling, ulceration, or crusting of the nipple, and the diagnosis is often delayed due to its resemblance to chronic eczema [7].

In some cases, topical corticosteroids may temporarily reduce inflammation, masking the underlying pathology and further postpone definitive diagnosis. In this case, the lesion persisted for several years without major symptoms, highlighting the deceptive nature of the disease and the critical role of early tissue diagnosis.

Differential diagnoses include atopic dermatitis, nipple eczema, psoriasis, Bowen's disease, and superficial basal cell carcinoma. Paget's disease may be differentiated histologically and through immunohistochemistry. Paget cells typically express CK7, HER2, and CEA, but are negative for melanocytic markers like S100 and HMB-45 [8].

Imaging, including MRI, plays a vital role in detecting non-palpable underlying disease, especially in cases of DCIS. However, imaging alone may not rule out malignancy in chronic nipple lesions. Thus, skin biopsy remains the diagnostic cornerstone.

Surgical treatment is the standard of care, with mastectomy being the common approach for cases involving the entire nipple-areolar complex or with extensive DCIS or invasive cancer. In select cases, breast-conserving surgery with radiotherapy may be considered [9]. In HER2-positive tumors, trastuzumab-based therapy has shown to improve survival outcomes and reduce recurrence [10].

The prognosis depends on multiple factors, including the presence and type of associated carcinoma, HER2 status, lymph node involvement, and margin status after surgery. In the absence of invasive disease or lymph node metastasis, long-term outcomes are generally favorable.

Conclusion

This case illustrates a diagnostically challenging presentation of Paget's disease of the breast, an indolent, asymptomatic lesion persisting for years without a palpable mass. It serves as an important reminder that not all chronic nipple lesions are benign, and that persistent, treatment-resistant plaques should be biopsied early. Dermatologists, general practitioners, and breast specialists must maintain a high degree of suspicion and collaborate for timely referral and intervention. Early diagnosis has the potential to significantly impact patient outcomes, reduce morbidity, and guide individualized treatment plans based on molecular characteristics such as HER2 positivity. By recognizing the subtle presentations of this rare disease, clinicians can intervene before invasive transformation occurs.

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References

1. Kanitakis J. Mammary and extramammary Paget's disease. *J Eur Acad Dermatol Venereol*. 2007;21(5):581–90.
2. Stojadinovic A, et al. Paget's disease of the breast: a 30-year experience. *J Am Coll Surg*. 1999;189(3):354–64.
3. Caliskan M, et al. Paget's disease of the breast: clinical, pathologic, and prognostic features. *Breast J*. 2004;10(6):454–61.
4. Sakorafas GH, et al. Paget's disease of the breast: a review. *Cancer Treat Rev*. 2001;27(1):9–18.
5. Paget J. On disease of the mammary areola preceding cancer of the mammary gland. *St Bartholomew's Hosp Rep*. 1874;10:87–9.
6. Wong SM, Freedman RA. Paget disease of the breast. *UpToDate*. 2023.
7. Fitzgibbons PL, et al. Prognostic factors in breast cancer. *Arch Pathol Lab Med*. 2000;124(7):966–78.
8. Colpaert C, et al. Immunohistochemical differentiation between mammary Paget's disease and other intraepidermal malignancies. *Histopathology*. 2001;39(2):141–9.
9. Chen CY, et al. Breast-conserving therapy in Paget's disease. *Ann Surg Oncol*. 2013;20(6):2215–22.
10. Kaufman B, et al. Trastuzumab plus anastrozole in HER2-positive metastatic breast cancer. *J Clin Oncol*. 2009;27(33):5529–37.

Case Report

Amyand's Hernia with Perforated Caecum Necessitating Right Hemicolectomy: A Rare Surgical Emergency

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Abstract:

Introduction

Amyand's hernia refers to the presence of the appendix within the sac of an inguinal hernia. It is an uncommon entity, occurring in about 1% of inguinal hernias, while complications such as acute or perforated appendicitis inside the hernia sac are reported in around 0.1% of cases 1,2. The condition was first described by the English surgeon Claudius Amyand, who in 1735 performed the earliest documented appendectomy on an 11-year-old boy with a right inguinal hernia³.

This report describes a rare presentation of Amyand's hernia in an elderly gentleman at Teaching Hospital Batticaloa. To our knowledge, no locally reported cases of Amyand's hernia with caecal perforation were identified in the available literature.

Keywords: Amyand's hernia, inguinal hernia, appendectomy, Caecal perforation.

Case History

A 76-year-old gentleman presented to our surgical unit with a six-month history of a right inguinal lump, which had become irreducible over the past 10 days. He reported intermittent low-grade fever, vomiting, and diffuse lower abdominal discomfort. His bowels had not opened for the past five days. He denied any chronic medical conditions or prior abdominal surgeries.

On examination, there was an irreducible right inguinal hernia with features of strangulation: the swelling was tender, erythematous, and lacked a cough impulse.

The patient was taken for urgent surgical exploration without delay. An inguinal incision revealed a hernia sac containing the appendix along with a portion of the caecum (Figure 1). A perforation was noted on the anterior caecal wall. Given the extent of contamination and the non-viability of the caecum, the incision was extended via a lower midline laparotomy. The terminal ileum and proximal ascending colon were mobilized, and a right hemicolectomy with primary ileo-transverse anastomosis was performed. The hernial defect was closed

primarily without a mesh due to the contaminated field. Intra-abdominal lavage was carried out, and the patient was transferred to the ICU for close monitoring. Broad-spectrum antibiotics were continued.

Postoperatively, the patient developed acute coronary syndrome, heart failure, and acute kidney injury. Despite intensive medical management, he succumbed to cardiogenic shock.

Histopathological examination confirmed ischemic necrosis of the bowel.



Figure 1. intraoperative figure showing perforated caecal wall.

Discussion

Amyand's hernia is rare and may present with a wide spectrum of clinical features⁴. Management is often guided by the classification system proposed by Losanoff and Basson, which helps tailor the surgical approach³:

- Type 1: Normal appendix – reduction of the hernia and mesh repair.
- Type 2: Inflamed appendix – appendectomy through the sac followed by hernia repair with mesh.
- Type 3: Appendicitis with peritonitis or sepsis – laparotomy and hernia repair without mesh.
- Type 4: Amyand's hernia with other unrelated intra-abdominal pathology.

Our case corresponded to type 3 but was distinguished by the unusual finding of a perforated caecum rather than an inflamed appendix. A possible mechanism is strangulation of the herniated caecum, leading to ischemia and subsequent perforation. Intraoperatively, the necrotic caecal wall necessitated extension to a laparotomy. A right hemicolectomy was performed because of the non-viable bowel, and a primary anastomosis was undertaken as the patient was initially hemodynamically stable. The hernia was repaired primarily, but mesh placement was avoided due to contamination.

This case adds to the limited literature on caecal involvement in Amyand's hernia and highlights the importance of individualized surgical decision-making based on intraoperative findings^{2,4}.

Conclusion

This rare case of Amyand's hernia involving a perforated caecum required right hemicolectomy and posed a unique surgical challenge. Surgeons should remain vigilant for atypical intraoperative findings when exploring long-standing obstructed hernias, particularly in elderly patients. Preoperative optimization and meticulous postoperative monitoring are vital for improving outcomes. Given the rarity and diverse presentations of Amyand's hernia, each reported case provides valuable insights into its diagnosis and management.

References

1. Morales-Cárdenas A, Ploneda-Valencia CF, Sainz-Escárrega VH, Hernández-Campos AC, Navarro-Muniz E, López-Lizarraga CR, Bautista-López CA. Amyand hernia: Case report and review of the literature. *Ann Med Surg*. 2015 Jun 1;4(2):113-5.
2. Michalinos A, Moris D, Vernadakis S. Amyand's hernia: a review. *Am J Surg*. 2014 Jun 1;207(6):989-95.
3. Losanoff JE, Basson MD. Amyand hernia: a classification to improve management. *Hernia*. 2008 Jun;12(3):325-6.
4. D'Alia C, Lo Schiavo MG, Tonante A, Taranto F, Gagliano E, Bonanno L, Di Giuseppe G, Pagano D, Sturniolo G. Amyand's hernia: case report and review of the literature. *Hernia*. 2003 Jun;7(2):89-91.

Case Report

Obstructed Spigelian Hernia in a 60-Year-Old Female

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Abstract:

Spigelian hernia is a rare abdominal wall hernia occurring along the semilunar line, accounting for less than 2% of all abdominal wall hernias. It is often diagnosed late due to its subtle clinical presentation and may present with complications such as obstruction or strangulation. We report a case of an obstructed Spigelian hernia in a 60-year-old female, successfully managed with surgical repair.

Keywords: Spigelian hernia, imaging, obstruction, mass in left iliac fossa

Introduction

Spigelian hernia arises through a defect in the Spigelian aponeurosis, typically at the level of the arcuate line. Due to its interparietal course, it can be clinically occult, leading to delayed diagnosis and complications such as bowel obstruction. Early imaging is critical to avoid morbidity. This report highlights a rare case of an obstructed Spigelian hernia diagnosed with imaging and managed surgically with favorable outcomes.

Case Presentation

A 60-year-old female with a history of hysterectomy presented with left iliac fossa (LIF) pain for one day, associated with nausea and vomiting. On examination, there was generalized abdominal tenderness with a palpable mass in the LIF region. No features of peritonitis were noted. The ultrasound scan of abdomen showed locally dilated bowel loops in LIF with adjacent mild free fluid, suggestive of obstructed hernia. A contrast-enhanced CT (CECT) confirmed Spigelian hernia with bowel obstruction.

Differentials considered were incarcerated incisional hernia, obstructed parastomal hernia, and localized diverticular abscess.

An exploratory laparotomy with hernia repair was performed under general anesthesia. (Figure 1) Postoperative recovery was uneventful, and the patient was discharged on postoperative day 3. Suture removal on day 12 showed good wound healing and the patient remained asymptomatic.



Figure 1. Intraoperative view of obstructed Spigelian hernia

Discussion

Spigelian hernia is rare, often occurring in older females, and may present with nonspecific abdominal pain or a lateral abdominal wall swelling. Obstruction occurs in up to 27% of cases due to the narrow fascial defect. Early imaging is essential for diagnosis, with CECT abdomen being the gold standard. Prompt surgical intervention prevents ischemia and reduces morbidity. Awareness of atypical hernia locations is critical in elderly females presenting with localized abdominal pain and prior abdominal surgeries.

Bibliography

Moreno-Egea A, et al. 'Spigelian hernia: bibliographical study and presentation of a series of 28 patients.' *Hernia*. 2002;6(4):167-170.

Skandalakis PN, et al. 'Spigelian hernia: surgical anatomy, embryology, and technique of repair.' *Am Surg*. 2006;72(1):42-48.

Larson DW, Farley DR. 'Spigelian hernias: repair and outcome for 81 patients.' *World J Surg*. 2002;26(10):1277-1281.

Mittal T, et al. 'Spigelian hernia: repair and outcome in 15 cases at a tertiary care center.' *Hernia*. 2008;12(2):165-169.

Montes IS, Deysine M. 'Spigelian and other uncommon hernia repairs.' *Surg Clin N Am*. 2003;83:1235-1253.

Case Report

Renal Artery Variation Encountered During A Deceased Donor Organ Surgery

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Abstract:

Renal arterial anatomy exhibits significant variation, which holds important implications for donor nephrectomy, deceased donor retrieval, transplantation, and other surgical procedures. Among these, accessory renal arteries and precaval courses represent clinically relevant anomalies that may complicate surgical dissection and graft revascularization. We describe a rare vascular anomaly identified during deceased donor organ retrieval in a 70-year-old female. In addition to the normal right renal artery, an accessory renal artery was noted arising from the abdominal aorta at the level of L2 and coursing anterior to the inferior vena cava (precaval) to enter the renal hilum. The left kidney demonstrated a single renal artery in its usual anatomical position. Both kidneys were successfully retrieved and transplanted, with both recipients showing immediate graft function and no early postoperative complications. Multiple renal arteries occur in 25–30% of individuals, whereas a precaval course is reported in only 0.8–5%. The simultaneous presence of precaval and postcaval renal arteries on the same side is exceedingly rare. Although accessory renal arteries are associated with higher surgical complexity and increased risk of vascular complications, meticulous procurement and reconstruction techniques enable favorable outcomes: This case highlights the importance of recognizing renal arterial variations during donor retrieval to ensure safe procurement and optimize transplantation success.

Keywords: Renal artery variant, cadaveric kidney donor, renal transplant

Introduction

The anatomy of the renal arteries plays a crucial role in the selection of kidney donors, particularly in live donor evaluations. However, during cadaveric organ retrieval, preoperative imaging is often unavailable to assess vascular anatomy. Therefore, a thorough understanding of renal vascular anatomy and its variations is essential for safe and effective organ procurement.

Typically, each kidney is supplied by a single renal artery arising as a lateral branch of the abdominal aorta between the first and second lumbar vertebrae. The left renal artery is usually shorter, while the longer right renal artery passes posterior to the inferior vena cava (IVC) to reach the renal hilum. Common morphological variations include differences in the number of renal arteries, their course, and early (prehilar) branching patterns. Reported variations include multiple renal arteries, precaval courses, and even thoracic origin of the renal artery.

Here, we report a case encountered during deceased donor organ retrieval, in which multiple right renal arteries were identified, including both precaval and postcaval arteries. This case emphasizes the importance of recognizing renal arterial anomalies during procurement to avoid inadvertent injury.

Case report

A deceased donor organ retrieval was performed on a 70-year-old female. A midline laparotomy with transverse extension was carried out to facilitate the procedure. During mobilization, an accessory right renal artery was identified arising from the aorta at the level of the second lumbar vertebra. This artery coursed anterior to the inferior vena cava (IVC) to enter the right renal hilum. There was no evidence of hydronephrosis. The left kidney had a single renal artery in its typical anatomical position. The right kidney also had a normal renal artery present in

the usual location. Both kidneys were drained by a single renal vein each.

Both kidneys were successfully retrieved for transplantation. Postoperatively, both recipients demonstrated immediate graft function with no early transplant-related complications.



Figure 1 - Accessory renal artery to right kidney running anterior to the inferior vena (IVC)

Discussion

A thorough understanding of renal vascular anatomy is essential in both live and deceased donor organ retrieval, renal transplantation, and various urological and vascular procedures. Anatomical variations in renal arteries are not uncommon, and failure to recognize them intraoperatively may result in vascular injury, inadequate organ perfusion, or technical difficulties in anastomosis during transplantation (Abdessater et al., 2022). The classical description states that each kidney is supplied by a single renal artery branching from the abdominal aorta at the level of L1–L2. However, studies have consistently reported that multiple renal arteries occur in approximately 25–30% of individuals, with a single artery present in only about 70% (Abdessater et al., 2022; Triantafyllou et al., 2024). These additional arteries may supply either the renal hilum (accessory hilar arteries) or directly enter the poles (polar arteries). Their presence is a result of the persistence of embryonic vessels that normally regress as the kidneys ascend from the pelvis to their final lumbar position (Singh et al., 2018).

In the present case, the unusual finding was the coexistence of both precaval and postcaval right renal arteries. A precaval course is reported in only 0.8–5%

of cases (Modi et al., 2008), making this a relatively rare anatomical anomaly. Even more exceptional is the simultaneous presence of both pre- and postcaval renal arteries in the same kidney, which has been documented only sporadically in the literature. Such variations have clinical relevance not only in transplantation but also in the interpretation of radiological imaging, endovascular interventions, and retroperitoneal surgery.

From a clinical standpoint, accessory and precaval renal arteries may be associated with pathological conditions. A precaval renal artery has been implicated in ureteropelvic junction obstruction and hydronephrosis due to its anterior compression of the ureter (Modi et al., 2008). However, in this donor, no hydronephrosis was observed, and both kidneys functioned well post-transplantation. Nonetheless, this reinforces the need for careful dissection during retrieval, as unrecognized accessory vessels may be inadvertently damaged, leading to ischemic injury in the graft or increased risk of postoperative complications in the recipient.

The surgical implications of accessory renal arteries are significant in transplantation. Studies indicate that kidneys with multiple arteries are at increased risk of vascular complications, delayed graft function, and higher technical complexity in arterial reconstruction (Bernal-García et al., 2022). Specifically, recipients of grafts with accessory arteries show a nearly 20% higher incidence of acute rejection and post-transplant viability loss compared to those with single renal arteries (Bernal-García et al., 2022). Despite this, modern microsurgical techniques and meticulous vascular reconstruction have largely mitigated these risks, allowing excellent outcomes even in kidneys with complex vascular anatomy. The present case highlights this, as both recipients had immediate graft function without early vascular or urological complications. Recent cadaveric and radiological studies further emphasize the high prevalence and variability of accessory renal arteries.

Triantafyllou et al. (2024) observed ARAs in 30.56% of specimens, with unilateral anomalies more common than bilateral ones, and a left-sided predominance. Similarly, in a donor nephrectomy series, Arudchelvam & Waruna Laksiri (2021) found multiple renal arteries in 14.5% and early branching in 21.4% of cases, often accompanied by multiple renal veins. These findings underscore the importance of comprehensive preoperative imaging in live donors and vigilant dissection in deceased donor procurement. Embryologically, the persistence of caudal mesonephric arteries explains the occurrence of ARAs.

Normally, as the kidneys ascend from the pelvis to the retroperitoneum, the lower arterial branches regress, while new branches form cranially from the abdominal aorta (Abdessater et al., 2022). Failure of regression results in accessory or polar arteries. Understanding this developmental process provides a framework for anticipating and recognizing such anomalies during surgery.

In conclusion, this case demonstrates a rare but clinically relevant vascular variation involving both precaval and postcaval renal arteries on the right side. Recognition of such anomalies during procurement is vital to avoid inadvertent vascular injury, ensure optimal graft perfusion, and facilitate successful transplantation. Although multiple or aberrant renal arteries increase surgical complexity, careful dissection and reconstruction allow excellent graft outcomes, as demonstrated by the immediate function observed in both recipients.

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References

1. Panis, A., De La Taille, A., Parier, B., Drouin, S. J., Matignon, M., Anglicheau, D., Fournier, C., Méjean, A., & Timsit, M.-O. (2025). Does the Sacrifice of Accessory Renal Arteries Impair Functional Outcomes After Living Donor Kidney Transplantation? A Retrospective Single-Center Cohort Study of 251 Recipients. *Clinical Transplantation*, 39(7), e70229. <https://doi.org/10.1111/ctr.70229>
2. Triantafyllou, G., Paschopoulos, I., Węgiel, A., Olewnik, Ł., Tsakotos, G., Zielinska, N., & Piagkou, M. (2024). The accessory renal arteries: A systematic review with meta-analysis. *Clinical Anatomy*. <https://doi.org/10.1002/ca.24255>
3. Bernal-Garcia, M., Matamoros, J., Sofia, G., & Alejandra, M. (2022). Clinical implications of the accessory renal artery. A systematic literature review. *Revista de Nefrología, Diálisis y Trasplante*, 41(3), 214–228. <https://www.medigraphic.com/cgi-bin/new/resumenI.cgi?IDARTICULO=108537>
4. Abdessater M, Alechinsky L, Parra J, Malaquin G, Huot O, Bastien O, et al. Anatomical variations of the renal artery based on the surgeon's direct observation: A French perspective. *Morphologie* [Internet]. 2022;106(352):15–22. Available from: <http://dx.doi.org/10.1016/j.morpho.2021.01.005>
5. Tardo DT, Briggs C, Ahern G, Pitman A, Sinha S. Anatomical variations of the renal arterial vasculature: An Australian perspective. *J Med Imaging Radiat Oncol* [Internet]. 2017;61(5):643–9. Available from: <http://dx.doi.org/10.1111/1754-9485.12618>
6. Researchgate.net. [cited 2025 Apr 9]. Available from: https://www.researchgate.net/publication/341256980_VARIATIONS_OF_RENAL_ARTERY_A_CADAVERIC_STUDY
7. Farahzadi A, Mahmoodzadeh H, Gopal N. A solitary precaval right renal artery: A case report. *Clin Case Rep* [Internet]. 2022;10(6):e05866. Available from: <http://dx.doi.org/10.1002/ccr3.5866>
8. Modi PR, Rizvi SJ, Gupta R, Patel S, Trivedi A. Retroperitoneoscopic right-sided donor nephrectomy with pre- and postcaval renal arteries. *Urology* [Internet]. 2008;72(3):672–4. Available from: <http://dx.doi.org/10.1016/j.urology.2008.06.006>
9. Arudchelvam, J. and Laksiri, W. (2021) 'Anatomical variations of the renal vasculature and outcome of live donor nephrectomies: experience of a single surgeon', *Sri Lanka Journal of Surgery*, 39(2), p. 28-30. Available at: <https://doi.org/10.4038/sljs.v39i2.8817>

Case Report

Accidental Strangulation by Mother's Hair, a Rare Risk of Co-Sleeping

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Abstract:

Hair tourniquet syndrome is often included in the medical evaluation of an irritable or crying infant, with most cases affecting the digits and external genitalia. Strangulation of the neck caused by hair tourniquet syndrome occurs less frequently when a young child co-sleeps with family members who have long hair.

A father discovered his 20-month-old son entangled and strangled in his mother's hair around 4 am. The baby's head had become entangled while sleeping with his parents on their bed. His parents faced difficulty in removing him. There was no respiratory distress, and they went back to sleep after untangling him. Upon waking, the parents noted the petechial rashes on his face and a strangulation mark around the neck and brought him to the emergency department (ED). His vital signs remained stable, and his pulse oximeter reading was 100%. He had ligature marks around his neck, petechiae on his face and neck, and oedema in the facial tissues. He was otherwise healthy, with no airway compromise or difficulty swallowing. The remainder of the examination was unremarkable.

Infants and children's sleeping arrangements are determined by a variety of factors. As part of proactive guidance, parents should be advised about the dangers of co-sleeping their children with family members who have long hair. Increased physician and parent awareness of accidental strangulation from the hair tourniquet syndrome plays an important role in preventing potentially fatal outcomes

Keywords: Hair strangulation, Co-sleeping, Facial Petechiae, Facial Oedema

Introduction

Although relatively rare, hair tourniquet syndrome has been reported since the 17th century (1,2). Hair tourniquet syndrome is often included in the medical evaluation of an irritable or crying infant, with most cases affecting the digits and external genitalia (3). Strangulation of the neck caused by hair tourniquet syndrome occurs less frequently when a young child co-sleeps with family members who have long hair (4). We report a 20-month-old boy with hair tourniquet syndrome causing signs and symptoms of acute strangulation from Australia.

Case report

At 4 am, a father discovered his 20-month-old son entangled and strangled in his mother's hair. The baby boy had been sleeping with his parents in their bed. The baby became entangled on top of his head, and his parents were initially unable to untangle and remove him. After that, he

cried and had a bottle of milk. There was no respiratory distress noted and they went back to sleep. At 8 am, after waking up parents noted the petechial rashes on his face and a strangulation mark around the neck and presented him to the emergency department (ED). When the child arrived at the ED, he was generally cheerful and in good health. His vital signs remained stable, and his pulse oximeter reading was 100%. He had ligature marks around his neck, petechiae on his face and neck, and edema in the facial tissues. (Figures 1 & 2). He was otherwise healthy, with no airway compromise or difficulty swallowing. The remainder of the examination was unremarkable.

Given the unusual presentation, the case was approached as per the child protection concerns. The child protection authority was notified, and a full workup was performed. The history has remained consistent from both parents and the social history revealed no risk factors for child abuse. His mother had 57cm length of hair. His basic

investigations including full blood examination, clotting profile, and liver function test were normal. The skeletal survey was unremarkable. The child remained well and was subsequently discharged from the paediatric ward with safety netting advices.



Figure 1. Showing the petechial rash on the neck and the face



Figure 2. Clear strangulation mark around the neck

Discussion

The typical hair tourniquet syndrome entails one single human hair or fine thread causing a tourniquet effect on an appendage (3). If not promptly identified and promptly solved, this syndrome may lead to necrosis of the affected appendage due to impaired lymphatic drainage, subsequently causing arterial inflow obstruction. Hair tourniquets are most common in children under 6 months of age (5). Only a few cases of human hair strangulation have been reported in literature to date (1,2). Although the clinical aspects of hair tourniquet syndrome are

well-documented, there is still debate about whether it is abusive or accidental (3,4). Rare cases of child abuse involve a carer creating a genital tourniquet to prevent nocturnal enuresis. Although rare, unintentional hair tourniquets are more common.

Most of the cases of the hair strangulations are due to co-sleeping. Infants and children's sleeping arrangements are determined by a variety of factors, including economic constraints (e.g., inability to afford multiple beds), cultural beliefs of their carers, and beliefs that co-sleeping between infants and parents is beneficial. If parents want to allow their children to sleep together (with siblings or parents), we recommend taking proper precautions to reduce the risk of a hair tourniquet strangulation incident (3,5).

Conclusion

Increased physician and parent awareness of accidental strangulation from the hair tourniquet syndrome plays an important role in preventing potentially fatal outcomes. As part of proactive guidance, parents should be advised about the dangers of co-sleeping their children with family members who have long hair.

Reference:

1. Chegwiddden HJ, Poirier MP. Near strangulation as a result of hair tourniquet syndrome. *Clinical pediatrics*. 2005 May;44(4):359-61. Wong K, Tiyyagura G, Langhan ML. Accidental strangulation: a rare but potential risk of co-sleeping. *Pediatric Oncall Journal*. 2019 Mar 23;16(1):21-2
2. Milkovich SM, Owens J, Stool D, Chen X, Beran M. Accidental childhood strangulation by human hair. *International journal of pediatric otorhinolaryngology*. 2005 Dec 1;69(12):1621-8.
3. Saad AZ, Purcell EM, McCann JJ. Hair-thread tourniquet syndrome in an infant with bony erosion: a case report, literature review, and meta-analysis. *Annals of plastic surgery*. 2006 Oct 1;57(4):447-52.
4. Murata Y, Sakakibara H. Neck hair-thread tourniquet syndrome by co-sleeping with family: a case report and literature review. *Cureus*. 2023 May 28;15(5).



Review Article

A Healthcare Leadership Perspective on Cleaner Production in Sri Lankan Hospitals: from Policy to Practice

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Introduction

Health-care institutions are paradoxical entities: while they exist to protect and restore human health, their routine operations contribute significantly to environmental degradation through excessive resource consumption, waste generation, and greenhouse gas emissions. Hospitals are among the most energy-intensive public sector institutions, operating continuously and requiring large volumes of electricity, water, pharmaceuticals, chemicals, and single-use materials. Globally, the health sector accounts for nearly 5% of total greenhouse gas emissions, positioning it as a major contributor to climate change—a phenomenon increasingly recognized as the greatest public health threat of the 21st century [1].

The concept of Cleaner Production (CP) emerged in the early 1990s within industrial sectors in Europe, particularly Austria, as a preventive environmental management strategy aimed at reducing pollution at source, improving resource efficiency, and minimizing waste generation rather than relying solely on end-of-pipe solutions. Over time, this concept expanded beyond manufacturing into service sectors, including health care, due to its demonstrated economic, environmental, and social benefits [2].

Sri Lanka recognized the importance of cleaner production early, formulating a National Cleaner Production Policy through the Ministry of Environment and Natural Resources in collaboration with key stakeholders, including the Ministry of Health. The policy received Cabinet approval in 2004, followed by the development of a Cleaner Production Policy for the Health Sector in 2007. Despite this policy foundation, systematic implementation across public hospitals remains limited and uneven.

From a hospital director's perspective, cleaner production is not merely an environmental agenda; it is a strategic management approach that enhances operational efficiency, reduces costs, improves staff morale, safeguards patient health, and strengthens institutional resilience. This article critically reviews the concept of cleaner production in hospitals, examines its public health implications, identifies gaps in existing knowledge, evaluates applicability to Sri Lanka, and proposes actionable recommendations for policy and practice.

Literature Review:

Cleaner Production and Environmental Sustainability

Cleaner production is defined by the United Nations Environment Program (UNEP) as the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase efficiency and reduce risks to humans and the environment [3]. Unlike traditional pollution control methods, CP emphasizes waste prevention, reduced toxicity, and optimal use of resources across the entire life cycle, from raw material extraction to final disposal, often described as a “cradle-to-cradle” approach.

In health-care settings, cleaner production aligns closely with the principles of sustainable health systems, which aim to deliver quality care without compromising ecological integrity or future generations' capacity to meet their health needs.

Carbon Footprint of Health-Care Systems

A carbon footprint refers to the total greenhouse gas emissions generated directly or indirectly by human activities, measured in carbon dioxide equivalents. Globally, the average per capita carbon footprint is approximately four metric tons annually, with higher values in high-income countries [4]. Health-care-related

emissions arise primarily from energy consumption, transportation, procurement of goods (including pharmaceuticals and medical devices), food services, and waste management.

Studies from the United Kingdom and United States demonstrate that hospitals' largest emission sources include electricity generation, heating, ventilation and air conditioning systems, and supply chains [5]. Transportation, staff commuting, patient travel, ambulance services, and logistics also contributes substantially. These findings underscore the need for comprehensive strategies addressing both direct and indirect emissions.

Environmental Pollution and Health Outcomes

Environmental pollution resulting from unsustainable industrialization and consumption patterns adversely affects air, water, and soil quality. Exposure to polluted environments is associated with respiratory diseases, cardiovascular illnesses, cancers, neurodevelopmental disorders, and adverse pregnancy outcomes [6]. Hospitals, if poorly managed, can exacerbate these risks through improper disposal of hazardous waste, chemical releases, and incineration practices.

Cleaner production therefore serves as a public health intervention, reducing exposure to harmful pollutants and supporting healthier environments for patients, staff, and surrounding communities.

Cleaner Production in Hospitals

Hospitals are complex organizations with diverse operational units, including wards, laboratories, operating theatres, pharmacies, kitchens, laundries, and administrative offices. Cleaner production interventions have been successfully implemented in hospitals worldwide, particularly in Latin America and Europe, resulting in reduced energy and water consumption, lower waste volumes, cost savings, and improved occupational health [7].

The World Health Organization (WHO) and Health Care Without Harm have jointly promoted the concept of Climate-Friendly Hospitals, identifying seven key elements: energy efficiency, green building design, alternative energy generation, sustainable transportation, sustainable food systems, waste reduction, and water conservation [8]. These elements provide a practical framework for operationalizing cleaner production in health-care settings.

Organizational Culture and Sustainable Consumption

A critical dimension of cleaner production is organizational culture. Transitioning from a "wasteful culture" to a "waste-minimized culture" requires behavioral change, leadership commitment, and staff engagement. Sustainable

consumption in hospitals does not imply reducing essential services, but rather consuming intelligently by changing consumption patterns, redesigning processes, substituting products with services, and conserving resources without compromising quality of care [9].

Public Health Implications:

Cleaner production in hospitals has profound public health implications at multiple levels—individual, institutional, community, and national.

Occupational and Patient Health

Reducing chemical toxicity, improving indoor air quality, and minimizing noise and waste contribute to safer and healthier working environments for staff. Improved environmental conditions reduce stress, enhance mental well-being, and increase job satisfaction. For patients, particularly those with compromised immunity, cleaner environments reduce infection risks and support recovery.

Environmental Health Protection

Proper segregation and management of health-care waste prevent contamination of soil and water sources. Reduced incineration and controlled chemical usage decrease emissions of dioxins, furans, and particulate matter, which are linked to cancer and respiratory diseases. Cleaner hospitals thus play a protective role in safeguarding community environmental health.

Climate Change Mitigation and Adaptation

By reducing energy consumption, adopting renewable energy sources, and optimizing transportation systems, hospitals can significantly lower their carbon footprint. Climate-resilient hospitals are better equipped to function during extreme weather events, power outages, and disasters—an increasingly important consideration for Sri Lanka as a climate-vulnerable island nation.

Health System Efficiency and Economic Benefits

Cleaner production leads to cost savings through reduced utility bills, lower waste treatment costs, and more efficient procurement. These savings can be redirected to improve service delivery, expand access, and invest in staff development—enhancing overall health system performance.

Gaps in the Existing Knowledge:

Despite growing global literature, several gaps remain:

1. **Limited empirical evidence from low- and middle-income countries**, particularly South Asia, on the long-term impacts of cleaner production in public hospitals.

2. **Insufficient Sri Lanka-specific data** on hospital carbon footprints, resource consumption patterns, and waste streams.
3. **Lack of standardized indicators** for monitoring and evaluating cleaner production interventions in health-care settings.
4. **Minimal research on behavioral and organizational determinants** influencing successful adoption of cleaner production practices.
5. **Scarcity of economic evaluations** demonstrating cost-effectiveness and return on investment in cleaner hospital initiatives.
3. **Capacity Building:** Conduct regular training programs for all staff categories focusing on energy conservation, waste minimization, and safe chemical use.
4. **Monitoring and Evaluation:** Develop standardized indicators and conduct routine audits of energy, water, and waste management practices.
5. **Infrastructure Investment:** Promote solar energy, rainwater harvesting, water-efficient fixtures, and green building retrofits.
6. **Research and Evidence Generation:** Encourage operational research and pilot projects to generate Sri Lanka-specific evidence.

Addressing these gaps is essential to inform policy, guide investment, and scale up successful interventions.

Applicability of the Evidence to Sri Lanka:

Sri Lanka's publicly funded health system, extensive hospital network, and strong preventive health tradition provide a favorable context for cleaner production implementation. Many recommended interventions—such as energy conservation, water harvesting, waste segregation, and behavioral change—require minimal capital investment and align well with existing infrastructure.

However, challenges include ageing hospital buildings, limited autonomy at institutional level, competing service delivery priorities, and inadequate monitoring mechanisms. Regional climatic diversity, resource availability, and hospital size necessitate context-specific solutions rather than a one-size-fits-all approach.

The principles outlined in WHO's climate-friendly hospital framework are highly applicable to Sri Lanka, particularly given rising energy costs, waste management challenges, and increasing climate-related health risks.

Recommendations:

1. **Policy Integration:** Embed cleaner production targets into national health policies, hospital accreditation standards, and performance indicators.
2. **Leadership and Governance:** Strengthen leadership capacity among hospital directors and administrators to champion cleaner production initiatives.
7. **Stakeholder Engagement:** Foster partnerships with local authorities, environmental agencies, and communities to strengthen waste management and sustainability efforts.

References

1. Watts N, et al. The Lancet Countdown on health and climate change. *Lancet*. 2018;392:2479–514.
2. Fresner J, et al. Cleaner production in practice. *J Clean Prod*. 2010;18:507–15.
3. United Nations Environment Programme. *Cleaner Production: Key Elements*. UNEP; 2002.
4. Wiedmann T, Minx J. A definition of carbon footprint. *Ecol Econ Res Trends*. 2008;1:1–11.
5. Eckelman MJ, Sherman J. Environmental impacts of the U.S. health care system. *PLoS One*. 2016;11:e0157014.
6. Landrigan PJ, et al. Pollution and global health. *Lancet*. 2018;391:462–512.
7. *Health Care Without Harm. Global Green and Healthy Hospitals Agenda*. HCWH; 2015.
8. *World Health Organization. Healthy Hospitals, Healthy Planet, Healthy People*. WHO; 2009.
9. Tukker A, et al. Sustainable consumption and production. *J Ind Ecol*. 2008;12:1–4.

Short Communication

Emergency Management of Convulsions due to Acute Poisoning from an Unknown Substance

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Introduction

Sudden-onset seizures without a clear cause are common presentations in emergency department. Seizure events that occur close together in time to an acute central nervous system (CNS) insult can result from ischaemic, metabolic, toxic, structural, infectious, or inflammatory causes [1]. Poisoning can be a hidden cause, requiring clinicians to act quickly to stabilise the patient while exploring diagnostic clues. Nitric acid (HNO₃), commonly called aqua fortis, is a highly corrosive mineral acid [2]. It is usually used in industrial processes where cases of acute poisoning are most often [3,4].

Case presentation and therapeutic intervention

A previously healthy 42-year-old man, with known hypothyroidism on levothyroxine, developed a sudden, prolonged seizure. A background of family conflict suggested possible intentional poisoning.

On arrival at the Accident and Emergency Unit, the patient was actively seizing with a partially blocked airway and low oxygen levels and he soon progressed to respiratory arrest. Point of care tests indicated metabolic acidosis with a high anion gap and hypokalaemia. Despite thorough assessment, the exact toxin was unclear due to delayed toxicology results, leading to a provisional diagnosis of undifferentiated poisoning causing convulsions and respiratory arrest, with other causes also considered.

The patient's airway was promptly secured and mechanically ventilated. Seizure was managed successfully with intravenous midazolam. Considered potential risk of aspiration, prophylactic antibiotics were administered. Gastric lavage was performed to limit toxin absorption. When his haemodynamic and respiratory vitals

were stable, the patient was moved to the ICU for two days, then transferred to the medical ward on the third day. Throughout admission, comprehensive investigations—including blood work, imaging (NCCT, MRI and MRA of brain), and toxicology screens—were carried out to identify the cause of the seizures, but all results were unremarkable and common illicit substances were excluded.

On the third day, after regaining consciousness and becoming fully alert, the patient disclosed that he had consumed fruit juice laced with a goldsmith's chemical. He explained that the chemical had been brought home a year earlier and stored in a concealed location.

Discussion

Nitric acid (HNO₃) is a highly corrosive and toxic chemical, commonly used in goldsmithing. Its hazards depend on the method and extent of exposure. Inhalation can cause severe respiratory issues, including life-threatening pulmonary oedema. Ingestion leads to intense burns in the digestive tract, pain, vomiting, perforation, metabolic acidosis, and possible organ damage. Skin and eye contact may result in deep burns, tissue death, scarring, and even permanent vision loss. The severity of poisoning is influenced by the acid's concentration, duration of exposure, and how quickly treatment is started.

In this reported case, a patient ingested a small quantity of nitric acid that had been stored for a year, potentially altering its toxicity. Prompt recognition and adherence to emergency protocols, such as immediate airway management and seizure control, were crucial in preventing further complications. Diagnosis was challenging due to the lack of screening for occupational toxins, so clinical suspicion and recognition of poisoning syndromes were essential.

This case underscores the importance of early identification and management of poisoning, particularly when symptoms escalate rapidly. Timely stabilisation, especially airway protection and seizure management, significantly improves outcomes. Rapid, thorough clinical assessment and strict adherence to emergency protocols are vital, especially where specialised diagnostic resources are limited. The report also highlights the need to enhance access to diagnostic tools for occupational and industrial poisons to improve patient care in similar scenarios.

Informed Consent

The patient gave informed consent for publishing this case report, with assurances of confidentiality.

Keywords: Sudden-onset convulsions, unknown poisoning, resuscitation, high anion gap metabolic acidosis, hypokalaemia

References

1. Beghi E, Carpio A, Forsgren L, Hesdorffer DC, Malmgren K, Sander JW, et al. Recommendation for a definition of acute symptomatic seizure. *Epilepsia* 2010;51: 671-5.
2. Speight, J.G. Industrial Inorganic Chemistry. In *Environmental Inorganic Chemistry for Engineers*; Speight, J.G., Ed.; Butterworth-Heinemann: Oxford, UK, 2017; pp. 111–169, ISBN 9780128498910.
3. Sharma, C.; Singh, R.; Gurjar, B.R.; Sahu, V.; Bhattacharya, S. 30—Emissions of Reactive Nitrogen from Energy and Industry Sectors in India. In *The Indian Nitrogen Assessment*; Abrol, Y.P., Adhya, T.K., Aneja, V.P., Raghuram, N., Pathak, H., Kulshrestha, U., Sharma, C., Singh, B., Eds.; Elsevier: Amsterdam, The Netherlands, 2017; pp. 483–488, ISBN 9780128118368. [CrossRef]
4. Public Health England. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/673594/Nitric_acid_TO_120118.pdf (accessed on 20 November 2022).
5. World Health Organization (WHO). (2004). *Guidelines for the Management of Common Poisonings*.



Quiz Answers

Quiz - 1

Answer – C – Pyogenic granuloma

Pyogenic granuloma (Lobular capillar haemangioma) is a type of common vascular lesion of the skin and mucosa and is actually a misnomer because it is neither infective nor a true granuloma but is a sudden proliferation of capillaries in response to trauma, irritation, hormonal influences, and drugs.

Clinically, it appears as an isolated, bright erythema, papule, or nodule characterized by friability and a tendency to bleed on touch after slight trauma.

Typically, there is a red homogeneous patch, white collarette sign, and white interlocking lines (white rail lines). Histology shows a lobular capillary proliferative lesion in an oedematous stroma. Biopsy is necessary when the diagnosis is uncertain and in excluding malignant mimics, for example, amelanotic melanoma.

Quiz - 2

Answer E - Macrophage activation syndrome

The description given is typical of Systemic Onset of Juvenile Idiopathic Arthritis (SOJIA). Juvenile Idiopathic Arthritis, is a group of rheumatoid illnesses, with the onset before the age of 16.

The most feared complication in SOJIA is Macrophage Activation Syndrome (MAS). It is a hyperinflammatory condition complicating autoimmune and rheumatological disorders, where there is activation in macrophages and T lymphocytes. Clinical features include persistent fever, cytopenias, liver dysfunction, coagulopathy and a very high ferritin. Bone marrow microscopy shows evidence of macrophages engulfing blood cell (haemophagocytosis).

(HLH -haemophagocytic lymphohistiocytosis is a similar condition triggered by infections or due to an inherited disorder)

Management includes immunosuppression with corticosteroids and biologics.

A & B, Acute renal failure and cerebral haemorrhage are expected complications of SLE

C, Coronary artery rupture is a complication if Kawasaki disease, where the illness is acute, not prolonged over months

D, DIC – can be the ultimate complication in many illnesses