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Editorial

The Impact of Doctors Going on Strike

Sathiadas MG

In recent days, the issue of doctors going on strike has once again come to the forefront, sparking debates and concerns across the country. The decision of healthcare professionals to withhold their services is a potent form of protest, one that demands attention due to its profound implications on public health and the healthcare system as a whole.

Firstly, it is crucial to recognize the underlying reasons that compel doctors to take such drastic action. Often, strikes are not born out of caprice but out of necessity—stemming from longstanding grievances over working conditions, inadequate resources, or disputes regarding compensation and benefits. These are issues that directly affect the quality of care patients receive and the well-being of those on the frontlines of healthcare delivery.

When doctors strike, the impact reverberates throughout the healthcare ecosystem. Patient care is disrupted and these consequences are not merely inconveniences; they can result in serious health risks for patients who rely on timely access to medical services. Moreover, the broader societal implications of doctors going on strike are profound. Trust in the healthcare system can erode, as patients and the public may feel abandoned or betrayed by those entrusted with their health. In times of crisis or uncertainty, such as during a pandemic or natural disaster, the absence of healthcare professionals can exacerbate fear and amplify the impact of the underlying emergency.

Strikes raise a range of ethical issues, related to patient care and perhaps most fundamentally, what healthcare workers and society owe one another when it comes to healthcare (1). Overwhelmingly arguments both for and against have focused on patient mortality and other outcomes. Several studies suggest that during junior doctor strikes emergency department can become more efficient on several metrics (e.g. waiting time) with more senior staff on the frontline. It is also noteworthy that in many cases, emergency services were able to be maintained or contingencies put in place to continue to deliver care with minimal disruption (2). In Sri Lanka Cancer care, Maternity, and child care services continue to function during a strike.

From a policy perspective, the occurrence of doctors' strikes underscores the need for effective mechanisms to address grievances and ensure the sustainable functioning of healthcare services (3). This includes fair negotiations between healthcare providers and administrators, transparent communication channels, and proactive measures to prevent issues from escalating to the point of strike action. Doctors, as influential members of society, can leverage public opinion and political ideologies to support their causes during strikes. Political parties or advocacy groups may also align themselves with healthcare professionals during labor disputes, amplifying the visibility and impact of the strike-through media coverage, public statements, or legislative support. A country like Sri-Lanka can easily be misled by such political influences.

However, it is essential to approach the issue with nuance. While strikes can be disruptive, they are often a last resort for healthcare workers who feel unheard or undervalued. It is incumbent upon healthcare institutions, governments, and society at large to listen attentively to the concerns raised by doctors and to work collaboratively towards solutions that prioritize both the welfare of healthcare professionals and the continuity of care for patients.

In conclusion, the decision of doctors to go on strike is a powerful statement that should prompt reflection and action from all stakeholders involved in healthcare. It highlights systemic challenges that must be addressed to ensure a resilient and equitable healthcare system. As we navigate these complex issues, it is imperative to prioritize dialogue, mutual respect, and the shared goal of safeguarding public health and well-being.

References:

1. Impact of strike action on health care delivery a scoping review. https://gala.gre.ac.uk/id/eprint/38264/7/38264_ESSEX_The_impact_of_strike_action_on_healthcare_delivery_A_scoping_review.pdf

2. Essex R, Weldon SM. The justification for strike action in healthcare: A systematic critical interpretive synthesis. Nurs Ethics. 2022 Aug;29(5):1152-1173. doi: 10.1177/09697330211022411. Epub 2022 Apr 12. PMID: 35411830; PMCID: PMC9442631.

3. Essex R, Milligan W, Williams G, Weldon SM. The impact of strike action on patient morbidity: A systematic literature review. Int J Health Plann Manage. 2022 May;37(3):1311-1326. doi: 10.1002/hpm.3418. Epub 2022 Jan 18. PMID: 35043468; PMCID: PMC9306929.

Arts and Humanities in Medical Education: Current and Future

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Modern medical education is facing several concurrent crises. The post-Covid era has shown growing reliance on remote learning, significant globalization of education, and unprecedented acceleration in the use of artificial intelligence in health and education. Despite these rapid changes in healthcare and education technologies, there persists a long-standing concern that medical education and training are associated with a decline in humane values and behaviours (1,2,3).

The primary humane attributes that have been described in medical education include altruism, empathy, and compassion, a spectrum of connected mental states or emotions that relate to understanding and responding to another's feelings. Compassion is a feeling that arises when witnessing another's suffering and motivates a desire to help, while empathy, is experiencing another's feelings, and sympathy is a feeling of sorrow and concern for another's pain or suffering (4,5,6). Altruism, in contrast, denotes an attitude of caring about others and helping them without expecting anything in return (7).

Measuring compassion and altruism is difficult, and most research is on empathy in medical education. The subsequent section of the article attempts to address a series of questions aimed to explore the current role of humanities in promoting humane attributes in health professionals, and potential future directions useful to medical schools.

Are humane attributes such as compassion and empathy necessary for health professionals?

There is compelling evidence highlighting the significance of compassion and empathy in clinical care. Patients consistently emphasize kindness as a crucial trait they prefer to see in doctors. Empirical studies have demonstrated that empathy yields improved diagnostic accuracy, enhanced drug compliance, and better health outcomes. Research also points to a troubling trend: a rapid decline in empathy observed during undergraduate medical courses (1,2,3). Therefore, medical educators need to take corrective action, at least, to reverse this trend of creating less compassionate healthcare workers!

A complicating factor is the emergence of Artificial Intelligence (AI) which is increasingly assuming a central role in healthcare. As AI has the potential to replace much of the technical expertise provided by human health workers, the importance of humane values and human skills will only intensify. Therefore, the cultivation of humane attributes such as compassion and empathy will become increasingly crucial.

Can empathy and compassion be developed or nurtured?

Research indicates that cultivating these qualities is indeed feasible, and universities like Stanford offer courses on nurturing compassion. Factors such as supportive work environments, the availability of positive role models, and engagement in reflective practices all play significant roles in fostering their development.

Figure 1 gives the Faculty of Medicine, University of Colombo Model to promote the growth of a more humane health professional (8). It shows the roles played by several interventions in the curriculum that could foster compassion in the learner.

- Narrative-Based Learning: Provides insight into the human dimension of illness. Patient narratives are commonly used as a trigger for discussions. Often, these highlight socio-economic, cultural or biographical aspects of a patient's life and help to understand the impact of illness on his/her life (9,10).

Emotional Intelligence: Enhances understanding of both others' and one's own emotions (11). Mindfulness and Meditation: Encourages introspection and self-reflection (12).

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Religion: Spirituality and religion shapes compassionate behaviours through their narratives and teachings by religious leaders. The Arts and Humanities: Increasingly utilized to foster empathy and compassion in healthcare professionals (13, 14).

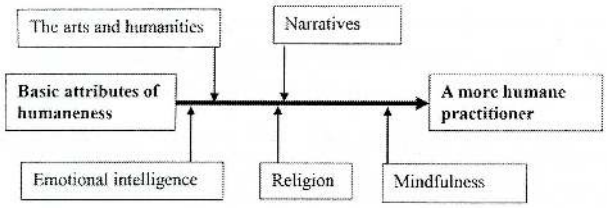

Figure 1: The Colombo Model of Developing a More Humane Health Professional

Is there a role for the arts and humanities to foster compassion in healthcare professionals?

Evidence suggests that exposure to the arts and humanities during medical education and training effectively shapes empathetic and compassionate physicians (13, 14). The phrase 'the arts and humanities' is used here to primarily encompass three major art forms: visual arts (e.g., painting, drawings, sculpture), literature (e.g. novels, short stories, poetry, story-telling), and performance arts (drama, cinema, dance). In contrast, medical humanities is an interdisciplinary field that integrates disciplines such as art, creative writing, drama, and anthropology into medical education and offers various strategies to enhance empathy and compassion (15, 16).

Role of the arts and humanities: International and regional experiences

In a recent scoping review, we delved into the role of the arts in medical education across the globe with a focus on the South-East Asia Region. Our findings revealed a diversity of artistic mediums being integrated into Medical Humanities courses. Table 1 a few examples drawn from the literature.

Lessons from The Colombo Experience (25)

In 1995, the Faculty of Medicine at the University of Colombo embarked on a significant curriculum reform and pioneered an integrated modular system with a longitudinal focus on Behavioural Sciences. This initiative, coordinated by the Behavioural Sciences Stream (BSS), and now known as the Humanities, Society, and Professionalism Stream (HSPS), emphasized topics such as personal development, communication skills, medical ethics, health management, and professionalism.

Table 1: Examples from literature

Art Form	Activities in the Curriculum
Visual art	Visual art is used to improve observational skills and promote empathy. Visual Thinking Strategy is one such approach. which is used to think more critically and systematically about images, based around 3 open-ended questions (17).
Creative writing and poetry	Students write, share, recite and discuss creative stories or poems written about their impactful experiences (18).
Story Telling	Through first-hand experiences, storytelling facilitates understanding of different perspectives of people and professionals (19). For example, stories on experienced of visible and/or invisible disabilities and their caregivers.
Theatre	Forum Theatre is a large group session which is participatory, in which a short scene is performed showing a moment of oppression or discrimination. The spectators interject and become the actors taking a role and show how they would change the dialogue/script (i.e. face the oppression) and have a different (better) outcome (20,21).
Films	Trigger Films use brief (3–10 min) movie clips to trigger debate and reflection, and help students address issues such as ethical dilemmas (22).
Literature	Read and discuss fiction and nonfiction literature that informs patient perceptions, socio-cultural contexts, and clinical practice (23).
Dance and movement	Students engage in dance and movement exercises and use them to express emotion and reduce stress (24).

Initially, artistic endeavours were primarily confined to extracurricular activities, such as concerts, art festivals, photography exhibitions, and musical events organized by students. However, in 2012, a subtle yet significant shift occurred with the introduction of the first formal lecture on "Illness from the Perspective of Humanities." Subsequent curriculum workshops emphasized the importance of enhancing the educational input from humanities, supported by research indicating that the arts fostered compassion and empathy in students. Since 2015, a few students have opted to do an art-related topic during their 4-week elective.

This momentum culminated in a milestone achievement in August 2016 with the official establishment of the Department of Medical Humanities. This was a significant achievement because it was the first department of its kind in Sri Lanka and possibly the entire region. The department organized expert-led lecture discussions to delve into the role of humanities in healthcare. This initiative paved the way for the inaugural International Conference on Medical Humanities in 2018, themed "Learning to be more humane: The Role of Medical Humanities." Notably, a half-day workshop on "Arts in Health Professional Education" which enriched , discussions on the intersection of art and health.

Insights gleaned from these activities were utilized in designing an innovative curriculum to promote humaneness and a person-centered approach to clinical practice. This curriculum incorporates a diverse range of educational strategies, including reflections on patient narratives, critique of short stories, discussions on poetry, large-group lectures on the neurophysiology of compassion and empathy, and student seminars reflecting on observations of kind and unkind behaviours in hospitals.

Amidst the challenges posed by the COVID-19 pandemic in 2021, the HSPS and the Department introduced an interactive series titled *Humanitas*. This initiative exploring contemporary health-related issues that are relevant to students, fostering transformative learning using the arts in an interactive manner has become the flagship program of the Department. Topics range from those addressing the plight of garment factory workers to LGBTQI to heartbreak.

Conclusions

Jaffna boasts a rich legacy of compassionate health professionals who dedicated their lives to serve suffering humans during tumultuous times of armed conflict. The university has been fortunate to have nurtured several such compassionate academic-health practitioners. The invaluable lessons in humaneness imparted by these individuals must be continued to inspire and guide future generations of health professionals. The University of Jaffna is presThis paper is based on the Dr. Nadarajah Sivarajah Memorial Lecture, delivered by the author at the Faculty of Medicine, University of Jaffna on 6th March 2024. It was held to commemorate the work of Dr. Nadarajah Sivarajah, an exemplary humane and compassionate academic community physician, from the Department of Community Medicine, University of Jaffna (26). His altruistic attitude and willingness to sacrifice his personal safety helped draw attention to the plight of malnourished children, maintain essential preventive services (such as vaccination of children) and establishment of an emergency ambulance service during an intensely violent conflict. Some of the established survive to this day: addressing the needs of the differently abled through the Association for Health Education and Development Trust (AHEAD Trust: https://www.aheadjaffna.org/about-us/), and a hospice through CAncer control North East, financed and helped by CANE UK, a charity (CANE): https://caneuk.org/jaffna-hospice/.

References:

1. Jones R. Declining altruism in medicine. BMJ. 2002 Mar 16;324(7338):624-5. : 10.1136/bmj.324.7338.62
2. Neumann M, Edelhäuser F, Tauschel D, et al. Empathy decline and its reasons: a systematic review of studies with medical students and residents. Academic Medicine. 2011;86(8):996-1009.
3. Newton BW, Barber L, Clardy J, Cleveland E, O'Sullivan P. Is there hardening of the heart during medical school? Academic Medicine. 2008; 83(3):244-249.
4. Singer, T,. Klimecki, OM, Empathy and compassion, Current Biology, 2014; 24 (18): R875-R878. DOI: 10.1016/j.cub.2014.06.054
5. Jayasinghe, S., Integrating compassion to clinical care: a review of an emerging 'science'. Ceylon Journal of Medical Science, 2017:54(1);3-8.

   DOI: 10.4038/cjms.v54i1.4822
6. Dohrenwend, Anne M. PhD. Defining Empathy to Better Teach, Measure, and Understand Its Impact. Academic Medicine 93(12):p 1754-1756, December 2018. | DOI: 10.1097/ACM.0000000000002427
7. Arman M. Empathy, sympathy, and altruism—An evident triad based on compassion. A theoretical model for caring. Scand J Caring Sci. 2023; 37: 862–871. DOI: 10.1111/scs.13163

8. Jayasinghe, S, de Abrew A, Amarasuriya, S, Fernando, S, Gunathilake, K Karunanayake, P, Rajasuriya, M. A Primer for Undergraduate Courses in Medical Humanities and Professionalism. Second Edition. 2023. Author publication

9. Childress, A, Lee PE, Toussant, R et al., Using Narrative Medicine workshops to improve empathy and emotional intelligence and address burnout among medical students. Academic Medicine 2022;97(11S):S120

10. DOI: 10.1097/ACM.0000000000004863

11. Impact of a narrative medicine programme on healthcare providers' empathy scores over time BMC Medical Education 2017;17(1):108

12. Emotional Intelligence, Goleman. D. Anniversary Edition. 2006, Bantam; London.

13. Mindfulness increases pro-social responses toward ostracized strangers through empathic concern. J Exp Psychol General. 2018;147:93-112

14. Chisolm MS & Bhugra D. The arts and humanities are fundamental to health professions education, International Review of Psychiatry, 2023; 35:7-8, 537-539, DOI: 10.1080/09540261.2023.2321034

15. Howley L, Gaufberg E, King B. The Fundamental Role of the Arts and Humanities in Medical Education. Washington, DC: Association of American Medical Colleges 2020.

16. Hegde S. Music therapy for mental disorder and mental health: the untapped potential of Indian classical music. British Journal of Psychiatry International. 2017;14(2):31-33.

17. van der Steen JT, van Soest-Poortvliet MC, van der Wouden JC, Bruinsma MS, Scholten RJ, Vink AC. Music-based therapeutic interventions for people with dementia. Cochrane Database Systematic Reviews. 2017;5:CD003477.

18. Cerqueira, A.R., Alves, A.S., Monteiro-Soares, M. et al. Visual Thinking Strategies in medical education: a systematic review. BMC Medical Education 2023;23:536. DOI: 10.1186/s12909-023-04470-3:

19. Joshi, A, Paralikar, S, Kataria, S, Kalra, J, Harkunni S, & Singh T. Poetry in medicine: a pedagogical tool to foster empathy among medical students and health care professionals, Journal of Poetry Therapy, 2022;35(2):85-97, DOI: 10.1080/08893675.2022.2043119

20. Liao HC, Wang YH. Storytelling in Medical Education: Narrative Medicine as a resource for interdisciplinary collaboration. Int J Environ Res Public Health. 2020;17(4):1135. DOI: 10.3390/ijerph17041135.

21. Gupta S, Agrawal A, Singh S, Singh N. Theatre of the Oppressed in medical humanities education: the road less travelled. Indian J Med Ethics. 2013 Jul-Sep;10(3):200-3. DOI: 10.20529/IJME.2013.059.

22. Shankar PR. A three-day workshop on the theatre of the oppressed in a Nepalese medical school. AMJ 2012, 5, 8, 440- 442. DOI: 10.21767/AMJ.2012.1351

23. Gangwani N, Singh S, Khaliq F. Trigger films to teach core competencies of ethics and professionalism to first-year medical and nursing students. Adv Physiol Educ. 2022;46(3):491-497. doi: 10.1152/advan.00041.2022.

24. DMani SS. Literary appreciation for medical students at International Medical University, Kuala Lumpur: the learner's experience Medical Humanities 2008;34:88-92.

25. Basso JC, Satyal MK, Rugh R. Dance on the brain: Enhancing intra- and inter-brain synchrony. Frontiers in Human Neuroscience. 2021;14:584312

26. Jayasinghe S, Fernando S. Developments in medical humanities in Sri Lanka: A call for regional and global action. TAPS 2023;8(4): 1-4 DOI: 10.29060/TAPS.2023-8-4/GP2878

27. Sivarajah M. Fourth Year Memorial Publication of Late Dr. Nadarajah Sivarajah.. Kumanan Book House 2023.

Review Article

Updates in Endoscopic Retrograde Cholangiopancreatography

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Abstract

Endoscopic retrograde cholangiopancreatography (ERCP) is a specialised endoscopic procedure for managing pancreatic and biliary diseases. Earlier in the 1970s, ERCP was mainly used for diagnostic purposes to evaluate the biliary and pancreatic ducts and surrounding structures. But nowadays, as non-invasive imaging studies advance, it is primarily used for therapeutic purposes though it is used for therapeutic and diagnostic purposes.

Therapeutic ERCP is broadly used in conditions that lead to impairment in bile flow and leak. The requirement of the ERCP extended further for evaluation of pancreatitis of unknown aetiology, preoperative evaluation of the patient with chronic pancreatitis and evaluation of the sphincter of Oddi by manometry.

Patients should be selected with a clear-cut indication for ERCP, avoiding unnecessary or marginally indicated ERCP, especially in high-risk patients. ERCP is usually performed using a dedicated side-viewing endoscope with the patient positioned prone on a fluoroscopy table under sedation or general anaesthesia. Proper positioning of the duodenoscope is the key to cannulation of the pancreatic or common bile ducts.

Keywords: ERCP, bile duct stones, cholangitis, duodenoscope, chronic pancreatitis, minimally invasive therapeutic procedure.

Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is a specialised endoscopic procedure for managing pancreatic and biliary diseases. The common bile duct (CBD) and/or the pancreatic duct (PD) are accessed via papillary orifices or surgical anastomoses [1]. This procedure combines the use of a side-viewing endoscope, also called duodenoscope and fluoroscopy [2]. The procedure is done by injecting a contrast medium, which helps visualise the pancreatic and biliary ductal systems.

The first endoscopy was developed and performed by Phillip Bozzini in 1806 [3] and the first bile duct (BD) imaging was performed in 1920 [1]. The specialised fibreoptic duodenoscope was first described by William McCune in 1968 and credited with the first report of endoscopic cannulation of the ampulla of Vater [4]. In 1973 first biliary sphincterotomy was performed to facilitate BD stone removal, and in 1974 the first endoscopic papillary balloon dilation was performed [1-2].

Earlier in the 1970s, ERCP was mainly used for diagnostic purposes to evaluate the BD and PDs [1]. But nowadays, advancements in non-invasive imaging studies such as Magnetic resonance cholangiopancreatography (MRCP), Contrast-enhanced computer tomography (CECT) and Endoscopic ultrasonography (EUS), ERCP is not preferred by clinicians for diagnostic.

Indication and Contraindication

ERCP is an advanced endoscopic procedure that should be performed by trained endoscopists using standard techniques, and there should be a clear indication for this procedure. The indication for ERCP may be diagnostic or, more frequently, therapeutic [1,6]. Therapeutic ERCP aims to re-establish the biliary drainage to the duodenum [1]. Therapeutic ERCP is broadly used in conditions that lead to impairment in bile flow (e.g.,

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biliary or pancreatic stones and malignant or benign stricture) and bile leaks [1,6]. Urgent or emergency ERCP is indicated when establishing biliary drainage is essential with or without a proven cause of biliary obstruction, e.g., ascending cholangitis [1-2,6].

Requirement of the ERCP extended further for evaluation of pancreatitis of unknown aetiology, preoperative evaluation of the patient with chronic pancreatitis and assessment of the sphincter of Oddi by manometry in patients with suspected type II Sphincter of Oddi dysfunction [2,4]. It is also helpful in endoscopic sphincterotomy in Choledocholithiasis, sphincter of Oddi dysfunction type I, Sump syndrome, papillary stenosis, stricture therapy and facilitating stent introduction or to enable access to the PD [2,6]. ERCP-guided stent placement mainly being used for benign or malignant strictures, fistulae, postoperative bile leak, or in high-risk patients with a large stone in the BD, which is difficult to remove [2,6-7]. In re-establishing bile flow, ERCP-guided dilation of intra-biliary strictures and balloon dilation of the papilla (sphincteroplasty) offer additional value [8,9]. Though the ERCP is primarily used for therapeutic indications, there are diagnostic indications where the ERCP becomes the primary tool for diagnosing some conditions that are unclear in imaging studies. In addition to facilitation of cholangioscopy and/or pancreatoscopy, the ERCP help in tissue sampling from PD or BD and ampullectomy of adenomatous lesions of the major papilla to ensure the biliary or pancreatic drainage [1,2,6].

ERCP should be avoided or cautiously performed in a patient with a previous history of pancreatoduodenectomy, coagulation disorder or using anticoagulant/antiplatelets, recent myocardial infarction and history of contrast dye anaphylaxis [2].

Patient preparation

The clinical condition of the patients and the treatment modalities should be thoroughly discussed with the patients and their family members compassionately before doing ERCP. While obtaining informed written consent, the patients should be aware of the procedure techniques, risks and complications, advantages and disadvantages of ERCP and alternatives [2].

All the patients should undergo pre-procedure evaluation with proper clinical history, examination, and investigative assessment for a successful procedure [2,10]. Basic investigations such as full blood count and prothrombin time/international normalised ratio needs to be checked prior to the procedure. In addition to cardiovascular, respiratory assessments and basic investigations, some conditions may need further investigations, such as coagulation screening in patients with coagulopathy, chest X-ray in patients with new respiratory symptoms and 2D Echo in patients with decompensated cardiac failure. Patients using anti-platelets or anti-coagulants should be evaluated and withhold or modify their medications at adequate intervals before the procedure [2,5].

Prophylactic antibiotics should be administered to high-risk patients before or after the procedure. Patients should be fasting for 6 hours before the procedure [1,5]. On top of all these preparations, the endoscopist should review all the previous abdominal imaging findings [CT and MRCP] just before the procedure [2,10].

Techniques and difficulties

ERCP is usually performed using a dedicated side-viewing endoscope with the patient positioned prone on a fluoroscopy table under sedation or general anaesthesia [1,2]. The duodenoscope is advanced to the second part of the duodenum and aligned with the major duodenal papilla to access the BD and/or PD. The major duodenal papilla appeared as a small, pink-coloured protuberance at the junction of the horizontal and the vertical duodenal folds (T-junction) (Figure 1) [2]. Proper positioning of the duodenoscope is the key to cannulating the PD or CBD. To cannulate CBD, the scope should be positioned to view the papilla in the upper part of the video monitor, and the cannulation device should be aimed slightly tangentially to the 11 o'clock position to make the cannulation easier [5,11]. PD cannulation can be achieved by an approach more perpendicular to the duodenal wall, and the device should be pointed to the one o'clock position [11].

Figure 1: Major duodenal papilla

Once deep cannulation has been obtained by the introducing cannulation device tip into the papillary orifice, radiopaque contrast is injected under fluoroscopic visualisation to confirm cannulation and proper positioning and to describe the normal anatomy of the duct and abnormalities. The wire guide approach also helps in deep cannulation, which involves a guide wire passage under fluoroscopy into the PD or CBD before the injection of contrast. PD access with guidewires and protection with pancreatic stents facilitate biliary access [2,11].

Obtaining biliary or pancreatic access can occasionally be challenging even for an advanced endoscopist in some conditions like duodenal or ampullary distortion by tumour, intra-diverticular papilla, or postsurgical ductal anastomoses [5,10]. A periampullary diverticulum,

which occurs in approximately 7.5% of patients, is the most common abnormality associated with difficult cannulation [2]. Many techniques and devices can help access BD or PDs when the standard cannulation technique is unsuccessful [5,11]. Pre-cut sphincterotomy is an incision made with a papillotome to enter the desired duct. It is generally associated with increased complications, possibly due to prior access attempts or the pre-cut itself [1]. In some cases, needle knife fistulotomy is also used for biliary access when there is a prominent papilla and dilated BD in which the roof of the papilla is punctured directly by avoiding the papillary orifice [1,2]. The rendezvous procedure also helps as an alternative for cannulation in difficult conditions. An interventional radiologist inserts a percutaneous trans hepatic catheter before or while doing the ERCP by using Endoscopic ultrasonography (EUS). EUS helps obtain antegrade access to the BD or PD, and a wire passes through the papillary or anastomotic orifice to complete ERCP. In the modern era, advanced endoscopists use EUS combined with ERCP as it helps with drainage and debridement of intra-abdominal and retroperitoneal collections, e.g., pseudocysts walled off pancreatic and peripancreatic necroses, and postoperative collections [1,11].

Though several alternative techniques are used in difficult cannulation of ERCP, no approach is universally superior to another (Table 1). The ideal approach is determined by operator expertise and the clinical situation [1].

Table 1: Commonly used therapeutic techniques for removal of bile duct stones

Biliary sphincterotomy
Stent placement
Large (>10 mm) balloon dilation
Balloon extraction
Basket extraction
Temporary plastic (or metallic) biliary stents
Lithotripsy techniques
Mechanical lithotripsy
Intraductal cholangioscopically directed lithotripsy
Electrohydraulic lithotripsy
Holmium laser lithotripsy
Extracorporeal shock wave lithotripsy

Sphincterotomy

Sphincterotomy helps to eliminate the anatomic barrier by cutting the biliary sphincter to allow impending stone passage and facilitate stone extraction (Figure 2) [1,2]. Sphincterotomy was performed using electric cauterisation to create an incision through the musculature of the biliary portion of the sphincter of Oddi. Sphincterotomy length should be tailored to the size of the bile duct. It is preferred to do up to the level of unroofing the papilla as it will help easy access to the CBD and reduces the risk of developing papillary necrosis. If it is not dilated, there is a risk of retroperitoneal perforation during sphincterotomy for CBD. The sphincterotome is also helpful in deep cannulation in a patient who underwent partial

gastrectomy with Billroth II anastomosis, as the standard technique is unsuccessful [2].

Figure 2: Fluoroscopy showing large pancreatic stones (a), basket extraction (b), and complete clearance (c)

Treating choledocholithiasis

Treatment involves sphincterotomes with an extraction basket and balloon. The baskets are used in conditions with duct dilatation and/or multiple large stones. In contrast, the balloons are used in conditions with no duct dilatation and/or single free-floating stone, and the balloons are also used when multiple small stones are present or when a large stone is being crushed [2,5,11]. In basket extraction, basket impaction within the duct is risky due to impending basket wires on the stone's surface. In these circumstances, mechanical lithotripsy helps break the stone trapped within the basket. The impaction of the basket can be prevented by extracting the distal stone first when multiple stones are present. It is also reduced by gently pulling the basket without closing it up to the periampullary level [2,11,12].

Papillary balloon dilatation (sphincteroplasty)

The special balloon performs papillary balloon dilatation under controlled pressure to dilate the ampulla. It can be performed alone or in combination with a small sphincterotomy to extract the stones (Figure 3) [9].

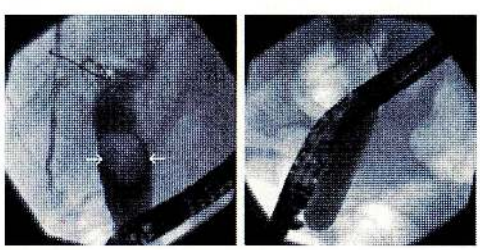

Figure 3 : Endoscopic papillary large balloon dilation to extract a very large BD stone after sphincterotomy but without requiring mechanical lithotripsy: very large stone (arrows), followed by balloon dilation to 15 mm (left to right).

There is less chance of developing post-procedure pancreatitis in combination with large balloon dilation with small sphincterotomy, and it is safer and allows stone extraction without mechanical lithotripsy [2,8-9]. This technique is preferred for patients with bleeding disorders, periampullary diverticulum, or Billroth II gastrectomy. In this procedure, the balloon inflated to 10mm for 20 to 60 seconds (Figure 4) [2,11].

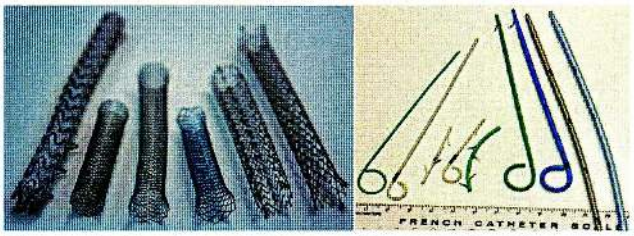

Figure 4 a): A variety of self-expanding metallic biliary stents, both covered (three on the left), and uncovered (three on the right). b) A variety of plastic stents used in the pancreatic duct for prophylactic and therapeutic purposes, ranging from 3 Fr on the left to 10 Fr on the right.

Endoscopic prosthetic stent placement

Prosthetic stent placement is an integral part of therapeutic ERCP. Stent placement is helpful in the re-establishment of biliary and pancreatic flow [1]. The stenting is primarily indicated for palliative management in malignant conditions and treatment of benign conditions such as stricture of the biliary tree, bile duct stones and bile leaks [2]. Pancreatic stents are also placed to treat recurrent pancreatitis, strictures, and duct leaks, to facilitate pancreatic stone removal, and to reduce the risk of post-ERCP pancreatitis [1,2,7,13-14].

In pancreatic or biliary malignant obstructions, the stents bridge surgery or palliation in patients with unresectable tumours with terminal disease [7,14]. Malignant conditions in which stenting is usually indicated are distal malignant biliary obstruction (often due to pancreatic cancer, cholangiocarcinoma, or external compression from lymph node metastases), hilar obstruction, may resulting from cholangiocarcinoma (Klatskin tumour), gallbladder carcinoma, hepatoma, local extension of pancreatic cancer, solid metastases, or compression from lymph nodes [1,7,13-14].

The pancreaticobiliary stents are in two categories, plastic and metallic stents (Figure 4) [1]. The metallic stents are self-expandable (Self-expandable metal stents: SEMS), have wider lumen than plastic stents (8 or 10 mm) and are variable in lengths (4–10 cm), which can be uncovered and partially or fully covered. The metal component can be stainless steel, nitinol (nickel and titanium), or Platinum (platinum core with

nitinol encasement) [1-2,7,15]. Among those metallic components, Nitinol is preferably used due to its ability to maintain the shape of the curved lumen [2]. Metal stents are cylindrical, made of interwoven alloy wires, with some stents having proximal and distal flaring to reduce migration. Biliary SEMS are deployed with through-the-scope (TTS) delivery systems. After the deployment, the stent material embeds into the tumour and normal tissue by expansible and radial pressure. Although metallic stents are only approved for malignant conditions, fully covered self-expandable metal stents (FCSEMS) are easily removable and capable of preventing tissue ingrowth, so they are increasingly used in benign conditions [1,7,16]. The choice of appropriate stent varies by clinical scenario, availability, and operator expertise [2,7,17].

Plastic stents can be in various shapes, including straight (Amsterdam), single-pigtail, and double-pigtail. One, two, or four flaps are at each end of the plastic stents to anchor the stent. Stents are available in different diameters, including 7, 8.5, 10, and 11.5 Fr, with lengths ranging between 5 and 15 cm. The plastic stents can be kept in place for a period ranging from 60 to 200 days [2,7].

Covered metal stents treat patients with unresectable tumours with an expected survival of more than 3 to 6 months [1-2,7,14]. Increased rate of stent migrations, inability to use them at the level of hilum and the possibility of stent-induced cholecystitis are considered disadvantages of the covered stents [1-2,7,14,18]. The uncovered metallic stents treat biliary obstruction caused by external compressions [2,7]. Placing covered metal stents in a patient with proximal biliary stricture should be avoided as it can cause blockage of the right or left hepatic duct [1-2,16]. It should be considered to place a plastic stent or short distal metal stent in a patient with distal biliary obstruction due to a resectable tumour [1,13]. For patients with hilar obstructions, stenting of both the right and left systems with either plastic stents or uncovered SEMS is indicated to decrease the risk of cholangitis [2,16].

There are several complications encountered in prosthetic biliary stenting. Stent occlusion and migration are the most common complications [2]. It may also cause cholecystitis, cholangitis, pancreatitis, perforation and bleeding as less common complications [2,5,19,20]. Though various stents (Plastic or metal) are indicated to treat some specific condition, a few characteristics of the stents can influence their selection and limit their usage. Limitations for using each type of stent are as follows (Table 2) [1,7,14] .

Table 2: Limitations of prosthetic stents

Plastic stents
Excessive length to diameter
Lack of conformability
Early occlusion
Risk of migration
Bacterial colonisation
Cholangitis from stent occlusion or nondrained segments
Difficulty in placement of multiple stents

Metal stents
Placement in patients with benign disease
Placement in wrong segmental ducts
Preclude resection
Tumour ingrowth
Stone formation
Reactive hyperplasia
Cholangitis – early or late
Erosion into vessels (bleeding)

Stricture dilatation

Biliary tree strictures can be benign, malignant or indeterminate. Stricture dilation can be achieved by using dilating catheters (up to 11.5 Fr) and a Gruntzig-type balloon (up to 30 Fr = 10mm, which is performed at 4 to 6 atm pressure), which is followed by stenting temporarily by the stent having a smaller diameter than the maximum diameter of the balloon [2,8,9]. The primary aim of the ERCP stricture dilation varies with the primary types of strictures. In benign stricture, dilation is used to establish the biliary drainage and treat the stricture. In malignant stricture, dilation is performed to bridge the treatment before surgery in resectable tumours or for palliative care in unresectable tumours

[1,2,9]. Indeterminate biliary strictures are one of the indications for both diagnostic and therapeutic ERCP. For the evaluation of indeterminate stricture, ERCP is used for multiple tissue sampling and cholangioscope evaluation [1,10,21].

Biliary leaks

Bile leaks most commonly result from iatrogenic injury during cholecystectomy. It may also result from pancreatic resection, hepatic resection, trauma, or necrotising pancreatitis' de novo complication [1]. ERCP and stenting is the management option. Fully covered SEMS can be used in a patient with voluminous biliary leakage with large defects in bile ducts [22-27]. The biliary stents can be kept in place for 4 to 6 weeks until the leak settles, and they can be removed by endoscopy (Figure 5) [2,25-26].

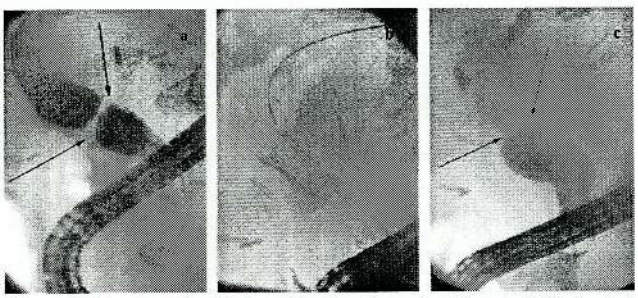

Figure 5: Anastomotic stricture after liver transplant (arrows) (a), treated with self-expanding metallic covered stent (b), with complete resolution of stricture after removal of stent (c). Source: Courtesy of Rajeev Attam, MD

Cholangioscope

Cholangioscope allows direct visualisation of the bile duct and helps in tissue sampling and directed therapy in particular conditions. Cholangioscopy can be performed by three different modalities, which are mother–daughter scope, spyglass system and slim or ultra-slim upper endoscopes [1-2,12].

The mother–daughter system is a fragile system that usually needs two operators, in which a small choledochoscope is advanced through the working channel of the duodenoscope. The spyglass system is a single-operator cholangioscope (SOC) system. In this technique, the fibreoptic bundle is advanced into the BD through a 10 Fr disposable sheath in which the fibreoptic bundle has four-way control, as for an endoscope, to steer the sheath inside the bile duct (Figure 6). This system needs adequate water irrigation to visualise biliary or PDs. This system has an additional channel for tissue sampling and introducing therapeutic devices such as stone lithotripsy probes. There are limitations in the Spyglass system as its image quality gradually reduces with subsequent usage due to the breakage of the individual fibres of the fibreoptic bundle, and replacement of the fibres is very expensive. This system has a 7%–10% risk of developing cholangitis due to prolonged water irrigation in the bile duct [1]. As the spyglass system can operate by a single person and its advantages in evaluating intraductal pathologies and therapeutic usage, it has become more popular among clinicians despite all the limitations. Placement of an ultra-slim upper endoscope directly into the bile duct is a technique that helps provide high-quality digital video images. However, the duct may be too small to accommodate the endoscope, or the scope may fall out of the ampullary opening as it is advanced due to the formation of a loop in the duodenum [1,5,10-12].

Complications

Though it is a safe and minimally invasive therapeutic procedure, it has rare complications that should be detected early and treated accordingly [5,12,19-20,27-29].

Acute pancreatitis is the most common complication in ERCP, especially associated with sphincterotomy, but it also can occur in ERCP without sphincterotomy. It ranges from 2% to 20%, depending on the patient and procedure. e.g., Sphincter of Oddi's dysfunction is associated with a 20% chance of developing pancreatitis, while CBD

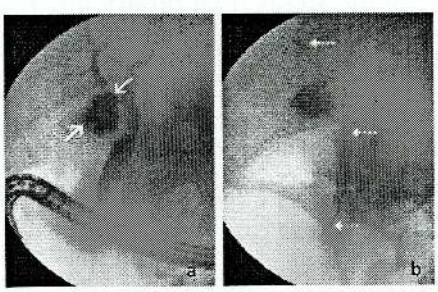

Figure 6: Cholangiograms showing a post cholecystectomy leak from an aberrant, low-insertion, right posterior sectoral duct, into which the cyst duct drained and was inadvertently injured during cholecystectomy. Leak shown by arrows (a) and 10 Fr stent placed transpapillary into right posterior sectoral duct bridging the leak (b) (arrows).

calculus is associated with less than a 5% chance [2,19-20,27,29]. The risk of developing pancreatitis can be reduced by following the strategies, including the selection of patients with absolute indication by avoiding unnecessary or marginally indicated ERCP, modifying the procedure with efficient cannulation with minimal pancreatic injection and instrumentation, considering pancreatic stenting in high-risk patients and considering pharmacological treatment in high-risk patients. (Prophylactic antibiotics, Administration of per-rectal NSAIDs, reduces the chance of developing pancreatitis by 50 %). In addition to the above strategies, aggressive fluid management significantly reduces post-ERCP pancreatitis [1,19-20].

Other rare acute complications are perforation of the duodenum or bile duct, haemorrhages, and infection, which may lead to sepsis in patients with partial obstruction of the CBD [2,18,27,29].

Haemorrhage is more commonly associated with sphincterotomy. The risk of haemorrhage is significantly high in patients with ascending cholangitis, the presence of coagulopathies and patients on anticoagulant treatment within three days [2]. As in other surgical procedures, intra-procedural haemorrhages may also lead to delayed haemorrhages in ERCP (Figure 7). Intra-procedural bleeding can be minimised by proper pre-procedural clinical and biochemical assessment to identify coagulation disorders and review previous imaging studies to identify abnormal anatomies. The bleeding can also be controlled therapeutically by injection of dilute epinephrine, application of balloon tamponade, placement of clips and placement of fully covered self-expandable metal stent [1-2,5,12].

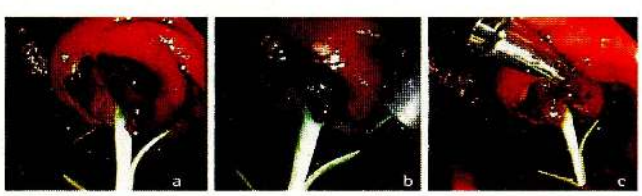

Figure 7: Delayed haemorrhage 3 days after biliary sphincterotomy that included a protective pancreatic stent (white): (a) fresh bleeding from the cut edge of the sphincterotomy just above the pancreatic stent; (b) injection of epinephrine to control the bleeding

Perforation of the viscera is usually associated with difficult access to the ampulla of Vater and abnormal or altered anatomy [1-2,30]. Early recognition of perforation is critically important to make it possible to manage with endoscopic techniques by either closure of sphincterotomy leaks or by using standard over-the-scope clips to manage bowel perforations. Surgery is usually indicated for large perforation or failed in endoscopic intervention or delayed recognition [1-2,27,29-30].

Some long-term complications following endoscopic sphincterotomy include papillary stenosis, and cholangitis, which occur in approximately 6 to 24 % of patients [2]. In addition to these complications, nonspecific complications can occur in a patient who underwent ERCP, including aspiration, respiratory depression or arrest, cardiopulmonary complications, contrast allergy, adverse reactions to medications and cholecystitis [1-2,4,27]

Conclusion

ERCP is an advanced endoscopic procedure aimed at treating the diseases of CBD and PD. Commonly it is used to treat CBD stones, benign and malignant strictures. In addition, PD strictures and stones are also treated by ERCP. Recent advances with cholangioscope combined with ERCP allow visualising the CBD / PD lumen and taking direct biopsies. Though ERCP has complications, expert hands will reduce its occurrence.

References

1. A.Arain M, L.Freeman M. Endoscopic retrograde cholangiopancreatography. In: *Clinical Liver Disease*. sixth. John willey & Sons; 2016:2582-2611. doi:10.1002/cld.441.

2. Hamoudi W. Cholangiopancreatography (ERCP). In: *Hepatogastroenterology, Part Ii: Gastroenterology.* ; 2017:247-279.

3. Liedlgruber M, Uhl A. Endoscopic image processing - An overview. *ISPA 2009 - Proc 6th Int Symp Image Signal Process Anal.* Published online 2009:707-712. doi:10.1109/ispa.2009.5297635

4. Singla S, Piraka C. Endoscopic retrograde cholangiopancreatography. *Clin Liver Dis.* 2014;4(6):133-137. doi:10.1002/cld.441

5. Cotton PB, Leung J. *ERCP The Fundamentals*. second.; 2015

6. Solomon S, Baillie J. Indications for and Contraindications to ERCP. In: *Ercp*. Third Edit. Elsevier Inc.; 2019:54-58.e1. doi:10.1016/b978-0-323-48109-0.00007-9.

7. Dumonceau J, Tringali A, Papanikolaou IS, et al. Endoscopic biliary stenting. *Thieme*. 2018;50(1):910-930. doi:10.11210/tando.30.43.

8. Grande G, Cocca S, Bertani H, et al. Dilation assisted stone extraction for complex biliary lithiasis: Technical aspects and practical principles. *World J Gastrointest Endosc*. 2021;13(2):33-44. doi:10.4253/wjge.v13.i2.33.

9. Kogure H, Mukai T, Doi S, Al E. Multicenter randomised trial of endoscopic papillary large balloon dilation without sphincterotomy versus endoscopic sphincterotomy for removal of bile duct stones: MARVELOUS trial. *Endosc Int Open*. 2021;53(2):212. doi:10.1055/a-1145-3377

10. Jorgensen J, Kubiliun N, Law JK, et al. Endoscopic retrograde cholangiopancreatography (ERCP): Core curriculum Prepared by. *Gastrointest Endosc*. 2016;83(2):279-289. doi:10.1016/j.gie.2015.11.006.

11. Murashima Y. Technique of Ercp. *Gastroenterol Endosc*. 1985;27(7):1375-1382. doi:10.11280/gee1973b.27.1375.

12. Søreide JA, Karlsen LN, Sandblom G, Enochsson L. Endoscopic retrograde cholangiopancreatography (ERCP): lessons learned from population-based national registries: a systematic review. *Surg Endosc*. Published online 2019. doi:10.1007/s00464-019-06734-w.

13. Wang DQ-H, Portincasa P, Liu M, Tso P. Overcoming Ductal Block: Emergency ERCP and Sphincterotomy Plus CBD Stenting Improves Therapeutic Outcomes in Severe Gallstone Pancreatitis. *Dig Dis Sci*. 2021;(0123456789):10-12. doi:10.1007/s10620-021-06905-7.

14. Yang J, Peng JY, Chen W. Endoscopic biliary stenting for irretrievable CBD stones: Indications, advantages, disadvantages, and follow-up results. *Surgeon*. 2012;10(4):211-217. doi:10.1016/j.surge.2012.04.003.

15. Siddappa PK, Hawa F, Prokop LJ, et al. Endoscopic pancreatic duct stenting for pain palliation in selected pancreatic cancer patients: a systematic review and meta-analysis. *Gastroenterol Rep*. 2021;9(2):105-114. doi:10.1093/gastro/goab001.

16. Paik WH, Lee TH, Park DH, et al. EUS-Guided Biliary Drainage Versus ERCP for the Primary Palliation of Malignant Biliary Obstruction: A Multicenter Randomised Clinical Trial. *Am J Gastroenterol*. 2018;113(7):987-997. doi:10.1038/s41395-018-0122-8.

17. Hamada T, Nakai Y, Isayama H. TOKYO criteria: Standardised reporting system for endoscopic biliary stent placement. *Gastrointest Interv*. 2018;7(2):46-51. doi:10.18528/gii180016.

18. Jadallah K, Alzubi B, Sweidan A, Almanasra AR. Intraperitoneal duodenal perforation secondary to early migration of biliary stent: Closure with through-the-scope clip. *BMJ Case Rep*. 2019;12(9):10-13. doi:10.1136/bcr-2019-230324.

19. Tryliskyy Y, Bryce GJ. Post-ERCP pancreatitis: Pathophysiology, early identification and risk stratification. *Adv Clin Exp Med*. 2018;27(1):149-154. doi:10.17219/acem/66773.

20. Martinez NS, Inamdar S, Firoozan SN, et al. Evaluation of post-ERCP pancreatitis after biliary stenting with self-expandable metal stents vs. plastic stents in benign and malignant obstructions. *Endosc Int Open*. 2021;09(06):E888-E894. doi:10.1055/a-1388-6964.

21. Dumonceau JM, Kapral C, Aabakken L, et al. ERCP-related adverse events: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. *Endoscopy*. 2020;52(2):127-149. doi:10.1055/a-1075-4080.

22. Adler DG, Papachristou GI, Taylor LJ, et al. Clinical outcomes in patients with bile leaks treated via ERCP with regard to the timing of ERCP: a large multicenter study. *Gastrointest Endosc*. 2017;85(4):766-772. doi:10.1016/j.gie.2016.08.018.

23. Abbas A, Sethi S, Brady P, Taunk P. Endoscopic management of postcholecystectomy biliary leak: When and how? A nationwide study. *Gastrointest Endosc*. 2019;90(2):233-241.e1. doi:10.1016/j.gie.2019.03.1173.

24. Desai A, Twohig P, Trujillo S, Dalal S, Kochhar GS, Sandhu DS. Clinical efficacy, timing, and outcomes of ERCP for management of bile duct leaks: a nationwide cohort study. *Endosc Int Open*. 2021;09(02):E247-E252. doi:10.1055/a-1322-2425.

25. Sendino O, Fernández-Simon A, Law R, et al. Endoscopic management of bile leaks after liver transplantation: An analysis of two high-volume transplant centers. *United Eur Gastroenterol J*. 2018;6(1):89-96. doi:10.1177/2050640617712869

26. Miyatani H, Mashima H, Sekine M, Matsumoto S. Post-ERCP biliary complications in patients with biliary type sphincter of Oddi dysfunction. *Sci Rep*. 2018;8(1):1-6. doi:10.1038/s41598-018-28309-w.

27. Kwak N, Yeoun D, Arroyo-Mercado F, Mubarak G, Cheung D, Vignesh S. Outcomes and risk factors for ERCP-related complications in a predominantly black urban population. *BMJ Open Gastroenterol*. 2020;7(1):1-11. doi:10.1136/bmjgast-2020-000462

28. Parikh MP, Wadhwa V, Thota PN, Lopez R, Sanaka MR. Outcomes associated with timing of ERCP in acute cholangitis secondary to choledocholithiasis. *J Clin Gastroenterol*. 2018;52(10):e97-e102. doi:10.1097/MCG.0000000000000982

29. Saito H, Kakuma T, Kadono Y, et al. Increased risk and severity of ERCP-related complications associated with asymptomatic CBD stones. *Endosc Int Open*. 2017;05(09):E809-E817. doi:10.1055/s-0043-107615

30. Simon K l. ERCP in Surgically Altered Anatomy. In: *Ercp*. Third Edit. Elsevier Inc.; 2019:288-307. e1. doi:10.1016/b978-0-323-48109-0.00031-6

Original Article

Socio-cultural and environmental risk factors for leprosy in Jaffna District, Sri Lanka.

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Abstract

This study was conducted to determine the socio-cultural and environmental risk factors of leprosy in Jaffna. A case-control study was conducted in dermatology clinic, teaching hospital, Jaffna from July 2015 to July 2016. All 97 cases and 291 controls by systematic sampling were recruited using interviewer-administered questionnaire.

The mean age of cases was 41 (SD=21) and control was 48 (SD=20). Of 97 cases, 54.6 %(n=53) males; 99 %(n=96) Tamils; 79.4 %(n=77) Hindus; 60 %(n=59) above secondary education. Of 291 controls, 42.3 %(n=123) were males; 99.3 %(n=289) Tamils; 85.6 % (n=249) Hindus; 78.4 % (n=225) above secondary education.

Socio demographic factors (12 variables), house and environmental factors (11 variables), and behavioral factors (18 variables) were included in bivariate analysis and many were found to be significantly ($p<0.05$) associated with leprosy. Marital status, displacement, monthly income, presence of BCG scar, firewood as cooking fuel, and hunting reptiles were not found to be associated with leprosy.

Multiple logistic regression analysis showed significant association between leprosy and - crowded household [OR4.5, (1.5-13.6)], non-availability of drinking water within 30 minutes walking [OR15.1, (2.3-98.3)], environment with shrub [OR2.9, (1.4-6.1)], exposure to shrub [OR2.7, (1.2-5.9)], exposure to leprosy patient [OR10.6, (4.1-27.5)], exposure to fishing [OR4.5, (1.5-13.6)], visits to leprosy affected area [OR10.8, (4.7-24.5)] and unavailability of safe water source [OR3.3, (1.2- 9.1)].

In addition to the well-known risk factors environment-related risk factors, especially exposure to jungle/shrubs could play a role in the transmission of leprosy.

Keywords

Leprosy, risk factors, Jaffna, Sri Lanka

Introduction

Leprosy is an ancient chronic communicable disease, caused by the bacterium *Mycobacterium leprae*. The global prevalence of leprosy decreased from more than 5 million cases in the mid-1980s to less than 200 000 by 2015 following the introduction of multidrug therapy (MDT) as a treatment for leprosy (1).

The available international, national, and sub-national data suggest that the distribution of leprosy cases is related to socio-economic and demographic factors that promote the disease spread and reduce the cure rate (2-5). Airborne diseases with long incubation periods like tuberculosis and leprosy have a strong relationship with environmental factors and standard of living. In 2006, Kerr-Pontes and his colleagues described the relationship between socio-cultural risk factors and leprosy (3).

In 1980, Sri Lanka adopted early diagnosis and complete treatment with MDT as the key strategies for reducing the disease burden due to leprosy (2). Sri Lanka was a pioneer in Asia to bring in multidrug therapy (MDT) in 1980 and full coverage was achieved in the same year. Sri Lanka achieved elimination status in 1995 (3). Since then Sri Lanka has been struggling to reduce the prevalence of leprosy much below the elimination target of one case per 10,000 population, with pockets of long-time leprosy endemic areas and some people seeking treatment late. The number of new cases has been increasing in recent years. Awareness regarding the disease remains low among the public resulting in delayed diagnosis (4).

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A similar situation has been observed in Jaffna District (population - 622,709) as well. More than half of the total cases in the district were reported from one Medical Officer of Health (MOH) area out of the 14 MOH areas in the district. Over the past 10 years, the number of cases reported or detected also showed a marked increase, and cases appeared in new geographic areas of the district (all MOH areas) with late presentations including all ages (more child cases) and both sexes (5). The present study was undertaken to determine the socio-cultural and environmental risk factors of leprosy in the Jaffna District, Sri Lanka.

Methods

Setting and participants

This case-control study was conducted from July 2015 to July 2016 with the cases and controls recruited from the dermatology clinic, at Teaching Hospital Jaffna. All leprosy cases (new and those who attended for follow-up during the study period) confirmed by a dermatologist were defined as cases. These included self-referrals as well as cases referred from house-to-house visits or mobile clinics. Other patients attending the dermatology clinic were selected as controls. Measures were taken to recruit as controls patients with diverse diagnoses.

Persons (both cases and controls) who stayed temporarily in the district and those who were unable to give the necessary information due to physical or mental infirmities were excluded.

Three controls were recruited for each case to increase the power of the recent data showed that about 39% of students in the district fail to qualify (GCE A/L result) for higher education (District Secretariat, 2014). We assumed that poor education level increased the risk of leprosy by about 1.9 times (3). The required sample size to detect this increased risk with 80% power and a level of significance of 0.05 was 103 cases and 309 controls.

All cases who attended the dermatology clinic (the cases included those who were being followed up at the clinic for leprosy treatment and those who came for the first follow-up visit after completion of treatment) during the study period were recruited. For each case, three controls were recruited on the following clinic day. The leprosy clinic is held on every Wednesday. On every Thursday, controls were recruited for the previous day's cases (if 3 cases were recruited on Wednesday, 9 controls were recruited on Thursday). The first control was selected randomly out of the first 10 patients registered on the particular day and consecutive patients were selected up to the required number. If the consecutive controls had the same diagnosis they were skipped and a patient with a different diagnosis was recruited to maintain the diversity of controls.

Instrument and data collection

A pre tested interviewer administered questionnaire (and interview guide) was used to collect the data. It consisted of socio cultural risk factors, demographic factors, environmental factors, behavioural factors and BCG vaccination status.

Pre-test was done in Kilinochi District. The patients' contact information was traced from the district leprosy register and data collection was done at home with the help of the district leprosy public health inspector (PHI). PI and one pre-intern doctor collected the data. Needed corrections were done in the questions mainly in wording and options (answers) of responses.

The data collectors (2 pre-intern doctors and one nursing graduate) were provided with adequate training prior to data collection to minimize interviewer bias and to ensure quality of data. Interview Guide was prepared by the PI and handed over to the data collectors before their training on data collection.

The training was done by the PI lasting a full day. A detailed explanation of the research objective and the related variables were explained to them. The PI discussed the data collection instrument in detail to ensure an understanding of the subject to be measured by the variables. Specific instructions for filling individual questions of the questionnaire were provided to them and the interview technique was demonstrated by role play among them. They filled out the first questionnaire (case) under the direct supervision of the PI on the same day. Following the training day, each data collector filled out four questionnaires (controls) in front of the PI and ensured the quality of data collection.

The selection criteria for the recruitment of controls described as in sampling section were explained. At the end of the session, the PI clarified the issues raised by the data collectors. Every week PI did random checks of 3-4 questionnaires to ensure completeness and gave appropriate feedback to data collectors.

Patients were interviewed after the completion of their clinical care. Interviews were conducted in a separate place without the interruptions of clinic staff after getting informed written consent. Some missed patients (who did not have adequate time to interview at the clinic) were interviewed at home by the same trained data collectors with the help of the area PHI or public health midwife (PHM) with prior arrangements.

Data analysis

During the collection, filled questionnaires were examined for completeness and missing data was attended at that point itself if the patient was available.

Coding of data was done by either the coordinator of data collection team or PI. Data was entered in to the computer and analyzed using SPSS version 21and WinPepi software. Entered data was re checked for any mistakes in data entry by cross checking and were corrected if found.

Univariate analysis was done for all the variables and background information were presented as simple descriptive statistics. Bivariate analysis was done to identify associations and described as crude odds ratio and 95% confidence interval with relevant p values.

The significant variables in the bivariate analysis were analyzed in forward stepwise logistic regression and presented as adjusted odds ratio and 95% confidence interval with relevant p values. Population Attributable Risk (PAR) with 95% confidence interval was calculated using the adjusted OR to each (individual) risk factor.

Ethical considerations

Permission was obtained from the Regional Director of Health Services, Jaffna and the director of the hospital. Ethical clearance was obtained from ethical review committee Faculty of Medicine, University of Jaffna.

During the data collection, voluntary participation was encouraged. From all the participants or guardians informed written consent was obtained. The interviewer read and explained both information sheet and consent form to illiterate participants in front of a witness (the accompanied person or Health Service Assistant or Nursing Officer. Parental Permission with Assent was obtained from 12-18 years old participants.

Results

Background

All 97 cases and 291 controls were recruited (94.2% of the required sample size). Mean age of cases was 41 (SD=21) years and controls was 48 (SD=20) years (table 1).

Table 1: Background of cases and controls

Description	Case (n=97)	Control (n=291)
Mean (and SD) age	41 (21)	48 (20)
Sex: male (%)	54.6	42.3
Ethnicity: Tamils (%)	99.0	99.3
Religion: Hindus (%)	79.4	85.6
Education: above secondary education (%)	60.0	78.4

Socio-demographic factors and leprosy

Among the socio demographic factors, age (OR=2.42), male sex (OR=1.65), low education level (OR=2.30), being unemployed (OR=2.10), child death in the family (OR=2.84), marriage of family members outside (OR=2.56), leprosy patient in marital place (OR=16.19) had statistically significant relationship with leprosy. Marital status, skin colour, displacement average monthly income did not have statistically significant relationship with leprosy (table 2).

Household and environmental factors with leprosy

All the studied household and environmental factors such as no electricity (OR=3.41), no water sealed toilet facilities (OR=2.61), use of dung or earth as flooring (OR=2.93), no safe water source within the house premise (OR=2.11), no access to safe water (OR=2.09) non-availability of drinking water within 30 minutes of walking distance (OR=7.44), environment with jungle/

able 2: Relationship of demographic factors with leprosy

Socio demographic factors		Case	Control	Odds ratio	95% Confidence Interval		p value
					Lower	Upper	
Age in years	0-15	14	19	2.42	1.16	5.03	0.018
	>15	83	272				
Sex	Male	53	123	1.65	1.04	2.61	0.035
	Female	44	168				
Education level	No/Primary	38	63	2.30	1.40	3.77	0.001
	Secondary/above	59	225				
Employment	Occupied	62	133	2.10	1.31	3.38	0.002
	Not occupied	35	158				
Marital status	Never married	36	19	1.42	0.88	2.31	0.152
	Ever married	61	272				
Skin colour	Dark	29	67	1.42	0.85	2.37	0.181
	Non dark	68	223				
Displacement	No/one time	41	112	1.16	0.73	1.85	0.541
	>one time	97	177				
Displacement within past 30 years	Yes	83	246	1.04	0.54	1.99	0.915
	No	14	43				
Child death in the family	Yes	13	84	2.84	1.30	6.20	0.009
	No	84	275				
Average monthly income	0-10,000	34	115	0.81	0.50	1.30	0.381
	> 10,000	63	172				
Marriage of family members outside	Yes	63	121	2.56	1.59	4.13	<0.001
	No	34	167				
Leprosy patient in marital place	Yes	8	2	16.19	3.20	81.93	<0.001
	No	21	85				

Table 3: Relationship of household and environmental factors with leprosy

Household and environmental factors		Cases	Controls	Odds ratio	95% Confidence Interval		p value
					Lower	Upper	
Electricity in household	Not available	17	17	3.41	1.67	6.99	0.001
	Available	80	273				
Water sealed toilet	Not available	15	19	2.61	1.27	5.36	0.009
	Available	82	271				
Dung or Sand in floor	Present	49	75	2.93	1.82	4.72	<0.001
	Absent	48	215				
Safe water source	Not available	83	214	2.11	1.13	3.93	0.019
	Available	14	76				
Access to safe water	Not available	65	143	2.09	1.30	3.38	0.003
	Available	32	147				
Drinking water access within 30 minutes' walk	Not available	7	3	7.44	1.89	29.37	0.004
	Available	90	287				
Environment with jungle/shrub	Present	61	52	7.76	4.66	12.91	<0.001
	Absent	36	238				
Satisfactory sewage disposal	Sometime	55	126	1.75	1.10	2.78	0.019
	Always	41	164				
Current house-hold crowding(persons/ room)	4/more	25	19	4.95	2.58	9.49	<0.001
	1-3 persons	72	271				
House-hold crowding 10 years back(persons/room)	4/more	32	47	2.55	1.50	4.31	<0.001
	1-3 persons	65	243				
Animals in house/yard	Sometime present	89	234	2.66	1.22	5.81	0.014
	Absent	8	56				

shrub (OR=7.76), poor sewage disposal (OR=1.75), crowded household (OR=4.95), house-hold crowding for 10 years (OR=2.55), availability in animals in house/ yard (OR=2.66) had statistically significant relationship with leprosy (table 3).

Behavioural risk factors

Among the behavioural factors, work in forest (OR=3.53), work in agriculture (OR=1.90), eating reptiles (OR=2.30), fishing (OR=8.41), exposure to open water source (OR=2.67), poor practice of hand washing (OR=3.06), exposure to jungle/ shrub (OR=4.44), live in jungle/shrub (OR=2.69), frequency of jungle exposure (OR=2.96), exposure to leprosy patient (OR=28.89), visit to leprosy affected area (OR=15.05), frequency of exposure to leprosy affected area (OR=6.21), experienced of food shortage (OR=3.35), frequency of changing bed linen (OR=1.75) had statistically significant relationship with leprosy. Other factors such as presence of BCG scar, firewood as cooking fuel, hunting in life time and hunting reptiles did not have statistically significant relationship with leprosy (table 4).

Multivariate analysis of significant risk factors associated with leprosy

All the statistically significant variables of the bivariate analysis, were analysed by forward logistic regression. Among them, crowded household (OR=4.54), no access to drinking water within 30 minutes' walk from home (OR=15.05), environment with jungle/shrub (OR=2.92), exposure to jungle/shrub (OR=2.72), exposure to leprosy patient (OR=10.63), exposure to fishing (OR=4.53), visits to leprosy affected area (OR=10.83) and unavailability of safe water source (OR=3.26) were found to be statistically significant in the final model (table 5). The highest PAR was found for visits to leprosy affected area (80.3%), followed by environment with jungle/shrub (54.8%), exposure to leprosy patient (51.8%), unavailability of safe water source (44.9%) and exposure to jungle/shrub (36.7%).

Discussion

Among the statistically significant variables in the final logistic regression model, highest PAR was found for visits to leprosy affected area (80.3%), followed by environment with jungle/shrub (54.8%), exposure to leprosy patient (51.8%), unavailability of safe water source (44.9%) and exposure to jungle/shrub (36.7%). Environmental related risk factors found to be associated with leprosy except exposure to leprosy patient directly.

Some of the known risk/protective factors(6–9) environmental, and behavioural factors associated with risk of leprosy occurrence in the endemic North-eastern region. A case-control study in four municipalities on cases of leprosy diagnosed in the previous 2 years, with no other known, current, or past case of leprosy in the household or in the neighbourhood. Controls were individuals presenting for reasons other than skin problems to the health unit where the case was diagnosed and who lived in the same municipality as the case with whom it was matched. Low education level, ever having experienced food shortage, bathing weekly in open water bodies (creek, river and/or lake of leprosy did not show significant association in our study. This is not due to inadequate power of the study but due to high prevalence (>90%) of such factors like housing conditions, BCG coverage, etc. in Sri Lanka(10). Though Jaffna District was identified as a low risk area for leprosy some time ago and the fluctuating pattern of annual new case detection, the power of the study was increased by 2 methods: increased case: control ratio (1:3) and achieving an adequate sample size by recruiting prevalent cases who were diagnosed in previous year and being followed up during the study period.

Nearly similar picture was demonstrated in other studies also. A case-control study done in Brazil had shown that Low education level, ever having experienced food shortage, bathing weekly in open water bodies (creek, river and/ or lake) 10 years previously, and a low frequency of changing bed linen or hammock (more than biweekly) of current practices were significantly associated with leprosy(6)environmental, and behavioural factors associated with risk of leprosy occurrence in the endemic North-eastern region.

Table 4: Relationship of Behavioural factors with leprosy

Behavioural factors		Cases	Controls	Oddsratio	95% Confidence Interval		p value
					Lower	Upper	
Work in forest	Ever work	21	21	3.53	1.83	6.80	<0.001
	Not work	76	268				
Work in agriculture	Ever work	42	83	1.90	1.18	3.06	*0.008*
	Not work	55	207				
Hunting in life time	No Hunting	93	281	0.75	0.22	2.48	0.630
	Ever Hunting	4	9				
Hunting reptiles	Not hunt	93	281	0.99	0.26	3.75	0.992
	Ever hunt	3	9				
Eating reptiles	Ever eaten	23	35	2.30	1.28	4.13	*0.006*
	Never eaten	73	255				
Fishing	Ever fishing	29	14	8.41	4.21	16.78	<0.001
	Never fishing	68	276				
Exposure to open water source	Ever exposed	49	84	2.67	1.66	4.31	<0.001
	Never exposed	45	206				
Firewood as cooking fuel	Never used	3	16	0.55	0.16	1.92	*0.345*
	Ever used	94	274				
Hand washing	Poor practice	66	119	3.06	1.88	4.98	<0.001
	Good practice	31	171				
Exposure of jungle/shrub	Ever exposed	46	49	4.44	2.59	7.56	<0.001
	Never exposed	51	241				
Live in jungle/ shrub	Ever live	34	48	2.69	1.60	4.52	<0.001
	Never live	62	235				
Frequency of jungle exposure	More frequent	41	22	2.96	1.33	6.57	*0.008*
	Less frequent	17	27				
Exposure to leprosy patient	Some exposure	52	11	28.89	14.02	59.52	<0.001
	No exposure	45	275				
Visit to leprosy affected area	Possible visits	80	83	15.05	7.94	28.52	<0.001
	No visits	13	203				
Frequency of exposure to leprosy area	More frequent	58	35	6.21	1.91	20.22	*0.002*
	Less frequent	4	15				
Experience of food shortage at any time	Yes	69	123	3.35	2.04	5.50	<0.001
	No	28	167				
Frequency of changing bed linen	<Biweekly	68	166	1.75	1.07	2.87	0.026
	Biweekly	29	124				
BCG scar	Present	80	258	0.797	0.321	1.978	0.625
	Absent	7	18				

In addition, there are some other factors also contributing in different parts of the world. A study performed in Bangladesh found that younger age and close relationship with leprosy patients were independent risk factors for leprosy and presence of a BCG scar and sex were not risk for leprosy (11). A Malawi study also found no evidence of BCG status and associated risk for leprosy(12)000 initially disease-free individuals followed up during the 1980s in a rural district of northern Malawi. A total of 331 new cases of leprosy were diagnosed among them. Individuals recorded as living in household or dwelling contact with multibacillary patients at the start of follow-up were at approximately five- to eightfold increased risk of leprosy, respectively, compared with individuals not living in such households or dwellings. Individuals living in household or dwelling contact with paucibacillary cases were both at approximately twofold increased risk.

Table 5: Results of the logistic regression model of selected significant risk factors associated with leprosy

Exposure	OR (95%CI)	P value	PAR (95%CI)
Crowded Household	4.54 (1.51 to 13.61)	0.007	20.6 (10.3 to 29.6)
No access of drinking water within 30 minutes' walk from home	15.05 (2.30 to 98.34)	0.005	6.2 (0.8 to 11.4)
Environment with jungle/shrub	2.92 (1.40 to 6.06)	0.004	54.8 (41.1 to 65.3)
Exposure to jungle/ shrub	2.72 (1.24 to 5.98)	0.013	36.7 (23.0 to 48.0)
Exposure to leprosy patient	10.63 (4.10 to 27.59)	<0.001	51.8 (40.2 to 61.1)
Exposure to fishing	4.53 (1.51 to 13.60)	0.007	26.3 (15.9 to 35.5)
Visits to leprosy affected area	10.83 (4.77 to 24.59)	<0.001	80.3 (67.2 to 88.2)
Unavailability of safe water source	3.26 (1.17 to 9.05)	0.024	44.9 (7.2 to 67.3)

The higher risk associated with multibacillary contact and the fact that dwelling contact entailed a greater risk than household contact if the association was with multibacillary, but not with paucibacillary, disease suggest that paucibacillary cases may not themselves be sources of transmission, but rather just markers that a household has had contact with some (outside. But a study done in Brazil has shown that presence of BCG vaccination scar was a significant protective factor for leprosy (6)environmental, and behavioural factors associated with risk of leprosy occurrence in the endemic North-eastern region.

A study done in Bangladesh revealed that the food shortage and less dietary diversity with household food insecurity associated with an increased risk of having leprosy(15). Similarly, our study also had shown a significant association between food shortage and leprosy in bivariate analysis.

Several studies suggested person-to-person is not the only form of M. leprae transmission, and that indirect transmission might occur, and other reservoirs should exist outside the human body. A study done in Indonesia revealed M. leprae in water bodies as a possible source of infection in that area(16). Similarly a few studies discussed about soil as a possible source(17,18). Some studies explored variety of animals as source of M. leprae. Armadillos were one such animal species known as a source(19)Mycobacterium leprae. In the Americas,\r\nnine-banded armadillos (Dasypus novemcinctus. In 1985, it was proved that a certain type of monkey developed leprosy as naturally acquired infection(20). Likewise another study shown Red squirrels in the British Isles were infected with leprosy bacilli(21). Our study also revealed that a possible environmental reservoir playing a role in the transmission of leprosy in addition to person to person transmission.

As above, most of our findings are consistent with international data, multivariate analysis shown following are statistically significant risk factors in Jaffna district: crowded household, no access of drinking water within 30 minutes' walk from home, environment with jungle/shrub, exposure to jungle/ shrub, exposure to leprosy patient, exposure to fishing, visits to leprosy affected area and unavailability of safe water source. These factors being significant even after adjusting for the variables exposure to patient with leprosy and socio-demographic factors raises the possibility of an environmental source of infection for leprosy, may be an animal/ reptile reservoir being present either in land/water among jungle or shrub in the district. Future studies for the demonstration of this, will facilitate further reduction in case load and sustain a leprosy free nation.

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References :

1. World Health Organization. Weekly epidemiological record [Internet]. 2015. Available from: https://www.who.int/wer/2015/wer9036.pdf
2. WHO. Weekly epidemiological record Relevé épidémiologique hebdomadaire [Internet]. Vol. 90. Geneva; 2015 [cited 2016 May 31]. Available from: http://www.who.int/wer
3. World Health Organization. Renewed efforts in Sri Lanka's battle against leprosy [Internet]. 2019 [cited 2019 Oct 29]. Available from: http://www.searo.who.int/srilanka/areas/sri-lanka-battles-against-leprosy/en/
4. World Health Organization. WHO Sri Lanka Annual Report 2015 [Internet]. 2016. Available from: http://

www.scaro.who.int/srilanka/documents/who_sri_lanka_annual_report_2015.pdf

5. Regional Director of Health Services. Statistical Hand Book 2015. Jaffna; 2016.

6. Kerr-Pontes LRS, Barreto ML, Evangelista CMN, Rodrigues LC, Heukelbach J, Feldmeier H. Socioeconomic, environmental, and behavioural risk factors for leprosy in North-east Brazil: Results of a case-control study. Int J Epidemiol. 2006;35(4):994–1000.

7. Bakker MI, May L, Hatta M, Kwenang A, Klatser PR, Oskam L, et al. Genetic, household and spatial clustering of leprosy on an island in indonesia: a population-based study. Vol. 6, Bmc Medical Genetics. 2005.

8. Wagenaar I, van Muiden L, Alam K, Bowers R, Hossain MA, Kispotta K, et al. Diet-Related Risk Factors for Leprosy: A Case-Control Study. PLoS Negl Trop Dis. 2015;9(5).

9. Moet FJ, Meima A, Oskam L, Richardus JH. Risk factors for the development of clinical leprosy among contacts, and their relevance for targeted interventions. Lepr Rev [Internet]. 2004;75(4):310–26. Available from: http://www.ncbi.nlm.nih.gov/pubmed/15682969

10. Sri Lanka Department of Census and Statistics. Sri Lanka Demographic and Health Survey 2016 [Internet]. Colombo; 2017. 371 p. Available from: http://www.statistics.gov.lk/social/DHS 200607 FinalReport.pdf

11. Moet FJ, Pahan D, Schuring RP, Oskam L, Richardus JH. Physical distance, genetic relationship, age, and leprosy classification are independent risk factors for leprosy in contacts of patients with leprosy. J Infect Dis [Internet]. 2006;193(3):346–53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/16388481

12. Fine PE, Sterne J a, Pönnighaus JM, Bliss L, Saui J, Chihana a, et al. Household and dwelling contact as risk factors for leprosy in northern Malawi. Am J Epidemiol. 1997;146(1):91–102.

13. Goulart IMB, Bernardes Souza DO, Marques CR, Pimenta VL, Gonçalves MA, Goulart LR. Risk and protective factors for leprosy development determined by epidemiological surveillance of household contacts. Clin Vaccine Immunol. 2008;15(1):101–5.

14. Sales AM, Ponce De Leon A, Dia N, Dü Ppre C, Hacker MA, Augusto J, et al. Leprosy among Patient Contacts: A Multilevel Study of Risk Factors. PLoS Negl Trop Dis. 2011;5(3):1–6.

15. Wagenaar I, van Muiden L, Alam K, Bowers R, Hossain MA, Kispotta K, et al. Diet-Related Risk Factors for Leprosy: A Case-Control Study. Melby PC, editor. PLoS Negl Trop Dis [Internet]. 2015 May 12 [cited 2016 Jun 26];9(5):e0003766. Available from: https://dx.plos.org/10.1371/journal.pntd.0003766

16. Matsuoka M, Izumi S, Budiawan T, Nakata N, Saeki K. Mycobacterium leprae DNA in daily use water as a possible source of leprosy infection. Int J Lepr Other Mycobact Dis. 1999;67(4 SUPPL.):518.

17. Lavania M, Katoch K, Katoch VM, Gupta AK, Chauhan DS, Sharma R, et al. Detection of viable Mycobacterium leprae in soil samples: Insights into possible sources of transmission of leprosy. Infect Genet Evol. 2008;8(5):627–31.

18. Turankar R, Lavania M, Singh M, Sengupta U, Siva Sai K, Jadhav R. Presence of viable Mycobacterium leprae in environmental specimens around houses of leprosy patients. Indian J Med Microbiol. 2016;34(3).

19. Cristiane Cunha Frota1, /, + LNCL, Adalgiza da Silva Rocha2, Philip Noel Suffys2 BNR, Laura Cunha Rodrigues4, et al. Mycobacterium leprae in six-banded (Euphractus sexcinctus) and nine-banded armadillos (Dasypus novemcinctus) in Northeast Brazil. Mem Inst Oswaldo Cruz Rio Janeiro. 2012;107:209–13.

20. Meyers WM, Walsh GP, Brown HL, Binford CH, Imes GD, Hadfield TL, et al. Leprosy in a mangabey monkey - Naturally acquired infection. Int J Lepr. 1985;53(1):1–14.

21. Avanzi C, del-Pozo J, Benjak A, Stevenson K, Simpson VR, Busso P, et al. Red squirrels in the British Isles are infected with leprosy bacilli. Science (80-). 2016;354(6313).

Original Article

Lipid levels of healthy adults in Jaffna district, Northern Province of Sri Lanka: An analysis of secondary data

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Abstract

Abnormal lipid profile is considered as an important contributor to cardiovascular diseases among South Asians. Sri Lanka is a multiethnic South Asian nation and differences in ethnicity may influence the pattern of lipid profile.

The aim of this paper is to analyse the lipid levels of healthy adults of a predominantly Sri Lankan Tamil population in the Northern Sri Lanka and compare it with the lipid levels of different ethnic groups reported in the literature.

It was a cross-sectional analysis of secondary data of 500 healthy adults who were the controls of a larger study on the lipid profile of diabetic and non-diabetic patients. Cut-off values for desirable lipid levels used in this study were determined according to national and international guidelines. Chi-squared test, independent t-test/ Mann–Whitney U-test and one-way analysis of variance were used to determine the statistical significance and a p-value <0.05 was considered significant.

The majority (61.4%) were women and the mean age was 54.8±12.6 years. Mean lipid levels were within normal range except HDL cholesterol (HDL-C) in women (46.6± ±10.6 mg/dL). Desirable lipid levels were observed in majority of the participants (58%-80%) except HDL-C among women (32%). Half of the study population had a desirable total cholesterol: HDL-C ratio (50.8%). Significant difference between men and women was observed for HDL-C ($p<0.05$).

The HDL-C levels and total cholesterol: HDL-C ratio of Jaffna population were comparable to those of South Asian populations. Further studies are needed to determine the clinical implication of these observations.

Keywords: Lipid level, HDL cholesterol, Jaffna population, South Asians

Introduction

Cardiovascular diseases (CVD) are the most common non-communicable disease worldwide [1]. South Asians seem to be more prone to develop CVD than Caucasians or Chinese descendants [2, 3, 4, 5]. Dyslipidaemia is considered as one of the important contributors to the increased risk of CVD among South Asians [2, 6]. Lower high-density lipoprotein cholesterol (HDL-C) and elevated triglyceride (TG) levels were observed among South Asians [6, 7, 8]. A review on lipoprotein abnormalities in South Asians reported that the lipid profile of South Asians was characterized by low but more atherogenic low-density lipoprotein cholesterol (LDL-C), low and dysfunctional HDL-C, elevated TG, and high lipoprotein (a) [9].

Being a South Asian nation Sri Lanka may also have a similar abnormalities in lipid levels and risk of CVD. In Sri Lanka, ischemic heart disease has been the leading cause of death for more than a decade and is on the rise [10]. Like other South Asians, dyslipidaemia could have contributed to the increased risk of CVD in Sri Lankans too. However, studies that specifically

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examined the pattern of lipid profiles of Sri Lankans are limited. A few studies conducted in Sri Lanka reported the pattern of lipid levels: Sri Lanka Diabetes and Cardiovascular Study (SLDCS) conducted across the country except in Northern and Eastern provinces showed a high prevalence of dyslipidaemia (77.4%) among Sri Lankans and low HDL-C (49.6%) was the commonest type [11]; Tennakoon et al. compared the risk of CVD between Sri Lankans in Oslo and Sinhalese and Tamils in Kandy and the study concluded that Kandy Sinhalese and Tamils had greater risk of CVD mainly due to impaired lipid profile [12]; A study on the prevalence of metabolic syndrome conducted in Jaffna reported that almost 80% of the study population had low HDL-C and TG was elevated in one-fourth of the participants [13].

The present study was conducted in Jaffna district which is located in the Northern Province of Sri Lanka. Sri Lanka is a multiethnic country and the population in the Northern Province is predominantly Sri Lankan Tamils, one of the minor ethnic groups in Sri Lanka. As ethnicity and culture influence the pattern of lipid profile [14, 15], the lipid profile of Sri Lankan Tamils may differ from that of other ethnic groups in Sri Lanka. Further, the Northern Province was not included in the previous studies conducted in Sri Lanka due to the inaccessibility during the civil conflict. Analysing the lipid levels of healthy individuals will help to understand the trend of the lipid profile and the risk of CVD of a population. This paper analyses the lipid levels of the Jaffna population and compares findings of this study with those of the other studies conducted in South Asians and non-South Asian populations.

Methods

This was a cross-sectional analysis of secondary data. We analysed the lipid levels of the control group (healthy adults) of a larger study on lipid profiles of diabetic and non-diabetic patients receiving treatment at Teaching Hospital, Jaffna using secondary data. In this study, healthy adults were the individuals who had no preexisting medical conditions and were not diagnosed with any medical condition during the screening for non-communicable diseases. Sample size of the groups were calculated with the power of 90% [16] using values of lipid levels of Sri Lankans reported by Katulanda et al [11] and recommended optimal lipid levels [17]. Lipid levels of healthy adults who underwent basic health screening for non-communicable diseases conducted in Jaffna district in 2021 and 2022 were obtained from the Regional Directorate of Health Services of Jaffna district. Information on age, gender, and total cholesterol (TC), LDL-C, TG and HDL-C levels were extracted from the database. Data were extracted consecutively until the required number of samples was reached. Ethical approval was obtained from the Ethics Review Committee of Teaching Hospital, Jaffna (Ref. No.: S02/08/2021) and administrative approvals were obtained from relevant authorities before commencing the data collection.

Estimation of lipid levels was carried out in two peripheral public hospitals in the Jaffna district using the same type of automated chemistry analyzer (Mindray BS-240). Enzymatic methods were used to determine TC and TG, HDL-C was estimated by direct method and LDL-C was estimated by calculation method.

Data analysis

Based on the national and international guidelines [17, 18, 19] desirable lipid levels were defined as follows; TC <200 mg/dL. LDL-C <130 mg/dL. TG <150 mg/dL. HDL-C (men) ≥40 mg/dL , HDL-C (women) ≥50 mg/dL, TC: HDL-C ratios (men) <4.5, TC: HDL-C ratios (women) <4.0

Data were entered in Microsoft Excel (version 16.0) and analysed. Descriptive statistics such as frequency, percentage, mean, and standard deviation (SD) were used to present the data. Interquartile method was used to identify the outliers. Lipid levels of men and women, different age groups and lipid levels with and without

outliers were compared. For the analysis, age was categorized as < 40 years, 40-59 years, and ≥60 years. Independent t-test/ Mann–Whitney U-test and one-way analysis of variance were used to compare the means of two groups and more than two groups respectively. Chi-square test was performed to compare proportions. A p-value less than 0.05 was considered statistically significant.

Results

Data from 500 healthy adults were analysed. The mean age of the study population was 54.8±12.6 years, ranging from 24 to 85 years. Fig. 1 shows the age distribution of the study population. Among the 500 participants, 193 (38.6%) were men and 307 (61.4%) were women. The Mean age of men was 57.6±12.8 years and that of women was 53.1±12.1 years. The number of participants in the age groups of <40 years, 40-59 years, and ≥60 years were 62 (men=17; women=45), 250 (men=81; women=169) and 188 (men=95; women=93) respectively.

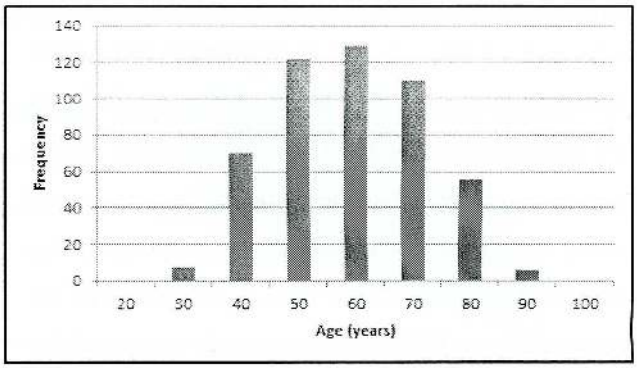

Fig. 1 Age distribution of the study population

Description of lipid levels

Distribution of lipid levels according to age groups and sex are shown in Table 1. All the mean lipid levels were within the normal range except HDL-C levels in women which were lower than the recommended value across all age groups. When comparing the mean lipid levels of men and women, a significant difference was observed for HDL-C (p=0.006). Differences in mean lipid levels among different age groups were not statistically significant.

The mean TC: HDL-C ratio of the total population, men and women were 4.4±1.5, 4.5±1.6 and 4.3±1.4 respectively. The difference in the mean TC: HDL-C ratio between men and women was not significant.

Table 1: Lipid levels according to age groups and gender

Age group (years)	Total Cholesterol Mean ± SD mg/dl			LDL Cholesterol Mean ± SD mg/dl			Triglyceride Mean ± SD mg/dl			HDL Cholesterol Mean ± SD mg/dl		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
<40 (n=62)	196.6 ±26.1	175.3 ±27.2	181.1 ±28.5	125.4 ±26.2	110.8 ±24.0	114.8 ±25.5	113.6 ±43.2	105.8 ±52.2	108.0 ±50.0	48.5 ±10.1	43.4 ±6.9	44.8 ±8.2
40-59 (n=250)	188.8 ±38.1	192.4 ±42.9	191.2 ±41.4	121.1 ±33.9	122.1 ±38.5	121.8 ±37.1	135.3 ±79.0	119.3 ±52.0	124.4 ±62.5	40.7 ±12.5	46.4 ±10.4	44.6 ±11.4
≥60 (n=188)	180.4 ±43.9	196.8 ±44.3	189.0 ±44.8	111.6 ±39.9	123.1 ±41.3	117.0 ±41.0	117.4 ±57.5	125.7 ±57.7	122.0 ±57.7	45.3 ±11.7	48.5 ±12.0	47.0 ±12.0
Total (n=500)	185.4 ±40.6	191.2 ±42.0	189.0 ±41.5	116.8 ±36.8	120.8 ±37.9	119.2 ±37.5	124.6 ±67.0	119.3 ±54.2	121.3 ±59.5	43.7 ±12.2	46.6 ±10.6	45.5 ±11.4

SD, standard deviation; LDL, low-density lipoprotein; HDL, high-density lipoprotein

Outliers

Outliers are shown in Fig. 2. In TC, nine (1.8%) outliers were identified: eight of them were above the upper limit (>288.7 mg /dL) and one was below the lower limit (<84.5 mg/dL). There were six outliers (1.2%) in the LDL-C and all were above the upper limit (>210.5 mg/dL). Seventeen (3.4%) outliers were identified in TG which were above the upper limit (>243.4 mg/dL). The number of outliers in HDL-C was fifteen (3.0%) and all were above the upper limit (>73.2 mg/dL). Mean values of TC, LDL-C, TG, and HDL-C after removing the outliers were 187.2±38.2 mg/dL, 117.7±34.9.mg/dL, 114.3±44.9 mg/dL and 44.5±10.0 mg/dL respectively. There were no significant differences when comparing lipid levels with and without outliers.

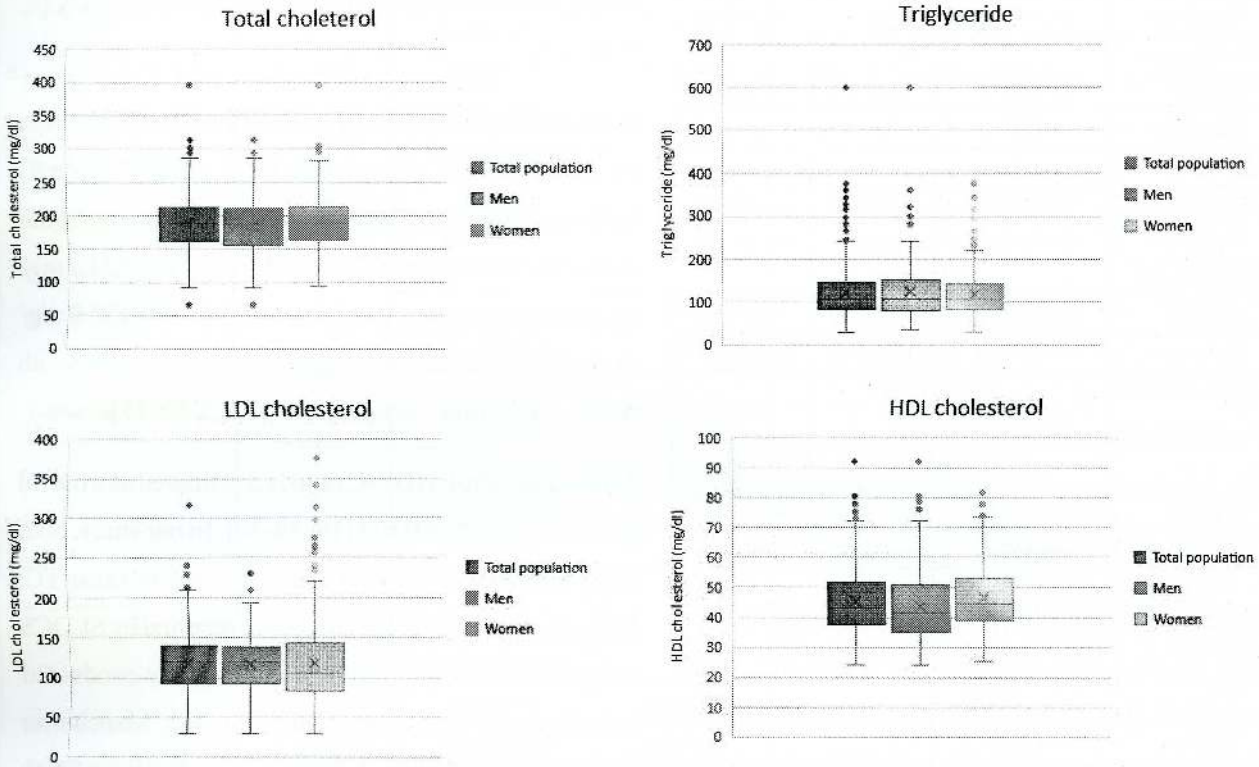

Fig. 2 Distribution of lipid levels among healthy adults

Pattern of lipid profile

Table 2 shows the proportion participants with desirable and undesirable lipid levels. Majority of the participants had desirable lipid levels except HDL-C in women. When comparing men and women, significant difference was observed for HDL-C ($p<0.001$). Proportion of participant with desirable and undesirable TC: HDL-C ratio was almost equal. Greater proportion of men had desirable TC: HDL-C ratio compared to women (Table 2). However, this difference was not significant.

Discussion

The present study found that the Jaffna population had a trend in HDL-C level similar to that of South Asian populations reported in literature. Table 3 compares lipid levels of different populations (values reported in mmol/L were converted to mg/dL).

We found that the mean HDL-C levels of the total population (45.5 mg/dL) and men (43.7 mg/dL) of our study were within an acceptable range. Although the mean HDL-C level of women (46.6 mg/dL) was higher than that of total population and men, it was below the acceptable value for women.

When compared to other studies conducted among Sri Lankans (Table 3), mean HDL-C of this study was comparable to the values reported in SLDCS study and Sri Lankans in Oslo and higher than the HDL-C levels of Sinhalese and Tamils in Kandy [11, 12]. A study conducted in three major cities in South Asia has reported low HDL-C levels (41.7 mg/dL to 46.2 mg/dL) in urban South Asians [24].

Table 2 : Proportion of participants with desirable and undesirable lipid levels

Description	Frequency (percentage)		
	Total population (N=500)	Men (N=193)	Women (N=307)
Total Cholesterol			
Desirable	306 (61.2%)	122 (63.2%)	184 (59.9%)
Undesirable	194 (38.8%)	71 (36.8%)	123 (40.1%)
LDL Cholesterol			
Desirable	321 (64.4%)	124 (64.3%)	213 (69.4%)
Undesirable	179 (35.8%)	69 (35.8%)	94 (30.6%)
Triglyceride			
Desirable	386 (77.2%)	142 (73.6%)	244 (79.5%)
Undesirable	114 (22.8%)	51 (26.4%)	63 (20.5%)
HDL Cholesterol			
Desirable	292 (58.4%)	111 (57.5%)	97 (31.6%)
Undesirable	208 (31.6%)	82 (42.5%)	210 (68.4%)
Total Cholesterol: HDL Cholesterol ratio			
Desirable	254 (50.8%)	107 (55.4%)	147 (47.9%)
Undesirable	246 (49.2%)	86 (44.6%)	160 (52.1%)

Other studies have also reported a lower HDL-C level among South Asians compared to non-South Asian populations [8, 25, 26]. The mean HDL-C level of the present study was similar to HDL-C levels of South Asian populations and lower than non-South populations [6, 11, 20-25].

In the present study mean LDL-C levels in both men and women across all age groups were within the desirable range whereas the SLDCS study (Table 3) reported a borderline high LDL-C among Sri Lankans [11]. A relatively lower LDL-C levels (102.2 mg/dL to 113.3 mg/dL) were reported in urban South Asians [24]. Several other studies also reported a slightly lower LDL-C level in South Asians than many other ethnic groups [7, 8, 25, 26]. Like most of the South Asians, our study population also had a relatively lower LDL-C level (119.2 mg/dL).

The mean TG level of the present study was within the normal range. The SLDCS study also reported a similar finding whereas Sri Lankans in Oslo and Kandy (Table 3) had a higher TG levels [11, 12]. In our study, women had a lower TG level than men which was observed in the SLDCS study as well [11]. It is interesting to note that the TG level of Jaffna population (121.3 mg/dL) was lower than the TG levels (128.4 mg/dL to 161.4 mg/dL) of most of the South Asians [6, 12, 21, 23, 24]. Triglyceride levels (<100 mg/dL to 145.3 mg/dL) among non-South Asian populations varied widely [6, 7, 25, 27].

In the present study both men and women had a desirable mean TC levels whereas SLDCS study (Table 3) reported a borderline high TC level [11]. Among South Asian, TC levels varied from 162.0 mg/dL to 224.3 mg/dL and a comparable variation in TC levels (138.8 mg/dL to 224.3 mg/dL) was observed among non-South Asian populations as well [6, 7, 11, 12, 20-27].

Total cholesterol: HDL-C ratio is considered as a useful predictor of risk of CVD [19, 28-30]. In our study, both men (4.4) and women (4.3) had a suboptimal mean TC: HDL-C ratio. Similar findings were reported by SLDCS study (men=4.5; women=4.4) and a study conducted in India (men=4.5; women=4.2) [11, 31]. Manchester study showed an undesirable TC: HDL-C ratio in South Asian women (4.7) and both men (4.7) and women (4.1) among non-South Asians [6]. A study compared Caucasians and Indo-Asians in United Kingdom reported undesirable TC: HDL-C ratio in Indo-Asian women (4.5) and both Caucasians (4.6) and Indo-Asian (4.9) men [22]. The UK-Biobank study reported a higher TC: HDL-C ratio among South Asians (4.3) compared to White Europeans (4.0) and Black Africans or Caribbean (3.7) [25]. Like other South Asians, Jaffna population also tend to have an undesirable TC: HDL-C ratio. Most of the findings, including the present study are suggestive of a female preponderance for undesirable TC: HDL-C ratio in South Asians [6, 11, 22, 25, 31]. Although we use the same target lipid levels across all ethnic groups, the prediction of risk of CVD based on lipid levels may not be the same for all ethnic groups.

Table 4 Lipid levels of different populations

Study, year	Country	Population (n)	Lipid level (mg/dL)			
			Total Cholesterol	LDL Cholesterol	Triglyceride	HDL Cholesterol
Present study, 2023	Sri Lanka	Healthy adults in Jaffna (500)	189.0±41.5	119.2±37.5	121.3±59.5	45.5±11.4
		Men (193)	185.4±40.6	116.8±36.8	124.6±67.0	43.7±12.2
		Women (307)	191.2±42.0	120.8±37.9	119.3±54.2	46.6±10.6
de Groot et al., 2019 [20]	Netherlands	Dutch blood donors (2547)	195.3±37.9	111.8 ±32.5	114.3 *	57.6±15.5
Katulanda et al., 2018 [11]	Sri Lanka	Adults (4451)	206.7±43.5	135.5±37.6	121.7±66.8	46.8±10.6
		Men (1758)	202.1±42.9	130.7±42.9	132.8 ±73.7	44.6 ±10
		Women (2693)	209.7±29.1	138.5±36.6	114.4±60.8	48.2±10.6
Telles et al., 2018 [21]	India	Healthy obese adults (1140)	176.7±35.6	-	148.8±80.6	44.5±11.2
Tennakoon et al., [12]	Sri Lanka Norway	Sri Lankans in Oslo[1] (1145)				
		Men (685)	208.8	-	230.3	41.4
		Women (460)	193.4	-	159.4	46.8
		Kandy Sinhalese (445)				
		Men (143)	212.7	-	221.4	37.1
		Women (302)	212.7	-	168.3	41.0
		Kandy Tamils (233)				
		Men (103)	201.1	-	221.4	35.2
		Women (130)	208.8	-	194.86	37.51
France et al., 2003 [6]	UK	Adults ≥30 years				
		South Asians (348)				
		Men (179)	199.9 ±3.9	-	140.0 [1]	41.4 ±1.2
		Women (169)	212.7 ±3.5	-	143.5 [1]	46.4±1.2
		Non-South Asian (3225)				
		Men (1633)	207.7 ±1.2	-	145.3 [1]	47.6±0.0
		Women (1592)	219.6 ±1.2	-	128.4[1]	56.5 ±0.8
Gama et al., 2002 [22]	UK	Caucasians (787)	224.3*	-	-	54.1*
		Men (421)	220.4*	-	-	46.4*
		Women (366)	224.3*	-	-	54.1*
		Indo-Asians (223)	220.4*	-	-	50.3*
		Men (129)	220.4*	-	-	46.4*
		Women (94)	208.8*	-	-	46.4*
Hoogeveen et al., 2001 [23]	USA India	Adults				
		Control[2] (46)	162.0±25.6	84.2±25.4	139.9±65.5	47.4±12.9
		CHD[3] (46)	193.6±47.3	110.7±40.1	186.0±101.3	42.3±8.8
		USA Asian Indians (206)	191.2±35.3	117.8±32.2	151.3±102.6	43.4±11.8

CHD, coronary heart disease; LDL, low-density lipoprotein; HDL, high-density lipoprotein; MS, metabolic syndrome; UK, United Kingdom; USA, United States of America

** Median, [1] Geometric mean, [1] 99% were ethic Tamils*

[2] Healthy individuals living in northern India , [3] Individuals with documented CHD living in northern India

The REGARDS study concluded that low HDL-C levels were associated with an increased risk of coronary heart disease in Whites but not in Blacks [32]. The Northern Manhattan Study reported that low HDL-C and high TG/ HDL-C ratios were not associated with the risk of myocardial infarction in Hispanics, but were predictive in non-Hispanic Blacks and Whites [33]. The INTERHEART study reported that changes in ApoA1 levels were better determinants of risk of acute myocardial infarction than changes in HDL-C levels [34]. The above findings indicate the need for ethnic and region-specific consideration in determining the risk of CAD. Despite the extensive works on ethnic differences in the pattern of lipid profiles over the past decades, clinical significance of these differences is yet to be established. Therefore, further extensive in-depth studies are needed to determine the role of ethnic variations in lipid profile and characteristics and their association with CAD. We may need to redefine the optimal lipid levels based on the ethnicity and region in future.

There are limitations in our study that need to be acknowledged. Firstly, the data were extracted from the data source of a screening programme, therefore, the study population may not be a representative sample of the local population. However, as healthy adults were identified using well-defined criteria, this study would give an insight to the pattern of the lipid profile of the local population. Secondly, the data we analysed was from Sri Lankan Tamils, therefore cannot be generalised to all Sri Lankans. Thirdly, since we used the data from a data source that was not designed for this study, we were not able to examine the likely contributors for suboptimal lipid levels and outliers. Nevertheless, the finding of this study would give an idea about the pattern of lipid abnormalities of the local population and help to plan future studies to investigate the link between the lipid levels and the risk for CVD.

Conclusion

Findings of our study support the claim that South Asians tend to have low HDL-C. Similar to other South Asians, Jaffna population also had a relatively low LDL-C levels than non-South Asians. However, TC and TG levels were not consistent with those of South Asians and Sri Lankans reported in the literature. Since the pattern lipid profile is influenced by ethnicity and culture, differences ethnicity and culture could have contributed to these differences. These findings indicate the complex nature of prediction of the link between lipid abnormalities and cardiovascular risk. Further studies that investigate the association between the lipid levels and the cardiovascular risk in the local population are needed to understand the implications of these observations. Since previous studies have shown that not only the quantity but also the quality particularly of LDL-C and HDL-C contribute to the risk of cardiovascular disease, the characteristics of lipids and their association with cardiovascular disease in the local population also need to be examined.

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Declarations

Competing Interest: None of the authors have any competing interest.

Ethical approval: Ethical approval was obtained from the Ethics Review Committee of Teaching Hospital, Jaffna (Ref. No.: S02/08/2021). Approval from the Regional Directorate of Health Services-Jaffna was obtained to extract information from the database.

References

1. WHO CVD Risk Chart Working Group. World Health Organization cardiovascular disease risk charts: revised models to estimate risk in 21 global regions. Lancet Glob Health. 2019; 7(10):e1332-e1345. doi: 10.1016/S2214-109X(19)30318-3
2. Gupta M, Singh N, Verma S. South Asians and cardiovascular risk: what clinicians should know? Circulation. 2006; 113(25):e924-9. doi: 10.1161/CIRCULATIONAHA.105.583815
3. Sniderman AD, Bhopal R, Prabhakaran D, Sarrafzadegan N, Tchernof A. Why might South Asians be so susceptible to central obesity and its atherogenic consequences? The adipose tissue overflow hypothesis. Int J Epidemiol. 2007; 36(1):220-5. doi: 10.1093/ije/dyl245
4. Ruuth M, Janssen LGM, Äikäs L, Tigistu-Sahle F, Nahon KJ, Ritvos O, Ruhanen H, Käkelä R, Boon MR, Öörni K, Rensen PCN. LDL aggregation susceptibility

is higher in healthy South Asian compared with white Caucasian men. J Clin Lipidol. 2019; 13(6):910-919.e2. doi: 10.1016/j.jacl.2019.09.011

5. Volgman AS, Palaniappan LS, Aggarwal NT, Gupta M, Khandelwal A, Krishnan AV, Lichtman JH, Mehta LS, Patel HN, Shah KS, Shah SH, Watson KE; American Heart Association Council on Epidemiology and Prevention; Cardiovascular Disease and Stroke in Women and Special Populations Committee of the Council on Clinical Cardiology; Council on Cardiovascular and Stroke Nursing; Council on Quality of Care and Outcomes Research; and Stroke Council. Atherosclerotic Cardiovascular Disease in South Asians in the United States: Epidemiology, Risk Factors, and Treatments: A Scientific Statement From the American Heart Association. Circulation. 2018; 138(1):e1-e34. doi: 10.1161/CIR.0000000000000580

6. France MW, Kwok S, McElduff P, Seneviratne CJ. Ethnic trends in lipid tests in general practice. QJM. 2003; 96(12):919-23. doi: 10.1093/qjmed/hcg154

7. Frank AT, Zhao B, Jose PO, Azar KM, Fortmann SP, Palaniappan LP. Racial/ethnic differences in dyslipidemia patterns. Circulation. 2014; 129(5):570-9. doi: 10.1161/CIRCULATIONAHA.113.005757

8. Singh K, Thanassoulis G, Dufresne L, Nguyen A, Gupta R, Narayan KV, Tandon N, Sniderman A, Prabhakaran D. A Comparison of Lipids and apoB in Asian Indians and Americans. Glob Heart. 2021; 16(1):7. doi: 10.5334/gh.882

9. Makshood M, Post WS, Kanaya AM. Lipids in South Asians: Epidemiology and Management. Curr Cardiovasc Risk Rep. 2019;13(8):24. doi: 10.1007/s12170-019-0618-9

10. Annual Health Statistics 2019, Sri Lanka. Medical Statistics Unit, Ministry of Health. Colombo.2019 http://www.health.gov.lk/moh_final/english/public/elfinder/files/publications/AHB/AHS%202019.pdf

11. Katulanda P, Dissanayake HA, De Silva SDN, Katulanda GW, Liyanage IK, Constantine GR, Sheriff R, Matthews DR. Prevalence, patterns, and associations of dyslipidemia among Sri Lankan adults-Sri Lanka Diabetes and Cardiovascular Study in 2005-2006. J Clin Lipidol. 2018;12(2):447-454. doi: 10.1016/j.jacl.2018.01.006

12. Tennakoon SU, Kumar BN, Selmer R, Mikram MJ, Meyer HE. Differences in predicted cardiovascular risk in Sinhalese and Tamils in Sri Lanka compared with Sri Lankans in Norway. Asia Pac J Public Health. 2013; 25(6):452-62. doi: 10.1177/1010539511423958

13. Amarasinghe S, Balakumar S, Arasaratnam V. Prevalence and factors associated with metabolic syndrome among Tamils aged over 18 years in Jaffna district, Sri Lanka. J Diabetes Metab Disord. 2015;14:61. doi: 10.1186/s40200-015-0190-x

14. Zhang L, Qiao Q, Tuomilehto J, Janus ED, Lam TH, Ramachandran A, Mohan V, Stehouwer CD, Dong Y, Nakagami T, Onat A, Söderberg S; DECODE/DECODA Study Group. Distinct ethnic differences in lipid profiles across glucose categories. J Clin Endocrinol Metab. 2010;95(4):1793-801. doi: 10.1210/jc.2009-2348

15. Yoo J, Miyamoto Y, Rigotti A, Ryff CD. Linking Positive Affect to Blood Lipids: A Cultural Perspective. Psychol Sci. 2017;28(10):1468-1477. doi: 10.1177/0956797617713309

16. Browner WS, Newman TB, Hulley SB. Estimating Sample Size and Power: Applications and Examples. In: Hulley SB, Cummings SR, Browner WS, Grady DG, Newman TB. Designing Clinical Research. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2013:55-83

17. Weekly Epidemiological Report. Vol. 40 No. 33. Epidemiology Unit, Ministry of Health. Colombo. 2013. https://www.epid.gov.lk/storage/post/pdfs/vol_40_no_33_english.pdf

18. Birtcher KK, Ballantyne CM. Cardiology patient page. Measurement of cholesterol: a patient perspective. Circulation. 2004 14; 110(11):e296-7. doi: 10.1161/01.CIR.0000141564.89465.4E

19. Millán J, Pintó X, Muñoz A, Zúñiga M, Rubiés-Prat J, Pallardo LF, Masana L, Mangas A, Hernández-Mijares A, González-Santos P, Ascaso JF, Pedro-Botet J. Lipoprotein ratios: Physiological significance and clinical usefulness in cardiovascular prevention. Vasc Health Risk Manag. 2009; 5:757-65.

20. de Groot R, Hoenink JC, Mackenbach JD, den Braver NR, Pinho MGM, Brassinga D, Prinsze FJ, Timmer TC, de Kort WLAM, Brug J, van den Hurk K, Lakerveld J. The association between population density and blood lipid levels in Dutch blood donors. Int J Health Geogr. 2019; 18(1):3. doi: 10.1186/s12942-019-0167-y

21. Telles S, Pal S, Sharma SK, Singh A, Kala N, Balkrishna

A. The association between the lipid profile and fasting blood glucose with weight related outcomes in healthy obese adults. BMC Res Notes. 2018; 11(1):383. doi: 10.1186/s13104-018-3485-4

22. Gama R, Elfatih AB, Anderson NR. Ethnic differences in total and HDL cholesterol concentrations: Caucasians compared with predominantly Punjabi Sikh Indo-Asians. Ann Clin Biochem. 2002;39(Pt 6):609-11. doi: 10.1177/000456320203900612

23. Hoogeveen RC, Gambhir JK, Gambhir DS, Kimball KT, Ghazzaly K, Gaubatz JW, Vaduganathan M, Rao RS, Koschinsky M, Morrisett JD. Evaluation of Lp[a] and other independent risk factors for CHD in Asian Indians and their USA counterparts. J Lipid Res. 2001;42(4):631-8

24. Fatmi Z, Kondal D, Shivashankar R, Iqbal R, Khan AA, Mohan D, Pradeepa R, Gupta R, Ali MK, Ajay VS, Mohan V, Kadir MM, Narayan KMV, Prabhakaran D, Tandon N. Prevalence of dyslipidaemia and factors associated with dyslipidaemia among South Asian adults: The Center for Cardiometabolic Risk Reduction in South Asia Cohort Study. Natl Med J India. 2020; 33(3):137-145. doi: 10.4103/0970-258X.314005

25. Razieh C, Zaccardi F, Miksza J, Davies MJ, Hansell AL, Khunti K, Yates T. Differences in the risk of cardiovascular disease across ethnic groups: UK Biobank observational study. Nutr Metab Cardiovasc Dis. 2022; 32(11):2594-2602. doi: 10.1016/j.numecd.2022.08.002

26. Gijsberts CM, den Ruijter HM, Asselbergs FW, Chan MY, de Kleijn DP, Hoefer IE. Biomarkers of Coronary Artery Disease Differ Between Asians and Caucasians in the General Population. Glob Heart. 2015; 10(4):301-311.e11. doi: 10.1016/j.gheart.2014.11.004

27. Ge P, Dong C, Ren X, Weiderpass E, Zhang C, Fan H, Zhang J, Zhang Y, Xi J. The High Prevalence of Low HDL-Cholesterol Levels and Dyslipidemia in Rural Populations in Northwestern China. PLoS One. 2015; 10(12):e0144104. doi: 10.1371/journal.pone.0144104

28. Lemieux I, Lamarche B, Couillard C, Pascot A, Cantin B, Bergeron J, Dagenais GR, Després JP. Total cholesterol/HDL cholesterol ratio vs LDL cholesterol/HDL cholesterol ratio as indices of ischemic heart disease risk in men: the Quebec Cardiovascular Study. Arch Intern Med. 2001; 161(22):2685-92. doi: 10.1001/archinte.161.22.2685

29. Genest J, Frohlich J, Fodor G, McPherson R; Working Group on Hypercholesterolemia and Other Dyslipidemias. Recommendations for the management of dyslipidemia and the prevention of cardiovascular disease: summary of the 2003 update. CMAJ. 2003; 169(9):921-4

30. Nam BH, Kannel WB, D'Agostino RB. Search for an optimal atherogenic lipid risk profile: from the Framingham Study. Am J Cardiol. 2006; 97(3):372-5. doi: 10.1016/j.amjcard.2005.08.055

31. Gupta R, Sharma M, Goyal NK, Bansal P, Lodha S, Sharma KK. Gender differences in 7 years trends in cholesterol lipoproteins and lipids in India: Insights from a hospital database. Indian J Endocrinol Metab. 2016; 20(2):211-8. doi: 10.4103/2230-8210.176362

32. Zakai NA, Minnier J, Safford MM, Koh I, Irvin MR, Fazio S, Cushman M, Howard VJ, Pamir N. Race-Dependent Association of High-Density Lipoprotein Cholesterol Levels With Incident Coronary Artery Disease. J Am Coll Cardiol. 2022; 80(22):2104-2115. doi: 10.1016/j.jacc.2022.09.027

33. Willey JZ, Rodriguez CJ, Carlino RF, Moon YP, Paik MC, Boden-Albala B, Sacco RL, DiTullio MR, Homma S, Elkind MS. Race-ethnic differences in the association between lipid profile components and risk of myocardial infarction: The Northern Manhattan Study. Am Heart J. 2011; 161(5):886-92. doi: 10.1016/j.ahj.2011.01.018

34. Karthikeyan G, Teo KK, Islam S, McQueen MJ, Pais P, Wang X, Sato H, Lang CC, Sitthi-Amorn C, Pandey MR, Kazmi K, Sanderson JE, Yusuf S. Lipid profile, plasma apolipoproteins, and risk of a first myocardial infarction among Asians: an analysis from the INTERHEART Study. J Am Coll Cardiol. 2009; 53(3):244-53. doi: 10.1016/j.jacc.2008.09.041.

Original Article

Serial Murderers In Japan (1882-2017): A Narrative Analysis

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Abstract

A retrospective narrative analysis of 61 serial murderers (a few, belonging to health care profession, such as physicians, midwives and paramedic) in Japan was attempted.

Materials available in the online databases including Wikipedia entries on individual criminals were studied. Among the studied total of 61 serial murderers covering the time span from 1882 to 2017, 59 were convicted and 2 were non-convicted. All five categories of Deitz typology of serial murderers were represented among the convicted sample. These include, psychopathic sexual sadists (e.g: Ryuun Daimai, Yoshio Kodaira, Genzo Kurita, Kiyoshi Okubo, Takahiro Shiraishi), crime spree killers (e.g: Kanae Kijima, Chisako Kakehi), custodial killers (e.g: Shige Sakakura, Miyuki Ishikawa and Hayato Imai), psychotic, religious-cult killers (e.g: Sachiko Eto, Shoko Asahara and his 12 collaborators) and organized crime functionaries (e.g: Satoru Nomura). Tomomasa Nakagawa, personal doctor of the *Aum Shinrikyo* Buddhist religious-cult leader Shoko Asakara, may hold a record for a scientist on death row to publish a paper in a peer-reviewed journal.

Limitations of this study include, (1) omission of the methods of killing used by the murderers from analysis (2) total reliance on media reports for information, in preference to voluminous records of Japanese court cases. Despite these limitations, details presented in this analysis of 59 convicted and 2 non-convicted serial murderers in 45 court cases held in Japan may be useful for comparative studies in forensic science and law enforcement.

Key words: *Aum Shinrikyo* cult, forensic psychology, hanging, sarin gas, Shoko Asahara

Introduction

The lack of consensus for a proper definition of what constitutes 'serial murder' to identify serial murderer(s) still remains unsolved. Adjorlolo and Chan [1] reviewed this controversy by listing 13 such definitions, published between 2001 and 2014. Among these, the definition proposed by the Federal Bureau of Investigation (FBI) of USA in 2005 – '*The unlawful killing of two or more victims by the same offenders in separate events*' has gained prominence lately, for it's simplicity [2, 3]. Nevertheless, clarity in the legal meaning of 'unlawful' is opaque and differs from country to country, as well as political system to political system. As Myers et al. [4] had reviewed, in the 20th century higher minimum casualties ranging from four or five or even greater had been considered. As such, comparative statistics on the number of serial murders of many countries do suffer due to inconsistency and inaccurate calibration. A two part review on serial killers by Miller [5, 6] had covered the history, proposed typologies, patterns, motives and forensic aspects of this specific category criminals, mainly from Europe and USA.

In a Master's degree dissertation submitted to the California State University in 2003, Kaori Aki [7] had compared 82 Japanese serial murderers (in 64 cases) with 402 serial killers from USA from 1880 to 2002. Details of this study (including the names of 82 Japanese serial murderers) was analyzed by Hickey [8]. Based on *Yomiuri Shimbun* database of articles on serial murderers, from 1970 to 2013, covering 467 homicides by 187 serial murderers and comparing their profiles with an equal number of individuals who had committed a single homicide, Kiire et al. [9] could conclude that 'there are few qualitative differences between serial and single homicide offenders.'

In this narrative analysis, an attempt is made to revisit the deeds of 61 serial murderers (a few of them be-

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longing to health care profession, such as physicians, midwives and paramedics) of Japan involved in 45 court cases, covering the 135 year period (1882-2017).

Methods

Literature on serial murderers in Japan, and its affiliated keywords like serial killers and serial homicide according to the FBI's 2005 definition, as indexed in the PubMed database, other appropriate online databases (such as Radford University/Florida Gulf Coast University serial killer database, Murderpedia.org) and Wikipedia were searched to collect empirical data.

Results

Among the 61 serial murderers counted in this study, 49 were men and 12 were women. Previously assembled data on male-female gender percent among offenders indicate that 12-17% were women [10]. Thus, 19.7% of women in the studied sample of 61 serial murderers aligns marginally with the previous data. Table 1 presents a listing of 59 convicted serial murderers in Japan – chronologically arranged tentatively arranged since 1882. While 58 of the convicted serial murderers were adults, one (Shinichiro Azuma aka Seito Sakakibara) was a juvenile offender. All five categories of Deitz typology [5, 11] of serial murderers were represented among this sample of 59. These five categories were,

1. Psychopathic sexual sadists (e.g: Ryuun Daimai, Yoshio Kodaira, Genzo Kurita, Kiyoshi Okubo, Takahiro Shiraishi)
2. Crime spree killers (e.g: Kanae Kijima, Chisako Kakehi),
3. Custodial killers (e.g: Shige Sakakura, Miyuki Ishikawa and Hayato Imai), and
4. Psychotic religious-cult killers (e.g: Sachiko Eto, Shoko Asahara and his 12 collaborators).
5. Organized crime functionaries (e.g: Satoru Nomura).

Though criminal gang activity had prevailed in Japan [12, 13], minimal number of convicted serial murderers representing this category in the surveyed sample is rather unusual; it may also explain the difficulty in persecuting this category of murderers in a court of law and convicting them for their crimes. Technically, Satoru Nomura (the head of Kudo-kai, criminal gang) is an outlier to the FBI's definition 'unlawful killing of two or more victims' for a serial murderer. He was convicted for the crimes for *only one murder* in 1998, a shooting in the thigh of a retired police officer investigating his criminal gang in 2012, facial-stabbing of a woman nurse at a cosmetic surgery clinic and stomach-stabbing of a dentist [14] One crime reporter had noted the cause of facial attack on the nurse as follows: 'Known for his violent temper, Nomura became enraged in 2012 when a penis enlargement procedure did not produce the desired results. He ordered an underling to stab the supervising nurse. She survived but was severely injured' [15].

Hanging is the only method used for all executions in Japan [16], and in the view of Holmes [17], executions in Japan still remain shrouded in secrecy and silence. Two serial murderers in Japan, a man and a woman, were not convicted in court, for reasons of their premature death. The man, Akiyoshi Umekawa, was shot dead by the Osaka armed police two days after he committed his second crime in 1979. The woman, Miyoko Sumida was the prime suspect in the Amagasaki serial murders of at least 8 individuals which happened for 15 years, between 1987 and 2012. The motive for the crime was pension fund and insurance fraud. Investigations revealed that victims were tortured to death. Sumida committed suicide by choking herself in her prison cell [18].

Discussion

The 135 year period, from 1882 to 2017, spreads along four distinct time frames in recent Japanese history designated on the basis of ruling Emperor; namely, Meiji period (1868-1912), Taisho period (1912-1925), Showa period (1925-1988) and Heisei period (1989-2017). Each period had distinct social markers, which include development in banking access to money transfer, telecommunication system, computer and internet revolution, as well as transportation links connecting various prefectures of Japan. Serial murderers who had lived in these four distinct time frames made use of these social markers, for their criminal activities.

When comparison between the data available in the 2003 study by Aki [7, 8] and this study. Two notable differences between the two studies are, Aki's study (1) contain 9 unidentified serial murderers, and (2) exclude the murderers Shoko Asahara (1955 - 2018) and his 12 associates, involved in the notorious sarin gas poisoning

cases, in the count. In my dissenting view, first, mixing identified and unidentified serial murderers in the same list defies logic. Secondly, due to its notoriety and shocking value, sarin gas poisoning cases in 1994 and 1995 had received specific attention from researchers in multiple fields, including religious-cults, cultural deviance, terrorism, toxicological science and chemical warfare [19-31]; as such, Asahara and his associates deserve recognition as serial murderers. Based on nosology and *Aum Shinrikyo* cult publications, Akimoto [32, 33] had found evidence for the leader Asahara suffering from pseudologia phantastica.

Among the 59 convicted serial murderers in this study, majority committed their crimes solitarily. Only four 'team activities' were identified in the studied sample. The largest team activity was that of the notorious *Aum Shinrikyo* Buddhist religious-cult group lead by Shoko Asahara. In addition to the leader, 12 of his associates (all men) were executed in July 2018, for three separate crimes, spread from 1989 to 1995. While Tanimoto et al. [34] published a brief commentary in the *Lancet* in 2018, after the execution of 13 *Aum Shinrikyo* cult members, under the title 'Involvement of doctors in *Aum Shinrikyo*', the doctors who were charged with crime and convicted were left out. It should be noted that one among these 12 associates of Asahara who were executed in 2018, was his personal doctor Tomomasa Nakagawa (1962 - 2018). [35, 36]

In fact, two months before his execution, a short communication with Nakagawa as the first author was published in *Forensic Toxicology* journal, with the title, 'Murders with VX: *Aum Shinrikyo* in Japan and the assassination of Kim Jong in Malaysia' [37]. This paper's publishing history is somewhat interesting. It was received at the journal on Feb 3, 2018, accepted on May 7, 2018 and published online on May 21, 2018. And Nakagawa was executed on July 6, 2018, two months after the acceptance of his paper. One specific line in the paper had this sentence: "The first author of this paper was actually involved in such manufacturing [unpublished observation]". The address given for Nakagawa was 'Hiroshima Detention Center'. This may be considered as a record for a scientist on death row to publish a paper in peer-reviewed journal. Another *Aum Shinrikyo* cult affiliated doctor (a heart surgeon) Ikuo Hayashi (b. 1947) who had functioned as the medical director of *Aum Shinrikyo* cult, received a relatively mild sentence of life in prison in May 1998, following his cooperation with the prosecutors [38, 39].

Since the conviction of British general practictioner Harold Shipman (1946-2004) in 2000 [40-46], serial murders by healthcare professionals (doctors, nurses, midwives and paramedics) have become a cause of serious concern globally [47]. During the late Meiji period, a three member women team, led by a midwife Shige Sakakura (1868-1915) were involved in a practice then tagged as 'baby farming' [during the Victorian period in Britain] of purchasing unwanted, illegitimate infants at a low cost and then killing. Sakakura and her two women accomplices were executed in 1915, for the crime of snuffing out the lives of nearly 200 infants. Subsequently, during the war-depleted period of mid 1940s during the Showa period, another midwife Miyuki Ishikawa (1897-1987) was also charged for killing an estimated 84 infants. Turbulence of property loss records during the war time in combination with the US Occupation administration by the Supreme Commander for the Allied Powers (SCAP) under Gen. MacArthur that lasted until 1952 was advantageous for the release of Ishikawa from her crimes, after spending 4 years behind the bars.

Hiroshi Maeue (b. 1968, identified by the media as the 'suicide website murderer' and executed in 2009) and Takehiro Shiraishi (b. 1990, identified by the media as the 'Twitter killer') belonged to a new breed of serial murderers, who adopted a novel modus operandi technique of preying on the fear/loneliness of depressed young women with suicidal feelings. Projecting themselves as 'concerned helpers' and as 'experts' in assisting suicide, Maeue and Shiraishi made use of digital world devices of internet activity, personal computer, email, smart phone and Twitter, which came to be promoted after 1995 [48, 49], to initiate contact with their gullible victims. Shiraishi's execution was finalized in Jan 2021 [50].

In conclusion, limitations of this study include, (1) non-specification of the methods of killing used by the murderers in this analysis. Japan being a country with strict gun control policy, all serial murderers had used either weapons other than guns or poisoning for their killings. The exception was the case of Akiyoshi Umekawa, dentified in Table 2. (2) total reliance on media reports for information, in preference to voluminous records of Japanese court cases. (3) To comply with maximum word limit requirements, detailed descriptions of inter-

esting case examples included in this study have to be curtailed. Despite these limitations, details presented in this retrospective narrative analysis of 59 convicted and 2 non-convicted serial murderers in 45 court cases held in Japan may be of some use for comparative studies in forensic science and law enforcement.

References

1 Adjorlolo S and Chan HC. The controversy of defining serial murder: Revisited. Aggression Viol Behavior 2014; 19: 486-491.

2 Morton RJ (ed). Serial Murder – Multi-Disciplinary Perspectives for Investigators, Serial Murder Symposium, US Dept. of Justice, Federal Bureau of Investigation, San Antonio, Texas, Aug 29-Sept 2, 2005, 61 pp.

3 Osowski K. Investigating a serial killer. Dttp: Documents to the People 2018; 46(4): 19-24.

4 Myers WC, Reccoppa L, Burton K and McElroy R. Malignant sex and aggression: an overview of serial sexual homicide. Bull Am Acad Psychiatry Law 1993; 21(4): 435-451.

5 Miller L. Serial killers: I. Subtypes, patterns and motives. Aggression Viol Behavior 2014; 19: 1-11.

6 Miller L. Serial killers: II. Development, dynamics and forensics. Aggression Viol Behavior 2014; 19: 12-22.

7 Aki K. Serial killers: a cross cultural study between Japan and the United States. Master's dissertation, California State University, Fresno, 2003, 93 pp. http://www.fresnostate.edu/academics/gradstudies/documents/thesis/summer2003pdfs/ABSTRACT-KAki.pdf

8 Hickey EW. Serial Murderers and Their Victims, 7th ed., Boston: Cengage Learning, 2016, pp. 399-404.

9 Kiire S, Kubota H, Niioka K and Ochi K. Classification of serial homicide and comparison of serial homicide with single homicide in Japan. Shinrigaku Kenkyu (Jpn J Psychol). 2017; 87(6): 633-643. (in Japanese, with an English abstract)

10 Scott J. Serial homicide. Brit Med J. 1996; 312: 2-3.

11 Dietz PE. Mass, serial and sensational homicides. Bull New York Acad Med. 1986; 62: 492-496.

12 Johnson EH. Yakuza (criminal gangs) in Japan: Characteristics and management in prison. J Contemp Criminal Justice 1990; 6(3): 113-126.

13 Gragert BA. Yakuza: The warlords of Japanese organized crime. Ann Survey Internat & Comp Law 1997; 4(1): 147-204.

14 Nikkei staff writers. Japan yakuza boss sentenced to death for ordering murder. Nikkei Asia, Aug 25, 2021. https://asia.nikkei.com/Spotlight/Society/Japan-yakuza-boss-sentenced-to-death-for-ordering-murder

15 Whiting R. Yakuza death sentence won't stop organized crime. Asia Times, Oct 11, 2021. https://asiatimes.com/2021/10/yakuza-death-sentence-wont-stop-organized-crime/

16 Johnson DT and Nagata K. Hanging in Japan -What Occupation-era documents and a lay judge trial reveal about executions in the state that still kills in secret. Punishment & Soc. 2014; 16(3): 227-257.

17 Holmes B. Secretive symbolism? The Death penalty, executions and Japan. Criminal Law Forum 2020; 31; 579-601.

18 Brown L. Suicide of the Piranha granny: Japanese serial killer, 64, found dead in her cell after murdering six people to claim life insurance. The Daily Mail online, Dec 12, 2012. https://www.dailymail.co.uk/news/article-2246996/Miyoko-Sumida-Japanese-woman-dead-cell-killed-SIX-members-family-insurance.html

19 Yanagisawa N, Morita H, Nakajima T, Okudera H, Shimizu M, Hirabayashi H, Nohara M, Midorikawa Y and Mimura S. Sarin poisoning in Matsumoto, Japan. Lancet 1995; 346: 290-293.

20 Metraux DA. Religious terrorism in Japan: the fateful appeal of Aum Shinrikyo. Asian Survey 1995; 35(12): 1140-1154.

21 Okumura Y, Takasu N, Ishimatsu S, Miyanoki S, Mitsuhashi A, Kumada K, Tanaka K and Hinohara S. Report on 640 victims of the Tokyo subway sarin attack. Ann Emergency Med. 1996; 28: 129-135.

22 Shimazono S. In the wake of Aum: The formation and transformation of a universe of belief. Jpn J Religious Stud. 1995; 22(3-4): 381-415.

23 Kogo Y. Aum Shinrikyo and spiritual emergency. J Humanistic Psychol. 2002; 42(4): 82-101.

24 Uchiyama A. The physical and psychological effects on victims of the sarin gas attack, Tokyo subway in 1995. Police J. 2003; 76: 149-160.

25 Taneda K. The sarin nerve gas attack on the Tokyo subway system: Hospital response to mass casualties and psychological issues in hospital planning. Traumatology 2005; 11(2): 75-85.

26 Sakurai Y. The risk of religious freedom: Asking the meaning of terrorism by Aum Shinrikyo. J Grad School of Letters, Hokkaido Univ. 2006; 1: 31-43.

27 Alexander R. Psychological aspect of religious terrorism in Japan. Procedia: Soc Behav Sci. 2013; 86: 146-150.

28 Ushiyama R and Baert P. Cultural trauma, counter-narratives, and dialogical intellectuals: the works of Murakami Haruki and Mori Tatsuya in the context of the Aum affair. Theory and Society 2016; 45(6): 471-499.

29 Gunaratna R. Aum Shinrikyo's rise, fall and revival. Counter Terrorist Trends Analysis 2018; 10(8): 1-6.

30 Ushiyama R. Latency through uncertainty: the 1994 Matsumoto sarin incident as a delayed cultural trauma. Int J Polit Cult Soc. 2019; 32: 21-41.

31 Lifton RJ. Owning reality: Reflections on cultism and zealotry. J Am Psychoanal Assoc.2020; 68(3): 413-432.

32 Akimoto H. Two cases of pseudologia phantastica: Consideration from the viewpoint of forensic psychiatry. Psychiatr Clin Neurosci.1997; 51: 185-195.

33 Akimoto H. The Aum cult leader Asahara's mental deviation and its social relations Psychiatr Clin Neurosci. 2006; 60: 3-8.

34 Tanimoto T, Ozaki A, Harada K, Tani Y and Kami M. Involvement of doctors in Aum Shinrikyo. Lancet 2018; 392: 1116.

35 Yoshida R and Murakami S. Aum Shinrikyo guru Shoko Asahara and six other cult members hanged for mass murders, Japan Times, July 6, 2018. https://www.japantimes.co.jp/news/2018/07/06/national/crime-legal/aum-shinrikyo-guru-shoko-asahara-hanged-mass-murder-reports/

36 Anon. 6 remaining ex-AUM cult members on death row executed. The Mainichi, July 26, 2018. https://mainichi.jp/english/articles/20180726/p2a/00m/0na/008000c

37 Nakagawa T and Tu AT. Murders with VX: Aum Shinrikyo in Japan and the assassination of Kim Jong Nam in Malaysia. Forensic Toxicol. 2018; 36: 542-544.

38 Kristof ND. Japanese cult said to have planned nerve-gas attacks in US. New York Times, Mar 23 1997, sect. 1, p. 14.

39 Anon. Aum doctor gets life sentence for subway sarin attack. Japan Times (Tokyo), May 26 1998.

40 O'Neill B. Doctor as murderer. Brit Med J., 2000; 320: 329-330.

41 Kinnell HG. Serial homicide by doctors: Shipman in perspective. Brit Med J., 2000; 321: 1594-1597.

42 Ramsay S. Audit further exposes UK's worst serial killer. Lancet, 2001; 357: 123-124.

43 Dyer O. Shipman murdered more than 200 patients, inquiry finds. Brit Med J., 2002; 325: 181.

44 Dyer O. Shipman found dead in prison cell. Brit Med J., 2004; 328: 123.

45 Jackson T, Smith R. Harold Shipman – a general practitioner and murderer. Brit Med J., 2004; 325: 181.

46 Baker R. Implications of Harold Shipman for general practice. Postgrad Med J., 2004; 80: 303-306.

47 Starr L. Registered nurse and serial killer. Australian Nurs J., 2009; 16(11): 41.

48 Goldsmith M and Jackson T. Eyewitness Computer, London: Dorling Kindersley Ltd., 2011, pp. 44-47..

49 Ozawa-de Silva C. Too lonely to die alone: Internet suicide pacts and existential suffering in Japan. Cult Med Psychiatry 2008; 32: 516-551.

50 BBC News. Japan 'Twitter killer' Takahiro Shiraishi sentenced to death, Dec 15, 2020. https://www.bbc.com/news/world-

Original Article

Endoscopic retrograde cholangiopancreatography; a single tertiary care centre experience from Northern Sri Lanka.

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Abstract

This study evaluated endoscopic retrograde cholangiopancreatography's safety, efficacy and outcomes in a single tertiary care centre.

This retrospective analysis used data from clinical records of patients who underwent ERCP from 2019 to 2022 at Teaching Hospital Jaffna. Demographic and historical characteristics, indications, and data related to cannulation, interventions, procedural difficulties, and complications were extracted from BHT. The mean age of participants was 57.99 ± 15.33 (23 – 90 years). 52 (49.1%) were males. 54 (50.9%) were females. The procedural success rate was 95.3% (101/106). All procedures were carried out under sedation or general anaesthesia. Common indications for ERCP were biliary stones (76.4%, n=81) and neoplasms involving the biliary tract and pancreas (19.8%). Standard sphincterotomy was performed in the majority of patients (97.2%). Successful retrieval of stones was achieved in 67 (82.7%) patients, predominantly using the balloon extraction method. Duct dilatation and stenting were performed on patients with neoplasm and stricture. The primary procedural difficulty encountered was difficult cannulation. 89.6% of patients did not experience any post-procedural complications, and the ten patients who did develop complications were successfully managed. Procedural mortality of ERCP was 0.9% (n=1).

ERCP can be effectively and safely performed at centers with low procedural volumes in well-experienced hands.

Keywords: ERCP, distal cholangiocarcinoma, Choledocholithiasis, Sphincterotomy

Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is a diagnostic or therapeutic procedure for biliary stones, stricture, and pancreatic pathologies [1,2]. The success rate of endoscopic retrieval of biliary tract stones is as high as 90%, as evidenced by previous studies [3]. Sometimes, difficult extraction occurs when multiple stones or distal common bile duct variations are present [4]. The success rate of the ERCP procedure may vary with the anatomical factors of the biliary tract, the experience of the interventionist, and interpersonal techniques between different endoscopists [3]. A trainee is expected to do a reasonable amount of ERCP procedures under supervision before carrying out an ERCP procedure alone to ensure the procedure's safety [5]. Post-ERCP complications are biliary tract injuries, cholangitis, perforation, bleeding, sepsis, and post-ERCP pancreatitis [6]. But, these complications are avoided by the operator's experience [7].

Causes for the difficult cannulation are periampullary diverticulum, periampullary tumour, surgically altered anatomy of the biliary tract, sphincter of Oddi dysfunction (SOD), and difficult approach to papilla [8]. When difficult cannulation is present, precut papillotomy is done as an alternative technical approach [9]. Teaching hospital Jaffna is the only tertiary care centre in the Northern Province of Sri Lanka with the availability of

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multiple endoscopists catering to the needs of surrounding district general and base hospitals. Annually, 50-60 patients undergo ERCP in THJ, and details have been maintained since 2019. This study evaluates ERCP's efficacy, indications, complications, safety, procedural difficulties, and outcomes. So far, there is no study carried out on the safety, efficacy, and outcomes of ERCP in Sri Lanka. Identifying and correcting gaps in the current practice of ERCP through this retrospective analysis will help improve the outcomes.

Methods

A retrospective observational descriptive study was conducted on 106 patients who underwent ERCP at the teaching hospital Jaffna from 2019 to 2023. Ethical approval was obtained from the Ethics Review Committee of the Teaching Hospital Jaffna, with reference number (Reg No- S06/08/2022). Of the 106 patients, 101 completed the ERCP procedure successfully. Patients from all age groups who underwent ERCP were included. No one was excluded. Indications of ERCP have adhered to the International Hepato- Pancreato Biliary Association (IHPBA) guidelines. Indications, technical difficulties, complications, procedural safety, reasons for difficult cannulation, and outcomes of ERCP were extracted from bed head tickets (BHT) after obtaining permission from the institutional ethical review committee. All ERCP procedures were performed by an experienced general surgeon trained in ERCP. Written informed consent was obtained from the patients who were underwent ERCP.

Procedures were performed using Olympus endoscopes. Endoscopic sphincterotomy was performed in patients with stone impaction with the obstructed bile duct, stricture, and obstruction due to neoplasms involving the biliary tract and pancreas. In patients with failed standard sphincterotomy, the precut approach was used. The standard procedure used for biliary stone retrieval included balloon extraction, dormia baskets, and mechanical lithotripsy. Stents were inserted for biliary drainage. Successful cannulation is considered selective deep cannulation to the common bile duct. Failed cannulation is difficulty in cannulating the biliary tree using an endoscopist's regular technique within a certain time limit or multiple attempts. However, heterogeneity of definitions exists for failed cannulation from different stakeholders. Complications following ERCP were defined according to IHPBA guidelines. Finally, data were analysed by descriptive statistics using SPSS version 26.0.

Results

Totally 106 patients underwent ERCP from 2019 to 2023. Of the 106 patients, 52 (49.1%) were males, and 54 (50.9%) were females. The mean age group of patients was 57.99 ± 15.33. (23 – 90 years). The common presentation on admission was obstructive jaundice (n=56, 52.8%). The demographic and historic characteristics of patients are listed in Table 01. Common indications for ERCP are illustrated in Figure 01.

Table 1 Demographic and historic characteristics

Gender	Male	52	49.1%
	Female	54	50.9%
Age	Mean	57.99 ± 15.33	
	Range	23 – 90 years	
Presentation on admission	Obstructive Jaundice	56	52.8%
	Acute cholecystitis	16	15.1%
	Acute Pancreatitis	6	5.6%
	Isolated RHC pain	28	26.4%

Standard sphincterotomy with sphincterotome was performed in 103 (97.2%) patients, and precut sphincterotomy using a needle knife was done on three patients (2.8%). Out of the 81 patients diagnosed with biliary stone disease, a single common bile duct (CBD) stone was detected in 43 patients (53%), while multiple stones were identified in 38 patients (47%). The predominant method used for stone retrieval was balloon extraction on 79 (97.5%) patients. 82.7% of stone retrievals were successful.

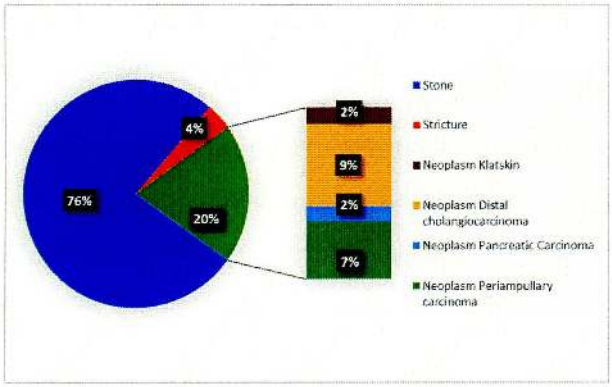

Figure 01: Indications for ERCP

The main reasons for the failed extraction of CBD stone (17.2%,14) are large stones >2cm (5%), irregular shape (3.7%), periampullary diverticula (1.8%) altered anatomy of the biliary tract by previous surgery (3.7%), and tumour impingement (2.5%). Stents were placed for biliary drainage in 47 (44.3%) patients. Stone retrieval methods and stenting methods are summarised in Table 02. Standard sphincterotomy was done in 97.2% of patients and remaining were cannulated by precut sphincterotomy (2.8%) (Figure 2). Balloon sweep was done in 98.1% and stone retrieval done in 76.4%.

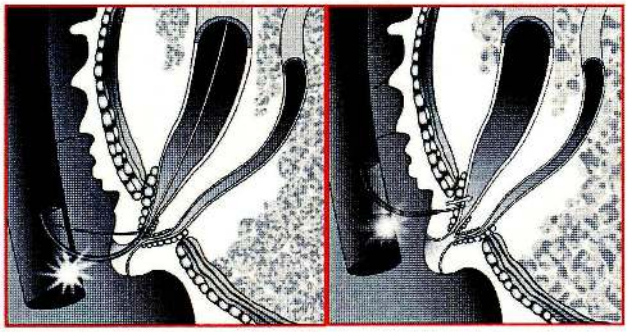

Figure 02 (A) Standard sphincterotomy with sphincterotome (B) precut sphincterotomy

There were minimal complications following ERCP, as 90% of the patients had no complications. Bile leak (n=2, 1.8%), perforation (n=1, 0.9%), and cholangitis (n=2, 1.8%) were the observed complication in our study (Figure 3). Observed procedural mortality rate was (n=1, 0.9%), attributed to sepsis with multi-organ failure. Failed cannulation (n=18, 16.9%), accidental pancreatic duct cannulation (n=5, 4.7%), difficult extraction (n= 14 , 13.2%) of the stones,

Table 2 Stone retrieval and stenting

Single/ Multiple stones	Single	43	53.0%
	Multiple	38	47%
Stone retrieval methods	Balloon extraction	79	97.5%
	Balloon + Lithotripsy	1	1.25%
	Dormia basket	1	1.25%
Stone extraction	Successful	67	82.7%
	Failed	14	17.3%
Type of stents in stent placed	JJ	7	6.6%
	Metal	6	5.6%
	Plastic	34	32.1%
	No Stent	59	55.7%

periampullary diverticulum (n=2, 1.8%) were the main problems noted during ERCP. (Figure 4)

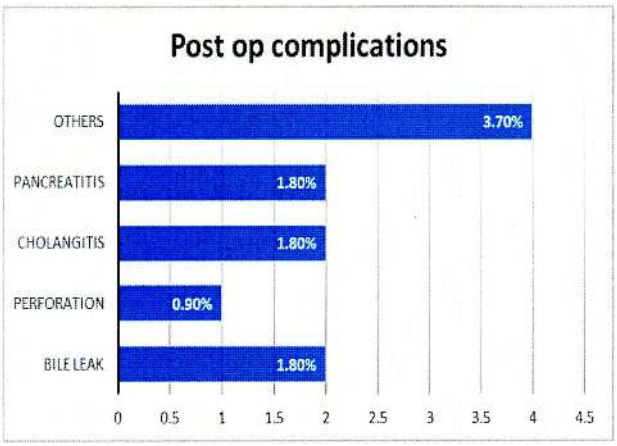

Figure 3 Post op complications

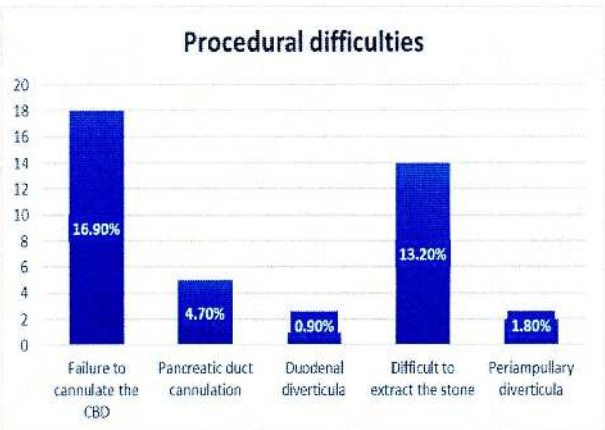

Figure 4 Procedural difficulties

Subsequent cholecystectomy was done in 49 (46%) patients with stone disease. CBD dilation and stenting was done for 24 patients (22.7%) with neoplasm and stricture.

Discussion

ERCP can be a diagnostic and therapeutic method for pancreatic and biliary conditions [5]. It is safe and effective in experienced hands [10]. This is the first study from Northern Sri Lanka to assess the safety, efficacy, and procedural challenges associated with ERCP.

ERCP is commonly indicated for benign conditions affecting the biliary or pancreatic ductal system, with some cases involving malignant conditions [11]. Our study also revealed that 80% of the cases were related to benign conditions, while 20% were attributed to malignant conditions. Numerous studies worldwide have consistently shown that choledocholithiasis is the most prevalent indication for ERCP [12-14].

In a multicenter study conducted in the United States, the most common ERCP indication was suspected or established uncomplicated common bile duct stones in 1470 (61.5%), followed by the management of existing biliary or pancreatic stent in 370 (15.5%) and acute biliary pancreatitis in 173 (7.2%) [15]. Similarly, our study revealed that the most prevalent benign indication was biliary stones (76%), followed by strictures (4%). Hence, stents were placed for biliary drainage in 47 (44.3%) patients in our study.

A study dealing with malignant indications for ERCP conducted in North India reported perihilar lesions being the most common (32.9%), followed by distal cholangiocarcinoma (23%), periampullary carcinoma (15.7%), and pancreatic carcinoma at 13.5% [13]. In contrast, our study found distal cholangiocarcinoma to be the most frequently observed malignant condition, followed by periampullary carcinoma.

Therapeutic ERCP requires selective cannulation of the biliary tract [16]. The success rate of cannulation in ERCP is influenced by the patient's factors and the endoscopist's experience [7]. Different studies have yielded different cannulation success rates in ERCP ranging from 65% to 100% [2]. A randomised controlled trial conducted in Australia unveiled that the success rate of cannulation was 97.3% [7]. Also, an Indian study revealed a success rate of 93% [13]. Despite encountering difficulties, our study also demonstrated a cannulation success rate of 95.3% (n=101). Standard sphincterotomy was the preferred technique in 1244 (52.0%) cases, and precut sphincterotomy was performed only in 22 (0.9%) cases in a study conducted in the United States. Similarly, the predominant method used in our setting was standard sphincterotomy (97.2%).

ERCP is an effective method for managing common bile duct (CBD) stones compared to open and laparoscopic CBD exploration, as evidenced by previous studies [17]. A study on the epidemiology and characteristics of choledocholithiasis concluded that CBD stones found in Sri Lankan patients were predominantly single, located in the distal portion of the duct, and of small size. These characteristics are conducive to successful retrieval through ERCP [18]. However, it's noteworthy that although many characteristics were in line with the findings of our study, our research demonstrated an almost equal percentage of single and multiple stones.

A study in Pakistan focusing on CBD stone extraction using ERCP reported a successful extraction rate of 81.08% for CBD stones. 90.42% of the patients underwent balloon extraction, while 9.58% had dormia basket retrieval [19]. When comparing these findings to our study, we observed a 82.7% success rate in CBD stone removal, with the majority of our patients also undergoing balloon extraction (n=104, 98.1%), similar to that study.

Older age >85, Periampullary diverticula, multiple stones (>4), and stones more than 1.5cm were found to be the primary reasons for the failed stone retrieval in a Greece study recruiting 1390 ERCP stone extraction [20]. Similarly, large stones (>2cm) and periampullary diverticula were the primary reasons for the failure in our study. Additionally, altered anatomy resulting from previous surgery and tumour impingement were identified as other reasons for the failure.

The challenges encountered during ERCP procedures can arise even before the endoscope is introduced, including factors that heighten the risks of sedation, bleeding tendencies, anatomical variations in the biliary system, and difficult cannulation [23]. Our study primar-

ily noted minor difficulties, with difficult cannulation being a commonly encountered issue. Nevertheless, we successfully navigated these challenges without experiencing any major complications.

Post-ERCP complications are known and mostly include pancreatitis, cholangitis, haemorrhage, and perforation [24]. In a recent study conducted in South India, 8% of patients experienced post-ERCP complications, with pancreatitis being the most common (3.06%), followed by cholangitis and bleeding (1.14%), and perforation (0.76%) [16]. Similarly, a European study also yielded comparable results, with 12% of patients experiencing complications [25]. Despite our setting having limited facilities, our study also demonstrated findings consistent with global literature, reporting a 10.4% rate of complications

Post-ERCP pancreatitis is a particularly concerning complication in ERCP as it contributes to mortality [26]. Difficult cannulation of the biliary tract has been associated with a higher risk of PEP [16]. Worldwide trials have reported PEP incidence rates ranging from 8% to 15%. In our study, two patients were developed PEP after normal cannulation, not in difficult cannulation. Other risk factors for PEP were female sex and advanced age [16]. A Chinese study involving 4234 patients reported post-ERCP cholangitis in 2.4% of cases (n=102) [27]. Compared to that study and the currently available literature on post-ERCP cholangitis, a minimal incidence was noted in our study (1.8%).

Unfortunately, our study experienced one procedure-related mortality attributed to sepsis. This particular patient had infiltrative distal cholangiocarcinoma and pre-existing cholangitis before undergoing ERCP. Cannulation could not be achieved, and the ERCP procedure failed due to the inability to identify the ampulla.

The primary limitations of our study include its retrospective nature, a relatively small number of patients, and the lack of data on long-term follow-up. Furthermore, we could not thoroughly explore complications and efficacy due to the limited sample size. A comprehensive five-year study on efficacy and safety involving multiple large-volume centres in Sri Lanka would provide valuable additional evidence.

Conclusion

ERCP is a safe and effective procedure in experienced hands. Choledocholithiasis is the commonest indication for ERCP in the northern part of Sri Lanka, followed by distal cholangiocarcinoma. Pancreatic duct cannulation, duodenal diverticula, and periampullary diverticula are the most common periprocedural problems. Further studies have to be done to identify the reasons for cannulation failure and complications in many participants.

Acknowledgement

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References

1. Bailey A, Bourke M, Williams S, Walsh P, Murray M, Lee E, et al. A prospective randomized trial of cannulation technique in ERCP: effects on technical success and post-ERCP pancreatitis. Endoscopy. 2008 Apr 4;40(04):296–301.
2. Farrell RJ, Mahmud N, Noonan N, Kelleher D, Keeling PWN. Diagnostic and therapeutic ERCP: a large single centre's experience. Ir J Med Sci. 2001 Jul;170(3):176–80.
3. Sabbah M, Nakhli A, Bellil N, Ouakaa A, Bibani N, Trad D, et al. Predictors of failure of endoscopic retrograde pancreatocholangiography during common bile duct stones. Heliyon. 2020 Nov;6(11):e05515.
4. Tumi A, Magadmi M, Elfageih S, Rajab AF, Azzabi M, Elzouki AN. ERCP in a cohort of 759 cases: A 6-year experience of a single tertiary centre in Libya. Arab J Gastroenterol. 2015 Mar;16(1):25–8.
5. Sheppard DP, Craddock SJ, Warner BD, Wilkinson ML. ERCP cannulation success benchmarking: implications for certification and validation. Frontline Gastroenterol. 2015 Apr;6(2):141–6.
6. Gamage R, TG Amal Priyantha. Post ERCP Cholangitis; Lessons Learnt from a Prospective Study in a Tertiary Care Center of Sri Lanka. 2019 [cited 2022 Aug 9]; Available from: http://rgdoi.net/10.13140/RG.2.2.32461.36326

7. Petersen BT. ERCP outcomes: Defining the operators, experience, and environments. Gastrointest Endosc. 2002 Jun;55(7):953–8.

8. Berry R, Han JY, Tabibian JH. Difficult biliary cannulation: Historical perspective, practical updates, and guide for the endoscopist. World J Gastrointest Endosc. 2019 Jan 16;11(1):5–21.

9. Siegel J. H. (1980). Precut papillotomy: a method to improve success of ERCP and papillotomy. Endoscopy, 12(3), 130–133. https://doi.org/10.1055/s-2007-1021728.

10. Samad A, Farrukh SZ ul I, Haqqi SA, Siddiqui AR, Niaz SK, Qadri MZ. Success Rate of Common Bile Duct Stones Extraction on First ERCP Attempt. J Dow Univ Health Sci. 2018 Dec 29;12(3):81–5.

11. Meseeha M, Attia M. Endoscopic Retrograde Cholangiopancreatography. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK493160/

12. Qureshi LA, Alzanbagi A, Tashkandi A, Khan MS, Malik ZM, Hefny ME, Shariff MK. Retrospective Analysis of Characteristics, Indications, and Outcomes of Endoscopic Retrograde Cholangiopancreatography (ERCP) in a Tertiary Referral Center in Saudi Arabia. Cureus. 2023;15(3):e36794. https://doi.org/10.7759/cureus.36794.

13. Parveen S, Shah AH, Gulzar GM, Sodhi JS, Khan MA, Tiwari A, Mir TA, Sharma A, Ahmad SN, Dar NA. ERCP practice at a tertiary care hospital in Kashmir, North India: a large single-center cross-sectional study with focus on quality indicators, success rate, and indications. Annals of Medicine and Surgery. 2023;85(5):1705–1711. https://doi.org/10.1097/MS9.0000000000000613

14. Jain RP, Jain P, Ravichandra NS, et al. Procedural outcome analysis of ERCP at a tertiary hospital in South India. International Journal of Research and Review. 2019;6:37–41.

15. Al-Mansour MR, Fung EC, Jones EL, Zayan NE, Wetzel TD, Martin Del Campo SE, Jalilvand AD, Suzo AJ, Dettorre RR, Fullerton JK, Meara MP, Mellinger JD, Narula VK, Hazey JW. Surgeon-performed endoscopic retrograde cholangiopancreatography. Outcomes of 2392 procedures at two tertiary care centers. Surgical Endoscopy. 2018;32(6):2871–2876. https://doi.org/10.1007/s00464-017-5995-x.

16. Sabbah M, Nakhli A, Bellil N, Ouakaa A, Bibani N, Trad D, et al. Predictors of failure of endoscopic retrograde pancreatocholangiography during common bile duct stones. Heliyon. 2020 Nov;6(11):e05515.

17. Zhu J, Li G, Du P, Zhou X, Xiao W, Li Y. Laparoscopic common bile duct exploration versus intraoperative endoscopic retrograde cholangiopancreatography in patients with gallbladder and common bile duct stones: a meta-analysis. Surg Endosc. 2021 Mar;35(3):997–1005.

18. De Silva WSL, Pathirana AA, Wijerathne TK, Gamage BD, Dassanayake BK, De Silva MM. Epidemiology and disease characteristics of symptomatic choledocholithiasis in Sri Lanka. Ann Hepato-Biliary-Pancreat Surg. 2019;23(1):41.

19. García-Cano Lizcano, J., González Martín, J. A., Pérez Sola, A., & Morillas Ariño, M. J. (2002). Success rate of complete extraction of common bile duct stones at first endoscopy attempt. Revista espanola de enfermedades digestivas, 94(6), 340–350.

20. Christoforidis E, Vasiliadis K, Tsalis K, Patridas D, Blouhos K, Pramateftakis MG, Moysidis M, Lazaridis C. Factors significantly contributing to a failed conventional endoscopic stone clearance in patients with "difficult" choledocholithiasis: a single-center experience. Diagnostic and Therapeutic Endoscopy. 2014;2014:861689. doi:10.1155/2014/861689.

21. Yin, H. K., Wu, H. E., Li, Q. X., Wang, W., Ou, W. L., & Xia, H. H. (2016). Pancreatic Stenting Reduces Post-ERCP Pancreatitis and Biliary Sepsis in High-Risk Patients: A Randomized, Controlled Study. Gastroenterology research and practice, 2016, 9687052. https://doi.org/10.1155/2016/9687052.

22. Stinton LM, Shaffer EA. Epidemiology of Gallbladder Disease: Cholelithiasus and Cancer. Gut Liver. 2012 Apr 15;6(2):172–87.

23. Baillie J. (2014). Difficult endoscopic retrograde cholangiopancreatography. Gastroenterology & hepatology, 10(1), 49–51.

24. Johnson, K. D., Perisetti, A., Tharian, B., Thandassery, R., Jamidar, P., Goyal, H., & Inamdar, S. (2020). Endoscopic Retrograde Cholangiopancreatography-Related Complications and Their Management Strategies: A "Scoping" Literature Review. Digestive diseases and sciences, 65(2).

25. Katsinelos, P., Lazaraki, G., Chatzimavroudis, G., Gkagkalis, S., Vasiliadis, I., Papaeuthimiou, A., Terzoudis, S., Pilpilidis, I., Zavos, C., & Kountouras, J. (2014). Risk factors for therapeutic ERCP-related complications: an analysis of 2,715 cases performed by a single endoscopist. Annals of gastroenterology, 27(1), 65–72.

26. Chen M, Wang L, Wang Y, Wei W, Yao YL, Ling TS, et al. Risk factor analysis of post-ERCP cholangitis: A single-center experience. Hepatobiliary Pancreat Dis Int. 2018 Feb;17(1):55–8.

27. Dumonceau JM, Andriulli A, Elmunzer B, Mariani A, Meister T, Deviere J, et al. Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Updated June 2014. Endoscopy. 2014 Aug 22;46(09):799–815.

Original Article

Influence of seasonality in pediatric Respiratory tract infections: A Hospital-Based retrospective Study in Jaffna

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Abstract

This study aims to determine the prevalence, age distribution, and seasonal variation of respiratory infection in the Jaffna peninsula. This study was a descriptive retrospective study in which all patients 12 years of age and below who presented with signs and symptoms of respiratory tract infections and received inward treatment between January 2016 and December 2020 were included. During that period, a total of 2924 data were analyzed. The analysis showed significant correlations between the seasons and disease burden. This knowledge can provide insight into managing resources effectively in resource-limited settings.

Keywords: Seasonality, Climate, Respiratory infections, Infectious diseases

Introduction

Seasonal variation of diseases among children is well known, especially for infectious and chronic diseases. Identification of the significance of the seasonal variation will help to improve understanding of the risk factors of diseases.

A study was published in the European Journal of Paediatrics in April 2016 which included all newly referred patients (51,054) to a teaching hospital in the Netherlands over six years (2008–2013). Seasonality was analyzed using simple moving averages, the standard error of the mean, and the percentage monthly variation. Among those, four diseases fulfilled the definition of seasonality. Respiratory tract infections had a peak in January, gastroenteritis peaked in February and March, functional complaints peaked in March and November, and asthma had a peak in March and October. The respiratory infections peaked during the winter season whereas the functional complaints peaked during the exam months and reached a nadir during the summer school holidays. (2)

A descriptive retrospective study on seasonal variations of respiratory viruses among children with respiratory tract infections in Saudi Arabia was published in 2018. All patients below 14 years of age with signs and symptoms of respiratory tract infections were included in the study. A total of 4611 patients were included from January 2013 to December 2014. Viruses were detected throughout both years, with a peak in December, January, February, and March which showed clear seasonal variation. (3)

Further, knowledge of seasonal variation may improve resource planning in health departments. As healthcare workers, we experience variations in the number of admissions annually, but apart from the well-known variation in respiratory diseases knowledge about patterns and causes of other diseases is lacking. Hospitalization patterns can be credited to not just medical reasons, but also environmental and social factors. This study aimed to analyze the extent to which seasonal variation plays a role in pediatric respiratory tract infections.

Methodology

A descriptive study was conducted at the University Paediatric Unit, Jaffna Teaching Hospital including all admissions from 2016 to 2020. All children below 12 years admitted with Respiratory tract infections such as upper (URTI) and lower (LRTI) respiratory tract infection, Bronchiolitis, and viral-induced wheeze were recruited into the study. URTI, LRTI, Bronchiolitis, and viral-induced wheeze cases were defined according to the ICD 10 classification of (WHO). Data were extracted from the Patient Management System(PMS) developed which is implemented at Professorial Paediatric unit Jaffna to improve the quality of documentation, minimise errors, and maintain a detailed patient database for instant retrieval

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The seasonal changes of the Jaffna district were obtained from the website of the meteorological department (4). Climate is the sum of atmospheric elements and their variations, solar radiation, temperature, humidity, clouds and precipitation, atmospheric pressure, and wind. With that, the seasons of Sri Lanka are divided into four seasons: First inter-monsoon, Southwest Monsoon, Second inter-monsoon, and Northeast monsoon falling in the months March to April, May to September, October to November, and December to February respectively.

The pattern of infection was described and analyzed between the number of cases of each infection and major seasons. Statistical significance was analyzed with ANOVA test and post hoc test.

Results

Out of 10, 923 total admissions in the five years, 2924 (26.7%) were admitted with Respiratory tract-related infections. Among them 50.5% were male and 49.5% were female. Highest number of admissions was noticed among younger children (0-5yrs). It was observed that the highest number of cases was reported in the Northeast monsoon (December to February) and the lowest numbers were observed in the southwest monsoon season (May to September). The analysis resulted in a statistically significant association between seasonal variation and the number of admissions [F (3,56) =5.8, p-0.002, CI=95%]. A Turkey post hoc test was performed to assess the number of admissions with respiratory infections between the seasons in Sri Lanka. It was observed that total number of cases in the first and 2nd inter-monsoon (p-0.18) and between the southwest and second inter-monsoon (p-0.01) were statistically significant.

Table 1. The four seasons of Jaffna peninsula

Seasons	Duration	Rainfall
First inter monsoon (FIMS)	March - April	50-100 mm
South-West Monsoon (SWMS)	May - September	Northwest 200-300 mm Southeast 100-200 mm
Second inter monsoon (SIMS)	Oct- November	500- 750 mm Strong wind + Wide-spread rain
Northeast monsoon (NEMS)	Dec – Feb	300-500 mm Dry cold wind

Table 2. The number of admissions of RTI throughout the seasons

	Gender	URTI	LRTI	Bronchi-olitis	Viral induced wheeze
FIMS	M	148	150	51	15
	F	108	173	34	13
SWMS	M	126	159	121	37
	F	122	152	76	31
SIMS	M	88	117	81	22
	F	100	92	58	18
NEMS	M	178	189	78	39
	F	156	130	68	27
Age	0-5	817	921	558	168
	6-12	197	221	09	34
Total		1026	1162	567	202

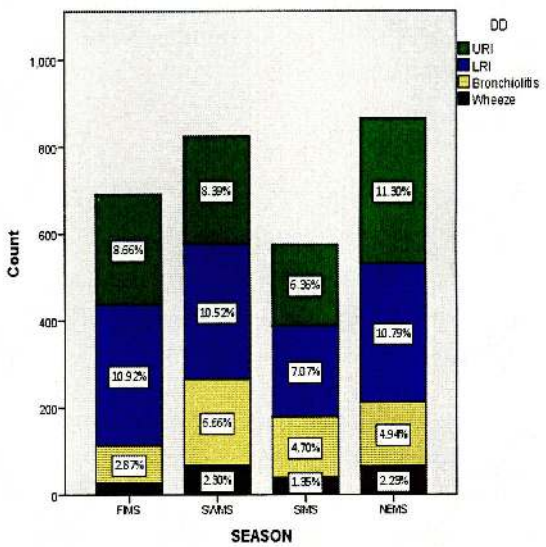

Figure 1. The number of admissions of RTI

Discussiothroughout the seasons

Seasonal variations in pediatric respiratory tract infections (RTIs) have long been recognized, yet their precise patterns and implications remain underexplored in many regions. This study presents findings from a retrospective study conducted at the University Pediatric Unit, Jaffna Teaching Hospital, aimed at elucidating the influence of seasonality on RTI admissions among children.

Drawing upon existing literature and methodologies, the study analysed admissions data spanning from 2016 to 2020, encompassing children under 12 years diagnosed with various RTIs, including upper and lower

respiratory tract infections, bronchiolitis, and viral-induced wheeze. The study leveraged the International Classification of Diseases (ICD-10) classification system for disease categorization.

The investigation incorporated meteorological data to correlate seasonal changes in the Jaffna district with trends in RTI admissions. Climate data, including rainfall, temperature, and wind patterns, were analysed alongside admission records to identify associations between environmental factors and disease incidence.

Results revealed a notable seasonal variation in RTI admissions, with a peak observed during the Northeast monsoon season (December to February) and decreased admissions during the Southwest monsoon season (May to September). Statistical analyses indicated a significant association between seasonal variation and the number of admissions, with colder, windier months correlating with heightened RTI incidence.

The analysis resulted in a statistically significant association between seasonal variation and the number of admissions [F (3,56) =5.8, p-0.002, CI=95%]. It showed a positive association with rainfall and cold windy weather. The admissions due to respiratory infection were very high among the wettest months of the Jaffna peninsula from October to February.

Limitations of the study, including the lack of virological data to identify specific pathogens, were acknowledged. Another limitation of this study is that it is hospital-based surveillance and assumes the hospital admissions are proportionate to the less severely affected population who are in the community.

However, the findings underscored the importance of understanding seasonal trends in RTIs for optimizing healthcare resource allocation and guiding clinical management strategies.

In conclusion, this study sheds light on the seasonal dynamics of paediatric RTIs in the Jaffna region, providing valuable insights for healthcare planning and disease management. By elucidating the influence of seasonality on RTI patterns, the study contributes to the broader understanding of infectious disease epidemiology and underscores the significance of climate-health correlations in public health initiatives.

As a country with limited resources, we are still far from incorporating virological studies into the free healthcare system, still, these kinds of analyses may help make clinical guidelines that may help local practitioners rationally prescribe antivirals and antibiotics.

References

1. Peltola, H. Observations on the seasonal variation of the most common acute pediatric diseases in the Helsinki area (Finland). *J Community Health* 7, 159–170 (1982). https://doi.org/10.1007/BF01325512

2. Schrijver, T.V., Brand, P.L.P. & Bekhof, J. Seasonal variation of diseases in children: a 6-year prospective cohort study in a general hospital. *Eur J Pediatr* 175, 457–464 (2016). https://doi.org/10.1007/s00431-015-2653-y

3. Saad S. Albogami, Meshal R. Alotaibi, Saud A. Alsahli, Emad Masuadi, Mohammad Alshaalan. Seasonal variations of respiratory viruses detected from children with respiratory tract infections in Riyadh, Saudi Arabia. Journal of Infection and Public Health, 183-186 (2018). https://doi.org/10.1016/j.jiph.2017.06.001

4. Department of Meteorology Srilanka 2024. (https://meteo.gov.lk)

Letter to the editor

Mass Cataract Surgery program as an effective approach to eradicate the Cataract backlog in resource constraint settings-A real life experience

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Introduction

Cataract has been identified as the major cause of blindness. Low and middle-income countries (LMIC) account for over 90% of all cataract blindness. The prevalence of blindness and low vision in any country is determined by the population's socioeconomic status, access to medical and healthcare services, and literacy level [1]. Even though cataracts cannot be prevented, vision can be restored with a cost-effective surgery in individuals with cataract. Despite technological advancements in cataract management, the volume of cataract surgeries remains low in many low middle-income countries.

It is estimated that in Sri Lanka, one of the LMICs, Cataract is accountable for 66.7% of cases of vision impairment and blindness [2] as the country faces several obstacles to implementing the World Health Organization's recommended rate of cataract surgery, including financial constraints and a shortage of eye care personnel.

Cataract as a cause in Northern Province

Northern Province is one of Sri Lanka's nine provinces, with a total population of 1,165,000 catered by two ophthalmologists and identified to have one of the highest prevalence of blindness in Sri Lanka [2].The cataract surgical rate in Northern Province is influenced by several barriers. Mainly,80% of its population residing in rural areas with relatively low median incomes, therefore they have limited access to cataract surgical services due to a scarcity of human resources and cataract surgery centres. Further, factors such as age, gender, education level also identified as barriers to obtaining cataract treatment, resulting in an instability in cataract surgery rate over the last decades irrespective of the high visual outcome.

The COVID-19 pandemic, followed by the economic crisis, slowed the progress in improving cataract surgery rates further, resulting in a significant case volume backlog. In order to tackle the major cause of blindness, cataracts must be treated, and treating cataracts necessitates cataract surgery. After a cataract is successfully treated, a person and their family may benefit for many productive years.

Therefore, given the large unmet need for cataract surgery, Eye Unit of Teaching Hospital Jaffna conducted a special 1000 free cataract surgery program to mark the world sight day- 2023 and as a part of the friendship week celebration between Teaching Hospital Jaffna and Teaching Hospital Ratnapura from 30th October to 03rd November 2023. This program was funded by non-government organizations.

Mass cataract surgery program-an effective approach

The mass cataract surgery programme proposes pragmatic solutions for innovative and equitable reforms in providing high-quality eye care services that will mitigate the burden of cataract-related blindness in a resource constrained setting. This program was designed with specific objectives to enhance and support the existing service delivery model by making good use of existing personnel and appropriate technology, which can be a very effective approach of cataract surgery to a huge number of patients.

First, the program determined to increase the quality and quantity of cataract surgery and minimize the prevalence of blindness by lessening the backlog of

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cataract surgery cases. Despite limited resources, financial constraints, insufficient staff, and an economic downturn, this programme was able to provide high-quality service delivery by performing 1052 cataract surgeries without complications by a diverse team of skilled surgeons, nurses, and health care assistants working collaboratively and cohesively. As a result, Northern Province alone achieved a CSR of 10/1000, which is similar to the CSR of high-income countries (8 to 14/1000). Additionally, the backlog for cataract surgery has been eliminated in the districts of Mullaitivu, Mannar, and Vavuniya.

Second, this program aided in providing equitable and affordable service delivery through public-private partnerships. The engagement and successful collaboration with the private and NGO sectors enhanced the availability of high-quality eye care services for individuals residing in underprivileged areas. Their input also facilitated the seamless execution of mass cataract surgeries in a resource-constrained setting over the course of the programme.

Third, the programme implemented particular steps to enhance access to eye care among impoverished population, especially women, as well as in distant and inaccessible areas. It is worth noting that of the 1052 people who underwent the surgery, 603 were women.

Fourth, because it is a mass cataract surgery programme, it enabled the achievement of sustainable development goals 2, 8, 12, 13, 16, and 17, which are zero hunger, decent work and economic growth, responsible consumption and production, climate action, peace, justice, and strong institutions and partnerships, respectively; reduction of carbon footprint; developed a skilled and efficient team by applying the 5S concept.

Conclusion

To have a significant influence on public health, initiatives must reach a substantial proportion of the population in need while also being effective and affordable. Following this program's success, second round of mass cataract surgery program was effectively implemented in the district of Vavuniya by employing the same strategies. Further, through its extensive scope, pragmatic, affordable, and contextually applicable strategies, it paved the way to address inequalities and promote safe, prompt, and affordable cataract surgery for all patients, regardless of their socioeconomic status or geographic location in a low resource setting. These efforts will ultimately lead towards the achievement of 2030 insights.

References

1 Pascolini, D.; Mariotti, S.P. Global estimates of visual impairment: 2010. Br. J. Ophthalmol. 2012, 96, 614–618.

2 Murthy, G.V. et al. (2018) "The Sri Lanka National Blindness, Visual Impairment and Disability Survey: Rationale, objectives and detailed methodology," Ceylon Medical Journal, 63(5), p. 3. Available at: https://doi.org/10.4038/cmj.v63i5.8735.

3 WHO. World report on vision. 2019

Case Report

Lupus pericardial effusion successfully treated with methylprednisolone pulse

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Abstract

Pericardial effusion is a rare complication of SLE-related serositis (1). We are presenting a case of lupus pericardial effusion that was successfully managed with methylprednisolone pulse therapy. The patient, a 22-year-old diagnosed with SLE, presented with symptoms and signs suggestive of pericarditis. Transthoracic echocardiography showed mild pericardial effusion. Investigations, including elevated ESR and C-reactive protein, were high with normal procalcitonin, were indicative of SLE-related serositis. TSH was within the normal range and tuberculosis screening was negative. The patient was treated with an intravenous methylprednisolone pulse. Following the treatment, the patient's pericardial effusion resolved, and inflammatory markers returned to the normal range. There are various treatment options for acute pericarditis in SLE, and methylprednisolone pulse therapy can be used in patients with associated pericardial effusion.

Key Words

SLE, Pericarditis, pericardial effusion

Introduction

Pericardial effusion in SLE is associated with SLE-related serositis. If left untreated, it can lead to high morbidity. We are presenting a case of lupus pericardial effusion that was successfully managed with methylprednisolone pulse therapy.

Case

A 22-year-old female patient with a history of systemic lupus erythematosus (SLE) on hydroxychloroquine 200mg presented with fever and chest pain for one week. The chest pain was confined to the anterior chest and increased with inspiration but was reduced by leaning forward. On admission, she was dyspneic and febrile but had no malar rash or oral ulcers. Respiratory examination showed a respiratory rate of 24, oxygen saturation of 96% in room air, and normal breath sounds without added sounds. Her blood pressure was 100/70 and her pulse rate was 130, with good volume and regularity. Heart sounds were normal, with no murmurs or pericardial friction rub. Other clinical examinations were unremarkable.

A complete blood count showed Lymphopenia with absolute lymphocyte count was 824 (WBC-10.18*10^3/uL, N-86.5%, L-8.1%), anemia (Hb-9.4g/dL, MCV-83fL, MCH-25.1pg), and normal platelet count (PLT-368*10^3/uL). ESR (108mm/1st hour) and CRP (106.2 mg/L) were elevated, while serum procalcitonin (0.05) was within the normal range. A 12-lead ECG showed sinus tachycardia. Chest X-ray showed an increased cardiothoracic ratio with a mildly globular-shaped heart but no significant carinal widening. An initial transthoracic echocardiogram showed good left ventricular function with mild pericardial effusion. Blood and urine cultures were negative, as were Trop I and D-dimer tests. Sputum for acid-fast bacilli was negative and Mantoux test was less than 5mm. Serum complement levels (C-3: 126 mg/dL [83-177], C-4: 16 mg/dL [12-36]) were within the normal range, as were VDRL and retroviral studies. Serum TSH was also within the normal range.

The patient was treated for lupus-induced pericardial effusion with intravenous methylprednisolone 1g daily for three days, followed by prednisolone 50mg (1mg/

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kg) daily. Her hydroxychloroquine dose was increased to 300mg orally daily and methotrexate 10mg weekly was added. Following the methylprednisolone pulse, her fever subsided, her hemodynamic parameters improved, and her inflammatory markers returned to normal (ESR-28mm/1st hour, CRP-23.5mg/L). A repeat echocardiogram showed no pericardial effusion.

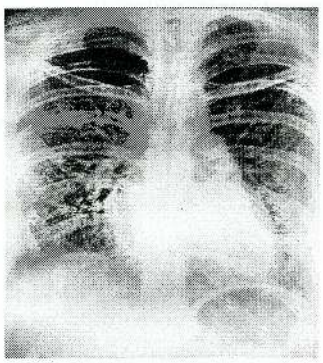

Figure 1: Chest X-ray shows an increased cardiothoracic ratio with a mild globular-shaped heart but no significant carinal widening. This appearance suggestive of the pericardial effusion

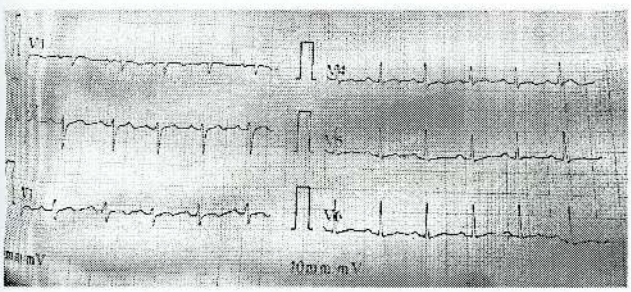

Figure 2 ECG : Limb leads of this patient show sinus tachycardia.

Discussion

Pericardial effusion in SLE is associated with SLE-related serositis (1). If left untreated, it can lead to high morbidity (2). Pericardial effusion can be an initial presentation of SLE and is included in the diagnostic criteria for SLE (3). In this case, a 22-year-old patient diagnosed with systemic lupus erythematosus presented with acute mild pericardial effusion. In tuberculosis-endemic areas, tuberculosis must be excluded as a cause of pericarditis (1). In this case, tuberculosis-related pericardial effusion was ruled out by negative procalcitonin and Mantoux tests. High C-reactive protein levels with normal procalcitonin levels support the diagnosis of lupus-related serositis. Although pericardial fluid analysis is essential for a definitive diagnosis of pericardial effusion, it was not attempted in this case due to the lack of diagnostic uncertainty and the mild nature of the effusion. Various treatment options for lupus-related pericardial effusion include NSAIDs, colchicine, and systemic steroids (4). Intravenous methylprednisolone therapy is reserved for patients with moderate to severe clinical presentation in SLE (5). In this case, the patient was treated with an intravenous methylprednisolone pulse, which resulted in the complete resolution of the pericardial effusion.

Conclusion

Pericardial effusion is a rare manifestation of SLE-related serositis. If left untreated, it can be associated with high mortality. There are various treatment options for lupus pericardial effusion, and methylprednisolone pulse therapy is reserved for moderate to severe presentations.

Consent

Written consent was obtained from the patient for publication of this study.

References

1. Adler Y CPIMea. ESC Guidelines for the diagnosis and management of pericardial diseases. In ESC ; 2015; London.
2. Alghareeb Rea. Cardiovascular Complications in Systemic Lupus Erythematosus. Cureus. 2022;: e26671.
3. Aringer Mea. 2019 European League Against Rheumatism/American College of Rheumatology Classification Criteria for Systemic Lupus Erythematosus. Arthritis & rheumatology. 2019; 71,9(doi:10.1002/art.40930): 1400-1412.
4. Dein E DH. Pericarditis in Lupus. Cureus. 2019; 11(3)(doi:10.7759/cureus.4166): e4166.
5. Bhatt Tea. A 35-Year-Old Female With a Lupus Flare Presenting as Cardiac Tamponade: A Case Report. Cureus. 2023; 15,5(doi:10.7759/cureus.39050): e39050.

Case Report

Hemophagocytic Lymphohistiocytosis in a patient with Dengue Hemorrhagic Fever

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Abstract

HLH is an uncommon, fatal complication of dengue infection and often leads to multi-system involvement and failure. Early recognition and prompt initiation of appropriate immunosuppressive therapy is crucial in improving the outcome. We report a case who developed secondary HLH following dengue haemorrhagic fever. An 8 year and 5-month-old child who was managed as dengue haemorrhagic fever, had persistent fever, hepatosplenomegaly, bicytopenia, hyper-ferritinemia (>20000), and hypertriglyceridemia. He was diagnosed with HLH according to the diagnosis criteria. This child was treated with steroids and supportive care following which the child made a gradual recovery. Second-line immunosuppressive treatment was not required in this case. Once sepsis is excluded, HLH should always be suspected early in this type of patient. Early appropriate immunosuppressive treatment is important to improve the long term outcome and prevent mortality.

Keywords: *Hemophagocytic Lymphohistiocytosis, Dengue Hemorrhagic Fever*

Introduction

Hemophagocytic lymphohistiocytosis (HLH) is an aggressive and life-threatening syndrome of excessive immune activation. It most frequently affects infants from birth to 18 months of age, but the disease is also observed in children and adults of all ages[1]. It is estimated that approximately 1 child in 3000 admitted to a tertiary care pediatric hospital will have HLH[2].

HLH can occur as a familial or sporadic disorder, and it can be triggered by a variety of events that disrupt immune homeostasis. Infection is a common trigger both in those with a genetic predisposition and in sporadic cases[1].

Familial HLH usually follows an autosomal recessive inheritance. About 40 to 60 percent of the mutations occur in PRF 1 and Unc-13 Homolog D (UNC13D) genes. Other genes involved are Syntaxin 11 (STX 11) and Syntaxin Binding Protein 2 (STXBP2) [3, 4]

Secondary HLH is usually acquired by malignant or non-malignant (infectious, non-infectious, and iatrogenic) conditions. Epstein-Barr virus (EBV) is the most common agent to cause HLH, which has poor outcomes [5]. Currently, there is increasing data that implies that severe dengue virus infection also causes secondary HLH with poor outcomes. The mortality may increase up to 43% [6].

Dengue-associated HLH has been well-reported in children, however, only a few case reports have been identified in adults. Out of the four dengue viruses, DENV1, DENV3, and DENV4 have been identified to cause HLH. Due to the increasing number of dengue detections every year, dengue-associated HLH has increased as well[10].

As per HLH-2004 diagnostic criteria, HLH is diagnosed when at least five of the eight criteria listed are fulfilled. These criteria are fever, splenomegaly, cytopenia affecting at least two of three lineages in peripheral blood, ferritin ≥500 µg/L, hypertriglyceridemia and/ or hypofibrinogenemia, hemophagocytosis in bone marrow or spleen or lymph nodes, low or absent natural killer (NK) cell activity, and high level of soluble interleukin-2 receptor alpha chain (CD25) [11]

Prompt treatment is critical, but the greatest barrier to a successful outcome is often a delay in diagnosis due to the rarity of this syndrome, variable clinical presentation, and lack of specificity of the clinical and laboratory findings [10].

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Pediatricians must consider HLH in dengue-infected patients if they observe persistent fever, abnormal mental state, cytopenia with organ issues, and, importantly, ferritin greater than 10,000 µg/L. Due to its anti-inflammatory effect, pulse doses of glucocorticoids (methylprednisolone or dexamethasone) can be used in the treatment of dengue-associated HLH. Intravenous immunoglobulin G can be used either alone or with dexamethasone or methylprednisolone. The dengue-associated HLH diagnosis is challenging but it is very important to recognize it as it is associated with better treatment options [12].

Case Presentation

An 8-year-old and 10-month-old boy was admitted to the ward with a history of high-grade continuous fever for 3 days duration, nausea, and a few episodes of vomiting associated with right hypochondrial pain. He also had frontal headache, myalgia, dizziness, and anorexia without any respiratory or urinary symptoms. The headache was not associated with photophobia or phonophobia. He passed urine just before the admission. He was ill-looking, the capillary refilling time was less than 2 sec and he was not pale or icteric. There was no lymphadenopathy. His pulse rate was 124/min while his blood pressure was 110/60 mmHg and had warm peripheries. There was tender hepatomegaly on abdominal examination. Other respiratory and neurological examinations were unremarkable.

Full blood count on admission WBC - 4.40 x 10^9/L(N-78.2%, L-17.5%), Hb- 13.8 g/dL, PLT- 203 x 10^9/L, AST - 71 (U/L), ALT -37 (U/L), Na - 133 mmol/L, K - 4.4 mmol/L (Table 1).

Febrile phase monitoring initiated. Input and output chart maintained. Supportive care was given. Antiemetic drugs and paracetamol started.

The following day (Day 4) - Fever and right hypochondrial pain persisted, and a few episodes of vomiting and loose stools developed. On examination: Had tachycardia and tender hepatomegaly. WBC and PLT dropped (Table 1), PCV raised, and USS findings revealed free fluid in the Hepatorenal pouch. Critical phase monitoring started. The next day WBC and PLT counts further dropped, LFT worsened (Table 1), PCV rose. Critical phase monitoring was continued. Fluid therapy and IV cefotaxime along with IV paracetamol were given as well as GCS was monitored.

Day 6 and Day 7 of illness- In addition to continuous high spike fever developed fluid overload symptoms and worsening of increased sleepiness and irritability. On examination: facial puffiness and periorbital oedema were noticed. He had tachycardia, tachypnea, R/S pleural effusion, ascites and the GCS was 14/15. AST and ALT are highly raised (Table 1). Troponin- negative. Fluid restriction was done, IV NAC, IV Vitamin K regular dose, IV omeprazole and rifaxamine were added.

Day 8 of illness – HLH was suspected as there was no improvement. S.ferritin>20000 ng/L (Table 2), Fibrinogen level - 2.6 g/L, Fasting triglyceride level 3.3 mmol/l (292 mg/dl), AST-4242 (U/L), ALT- 947(U/L), CRP- 10.7 mg/L, ESR- 32 mm/1st hr , LDH 4981 U/L. Blood picture: anemia suggestive of intercurrent illness and mild to moderate thrombocytopenia, CXR- mild pleural effusion .USS - Mild splenomegaly with B/L Mild pleural effusion and Ascites.

The child was managed withIV methylprednisolone 30 mg/kg given for 5 days preceding pulse therapy of oral dexamethasone 10 mg/m^2. Follow-up serum ferritin level (Table 2) done while monitoring the clinical outcome. Day 12 child recovered and discharged home.

Table 1 : Summary of Basic Blood Investigations

Investigation	Day 3	Day4	Day5	Day 6	Day 7	Day 8
WBC (x 10^9/L)	4.40	3.98	5.59	10.32	10.15	9.75
Neutrophils (x 10^9/L)	3.44	3.24	3.38	4.89	4.90	5.62
PLT (x 10^9/L)	203	94	22	16	49	102
Hb (g/dL)	13.8	14.4	14.8	14.7	12.4	11.9
AST (U/L)	71	353	399	613	3248	4652
ALT (U/L)	31	66	95	145	842	3190

Table 2 : Summary of Serum Ferritin Levels

Day	Serum Ferritin (ng/L)
Day 8	>20000
Day 9	7160
Day 11	5060
Day 12	2600

Discussion

HLH is an uncommon, potentially Life threatening hyper inflammatory and hemophagocytic syndrome which causes severe hypercytokinemia with excessive activation of lymphocytes and macrophages. It is associated with various conditions [15].This case report describes a patient who developed HLH following dengue haemorrhagic fever. Acquired HLH can occur in a patient with dengue and is a rare manifestation. The diagnosis of HLH may be challenging in dengue due to overlap of the clinical features [15].

The diagnosis of HLH was made based on features like increased serum ferritin and triglyceride level according to HLH protocol [4]. Compared to other cases bone marrow biopsy was not done as invasive investigations like bone marrow biopsy was not required to diagnose HLH in this case [14,15].

The management principles of HLH include suppression of hyperinflammation, elimination of activated immune cells, elimination of triggers, supportive therapy, and replacement of defective immune systems [14]. Treatment protocol contains induction, salvage, and continuation therapy [4].

Suppression of hyperinflammation and elimination of activated immune cells can be achieved with corticosteroids, intravenous immunoglobulin, cyclosporine, anti-cytokine agents like etoposide, and monoclonal antibodies [15]. Corticosteroids are the first choice to suppress the hypercytokinemia [14].

In this case, the child was managed with intravenous methylprednisolone for 3 days followed by oral dexamethasone induction along with supportive management for the critical phase of dengue and liver involvement. After the acute management follow-up was arranged for this patient with a plan of tailing off dexamethasone over 8 weeks. This patient had an excellent response to treatment with steroids alone like other similar cases reported [15].

A favorable outcome was able to be achieved in this case due to early recognition and initiation of treatment like few other HLH cases reported [14,15].

Conclusion

Dengue-associated HLH is a rare but potentially life-threatening condition. It is associated with severe dengue fever such as dengue haemorrhagic fever or dengue shock syndrome [12]. Persistent fever following dengue infection may point towards sepsis or expanded dengue syndrome including HLH [12]. Early recognition and prompt initiation of appropriate immunosuppressive therapy are crucial for reducing morbidity and mortality [13].

Consent

Written informed consent was taken from the parents for the publication of the case.

References

1. https://www.uptodate.com/contents/clinical-features-and-diagnosis-of-hemophagocytic-lymphohistiocytosis?source=history_widget
2. Jordan MB, Allen CE, Weitzman S, et al. How I treat hemophagocytic lymphohistiocytosis. Blood 2011; 118:4041.
3. Cetica V, Pende D, Griffiths GM, Aricò M: Molecular basis of familial hemophagocytic lymphohistiocytosis. Haematologica. 2010, 95:538-41. 10.3324/haematol.2009.019562
4. Zhang K, Filipovich AH, Johnson J: Familial hemophagocytic lymphohistiocytosis . Adam MP, Mirzaa GM, Pagon RA, et al. (ed): GeneReviews, Seattle, WA; 2013. http://www.ncbi.nlm.nih.gov/books/NBK1444/.
5. Goudarzipour K, Kajiyazdi M, Mahdaviyani A: Epstein-barr virus-induced hemophagocytic

lymphohistiocytosis. Int J Hematol Oncol Stem Cell Res. 2013, 7:42-5.

6. Kan FK, Tan CC, Von Bahr Greenwood T, et al.: Dengue infection complicated by hemophagocytic lymphohistiocytosis: experiences from 180 patients with severe dengue. Clin Infect Dis. 2020, 70:2247-55. 10.1093/cid/ciz499

7. COVID-19: consider cytokine storm syndromes and immunosuppression. Mehta P, McAuley DF, Brown M, Sanchez E, Tattersall RS, Manson JJ. Lancet. 2020;395:1033–1034.

8. Comparing hemophagocytic lymphohistiocytosis in pediatric and adult patients. Wysocki CA. Curr Opin Allergy Clin Immunol. 2017;17:405–413.

9. A consensus review on malignancy-associated hemophagocytic lymphohistiocytosis in adults. Daver N, McClain K, Allen CE, et al. Cancer. 2017;123:3229–3240.

10. Munshi A, Alsuraihi A, Balubaid M, et al. (December 05, 2021) Dengue-Induced Hemophagocytic Lymphohistiocytosis: A Case Report and Literature Review. Cureus 13(12): e20172. doi:10.7759/cureus.20172

11. Henter JI, Horne A, Aricó M, et al.: HLH-2004: diagnostic and therapeutic guidelines for hemophagocytic lymphohistiocytosis. Pediatr Blood Cancer. 2007, 48:124-31. 10.1002/pbc.21039

12. Dengue infection complicated by hemophagocytic lymphohistiocytosis: experiences from 180 patients with severe dengue. Kan FK, Tan CC, Von Bahr Greenwood T, et al. Clin Infect Dis. 2020;70:2247–2255.

13. Hemophagocytic lymphohistiocytosis as a rare complication of dengue haemorrhagic fever: a case report,Chamila Pradeep1, Parackrama Karunathilake2, Shamali Abeyagunawardena3, Udaya Ralapanawa3, Thilak Jayalath3

14. Dengue Fever AssociatedHaemophagocytic Lymphohistiocytosis: A Report of Two Children. Monitoring Editor: Alexander Muacevic and John R Adler ,Vijayakumary Thadchanamoorthy 1 and Kavinda Dayasiri2

15. Dengue-Induced Hemophagocytic Lymphohistiocytosis: A Case Report and Literature Review.Monitoring Editor: Alexander Muacevic and John R Adler.AdeebMunshi,1 AnasAlsuraihi,2 MarwanBalubaid,3 Mohammad Althobaiti,2 and Abdulhakeem Althaqafi 4

Case Report

Tuberculosis masking T-cell lymphoblastic leukemia

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Abstract

T-cell lymphoblastic leukemia characterized by infiltration of immature T cells mainly in the mediastinum and other lymphoid organs (1). Here we present a case of a forty-five years old female who was presented with tuberculosis pleural effusion but did not respond to treatment and later found to have a T-Cell ALL. Forty-five years old female presented with fever for three weeks with left sided pleural effusion. She was diagnosed to have tuberculous pleural effusion based on positive Mantoux test (12mm induration), lymphocytic exudative pleural effusion and High ADA (80U/L). She was started on anti-tuberculosis treatment but did not respond so she underwent CECT chest and abdomen which showed pleural and pericardial effusion with mediastinal lymphadenopathy. She was further evaluated with a blood picture and bone marrow biopsy which revealed T-cell lymphoblastic leukemia. Tuberculosis can mask the underlying malignancies. In tuberculous pleural effusion if not responded to initial management CT Chest and thoracoscopy with pleural biopsy will help us to diagnose underlying malignancies.

Keywords: Tuberculosis, T-cell lymphoblastic leukemia/lymphoma, Leukemia

Introduction

T-cell lymphoblastic leukemia is characterized by massive infiltration of immature T cells mainly in the mediastinum and other lymphoid organs (1). T-Cell ALL can present with pleural effusion, pericardial effusion, and mediastinal lymphadenopathy which can mimic tuberculosis.

Case

A forty-five-year-old female patient from Vavuniya was transferred from DGH Vavuniya for further management of unresolving left-sided plural effusion and pericardial effusion. She was diagnosed to have tuberculous pleural effusion six weeks back based on positive Mantoux test (12mm induration), lymphocytic pleural effusion and High ADA (80U/L) while she presented with fever for three weeks duration to DGH Vavuniya. The patient was started on category one anti-tuberculosis treatment. Despite the treatment for six weeks, patient symptoms were not resolved over time she had a fever as well, so she was transferred to Teaching Hospital Jaffna for future management.

She was re-evaluated in our hospital; she had a fever for almost two-month duration along with an insidious onset of shortness of breath also an association. She had a non-productive cough. She had loss of weight and loss of appetite. On examination, she was pale and dyspneic. Her respiratory rate was twenty-four and respiratory examination revealed left sided plural effusion. The pulse rate was 110 good volume, regular and blood pressure was 110/70. Abdominal examination revealed no organomegaly or free fluid.

Full blood count showed leukocytosis (WBC $17.83*10^3/\mu l$) and blood picture showed leukocytosis with a predominant population of medium size immature cells with high nuclear-cytoplasmic ratio, diffuse chromatin pattern, and indistinct nucleoli. Blood picture findings were suspicious of bone marrow pathology. The ultrasound chest revealed left sided moderate plural effusion and Transthoracic echo cardiogram revealed mild pericardial effusion. The patient has undergone pleural fluid analysis which showed exudative lymphocytic pleural effusion with High ADA (78U/L). Following an initial evaluation, the patient underwent a CECT chest abdomen and pelvis which revealed mediastinal lymphadenopathy.

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As the overall finding was suggestive of hematological malignancy, she underwent a bone marrow biopsy. Bone marrow biopsy with flowcytometry findings favored the diagnosis of T Cell acute lymphoblastic leukemia.

The patient was transferred to oncology unit for chemotherapy and planned to continue category one anti tuberculosis treatment.

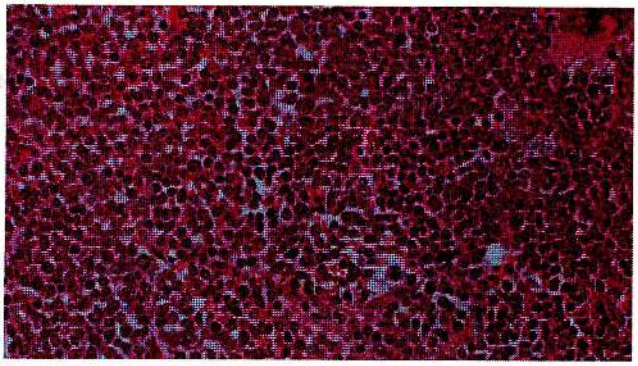

Figure 1 Bone marrow biopsy shows prominent blast cells.

Discussion

T-cell lymphoblastic leukemia is characterized by massive infiltration of immature T cells mainly in the mediastinum and other lymphoid organs (1). T-Cell ALL can present with pleural effusion, pericardial effusion, and mediastinal lymphadenopathy which can mimic tuberculosis. Tuberculous pleural effusion is one of the most common forms of extrapulmonary tuberculosis (2). It can be diagnosed in high prevalence settings with positive Mantoux and High ADA (2). False positive ADA can happen in leukemia but if the level of more than 70U/L favors tuberculous pleurisy (3). Our patient was diagnosed to have tuberculous pleural effusion. Her plural effusion was not resolved with a treatment. Unresolved infectious pleural effusion to treatment needs a CT scan to exclude the associated malignancies (4). Her CECT Chest abdomen and pelvis revealed mediastinal lymphadenopathy, pleural and pericardial effusion. followed that she has undergone bone marrow with flowcytometry studies which revealed T-cell lymphoblastic leukemia. T-Cell ALL diagnosis was delayed at initial presentation due to co-infection with tuberculosis. Definitive diagnosis of pleural disease can be archived through thoracoscopy with pleural biopsy and cytological studies which can help to differentiate tuberculosis and leukemia/ lymphoma (5). which was not attempted in our patient because we came to a diagnosis with a bone marrow biopsy.

Conclusion

Tuberculosis can co-exist with other malignancies and can mask the underlying disorder leading to delayed diagnosis and management. T-cell lymphoblastic leukemia can present like tuberculosis. Co-Infection with tuberculosis is very difficult to distinguish. If tuberculous pleural effusion did not respond to treatment and to rule out the underlying malignancies CT scan of the chest and thoracoscopy with pleural biopsy would help.

Consent

Written consent was obtained from the patient for publication of this study.

References

1. Arber DA OA. The 2016 revision to the World Health Organization classification of myeloid neoplasms and acute leukemia. Blood. 2016; 127(20) (doi:10.1182/blood-2016-03-643544): 2391-2405.

2. Zhai K LYSH. Tuberculous pleural effusion. Journal of thoracic disease. 2016; 8(7)(doi:10.21037/jtd.2016.05.87): E486–E494.

3. Shimoda M,HA. Characteristics of pleural effusion with a high adenosine deaminase level. BMC Pulm Med. 2022; 22(https://doi.org/10.1186/s12890-022-02150-4): 359.

4. Hooper C LY. Investigation of a unilateral pleural effusion in adults. British Thoracic Society pleural disease guideline Thorax. 2010;: ii4-ii17.

5. He XLea. T-cell lymphoblastic lymphoma presenting with pleural effusion. Respiratory medicine case reports. 2014 May; 12(doi:10.1016/j.rmcr.2014.04.003): 55-58.

Case Report

Large human fabella bone

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Abstract:

Fabella bone is identified as an accessory and evolutionary sesamoid bone in humans. It was noticed as an irregular shape located within the lateral head of gastrocnemius in the posterolateral capsule of the left knee of a 55-year-old male. Another smaller fabella was noted and both were kept in a safe place Measurements were taken after a week and their length was 2.7 cm and 1.8 cm respectively. The size of fabella usually ranges from 5mm-20mm in diameter, but in this study, the length of the larger one was 2.7 cm. Fabella originated as a small cartilaginous nodule and underwent endochondral ossification. It helps to reduce resistance within tendons and redirect muscle forces. In humans, gastrocnemius acts to flex the knee and plantar flex the foot. Fabella function was thought to stabilize the femoral complex and medial femoral condyle. Patients with fabella pain syndrome usually complain of increased posterolateral pain during the full extension of the knee joint. Fabella pain syndrome could be treated with physical therapy, local anaesthetics injection, radial extracorporeal shock wave therapy or fabellectomy. It has been observed that there has been an increase in the prevalence of fabella in recent years. Larger moments acting on the knee and increasing muscle or tendon strain could produce stimuli essential to encourage fabella formation.

Keywords: Fabella, Sesamoid bone, Posterolateral knee pain, Fabellar complex

Introduction:

The patella is a well-known sesamoid bone in the knee joint. There are few sesamoids present in human hands and feet. Fabella is identified as an accessory and evolutionary sesamoid bone in humans. Previous studies mentioned the presence of fabella in humans and it is constantly present in domestic animals. Fabella size is variable and it could be either cartilage or bony components. Fabella prevalence(FP) in humans has increased recently within 150 years and could be mistaken for loose bodies or osteophytes.

Case report:

Incidentally noticed an irregular shape fabella located within the lateral head of gastrocnemius in the left knee of a 55-year-old male cadaver during dissection at the Department of Anatomy, Faculty of Medicine, University of Jaffna. It was white and shiny immediately after dissection and seemed to be covered by jelly fluid. Its surfaces had small furrows and ridges. A small area of the smooth surface was noticed at one end. Thus its surfaces were not well oriented and dissimilar with patella bone. Another bone comparatively smaller than the first one was found beneath the same muscle. It seems to be broken out from the fabella described above. The smaller one has comparatively smooth surface on one side. Bones were kept in a safe place measurements were taken after a week and its length was 2.7 cm and 1.8 cm respectively. The white glistening appearance disappeared later and both bones exactly looked like ossified bones.

Figure 1: The large fabella bone

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Discussion:

Fabella is present in the posterolateral capsule of the knee where lines of tensile stress overlap (3). It articulates with the posterior articular surface of the lateral femoral condyle and is embedded in fibers of gastrocnemius (4). Size of fabella usually ranges from 5mm-20mm in diameter (1) but in this study length of the larger one was 2.7 cm.

Fabella prevalence was 10-30% among the general population with a higher prevalence in Asians (1). FP was an equal percentage in both genders and bilateral cases were more common than unilateral occurrences (5). FP was similarly common on the right and left sides (6). Men had an incidence of 21.2 % whereas females had 27.2% and that there were no major sex-based differences (1).

Previous studies observed the presence of either whole ossified bony fabella or partly ossified cartilage. The human patella normally formed from one primary ossification center but started to ossify by 3-6 years and completed the ossification by 20 years. Osteoarthritis and age-related degeneration were causes for its ossification and it suggested that Fabella was definitely ossified by the endochondral method. Lateral fabella also had a common origin comprising plantaris muscle, oblique popliteal, and arcuate ligaments and contained in fabellar complex(FC) where they made a small articular cavity between FC and lateral femoral condyle(2). Ossification of fabella in the lateral head was easier than medial fabella(2). Thus bony fabella made an impression on femoral condyle. Therefore, fabella seems to be fixed in the same part of the femur regardless of knee movement. The fabellar complex was made of plantaris, gastrocnemius, arcuate fabello-fibular, fabello-popliteal and oblique popliteal ligaments (1). Presence, width, and thickness of those ligaments would depend on presence of fabella(2). Fabella helped to reduce resistance within tendons and redirecting muscle forces. In humans, gastrocnemius acts to flex knee and to plantar flex the foot. Fabella's role was thought to stabilized FC and medial femoral condyle(1).

Posterolateral knee pain could be associated with contact between fabella and lateral femoral condyle(3). FP could lead to various pathological conditions such as fabellar pain syndrome(FPS), common peroneal nerve(CPN) palsy, and popliteal artery entrapment (PAE) syndrome(1). In CPN palsy,20.8% of patients had a nerve located posterior to the fabella. Less subcutaneous fat in overweight patient might lead to compression of CPN by Fabella (1).

Differential diagnoses for posterolateral knee pain were FPS, meniscal tears, lateral ligament unsteadiness, Baker's cyst and proximal tibiofibular joint hypo mobility. Patient with FPS usually moans increased posterolateral pain during the full extension of knee joint(1). First known case of FPS with PAE presented with intermittent claudication and severe knee osteoarthritis (1). FPS could be treated with physical therapy, local anaesthetics injection, radial extracorporeal shock wave therapy(rESWT) or fabellectomy(1). A significant relationship between FP and os peroneum in the tendon of human peroneus longus was noted (7).

Conclusions:

Though there are not enough evidence-based studies, it has been observed that there is an increase in FP rate. It could be due to many factors such as global increase in human height and weight, increase tibial length and muscle mass(5). This lead to a larger moment acting on knee and increase muscle or tendon strain. This could harvest stimuli essential to encourage fabella formation.

References:

1. Dalip D, Iwanaga J, Oskouian R J, et al. (June 05, 2018) A Comprehensive Review of the Fabella Bone. Cureus 10(6): e2736. DOI 10.7759/cureus.2736

2. Kawashima T, Takeishi H, Yoshitomi S, Ito M, Sasaki H. Anatomical study of the fabella, fabellar complex and its clinical implications. Surg Radiol Anat. 2007 29(8):611-6. doi: 10.1007/s00276-007-0259-4. Epub 2007 Sep 19. PMID: 17882346.

3. Weng SP, Wu TM, Chien CS, Lin SH. Treatment of Fabella syndrome with arthroscopic fabellectomy: a case series and literature review. BMC Musculoskelet Disord. 2021 Aug 30;22(1):748. doi: 10.1186/s12891-021-04630-w. PMID: 34461874; PMCID: PMC8406563.

4. Driessen A, Balke M, Offerhaus C, White WJ, Shafizadeh S, Becher C, Bouillon B, Höher J. The fabella syndrome - a rare cause of posterolateral knee pain: a review of the literature and two case reports. BMC Musculoskelet Disord. 2014 Mar 26;15:100. doi: 10.1186/1471-2474-15-100. PMID: 24666711; PMCID: PMC3987160.

5. Berthaume MA, Federico ED and Bull AMJ. Fabella prevalence rate increases over 150 years, and rates of other sesamoid bones remain constant: A systematic review. J. Anat. (2019) 235, 67—79

6. Berthaume MA, Bull AMJ. Human biological variation in sesamoid bone prevalence: the curious case of the fabella. J Anat. 2020 Feb;236(2):228-242. doi: 10.1111/joa.13091. Epub 2019 Oct 17. PMID: 31623020; PMCID: PMC6956444.

7. Vincet k. Sarin,* Gregory M. Erickson, Nicholas J. Giori, A. Gabrielle Bergman, and Dennis R. Carter. Coincident development of sesamoid bones and clues to their evolution. The Anatomical Record (New Anat.) 257:174–180, 1999

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Original articles report the results of original research, systematic reviews and meta-analyses. Observational studies (cohort, case-control, or cross-sectional designs) must be reported according to the STROBE statement. Systematic reviews and meta-analyses must be reported according to PRISMA guidelines. Reports of randomised trials must conform to CONSORT 2010 guidelines. Diagnostic accuracy studies must report according to the STARD guidelines. The guidelines on reporting sex and gender information (SAGER) should also be considered. Original articles should have less than 2500 words, 5 tables / illustrations and should include a structured abstract of less than 250 words.

Brief reports

This category includes preliminary reports, novel patient management methods, and reports of new techniques and devices. They should be limited to 1000 words, 3 tables/illustrations and 10 references, and should include an unstructured abstract of less than 100 words.

Case reports

Acceptance of case reports is based strictly on originality and whether there is an important new lesson to be learnt or a new message from the report. It should not contain more than 750 words, one table / illustration and 5 references. Authorship should be limited to five. Case reports may be accepted as contributions to the picture-story series (not more than 300 words of text, 3 references and 2-3 clear black and white or colour photographs). Case reports must be prepared according to the Consensus-based Clinical Case Reporting (CARE) guidelines.

Letters

The *JMJ* will also consider for publication letters (less than 400 words, maximum of 3 authors, and maximum of 5 references). These may be in response to a recently published article or a short freestanding piece expressing an opinion.

ETHICAL RESPONSIBILITIES

Criteria for authorship

Only persons who contributed to the intellectual content of the paper should be listed as authors. According to the ICMJE recommendations authorship should be based on the following 4 criteria:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he or she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. In addition, authors should have confidence in the integrity of the contributions of their co-authors.

All those designated as authors should meet all four criteria for authorship, and all who meet the four criteria should be identified as authors. Contributors who meet fewer than all 4 of the above criteria for authorship should not be listed as authors, but they should be acknowledged.

Previous publication

In the cover letter give full details on any possible previous publication of any content of the paper. (e.g.)

1. Reworked data already reported.
2. Patients in a study already described and published.

3. Content already published or to be published in another format.

Previous publication of some content of a paper does not necessarily preclude it being published in the *JMJ*, but the editors need this information when deciding how to make efficient use of space in the journal, and regard failure of a full disclosure by authors of possible prior publication as a breach of scientific ethics.

Ethics Approval

For studies involving human participants a statement detailing ethics approval and consent should be included in the methods section. Every research article should include a statement that the study obtained ethics approval (or a statement that it was not required and why), including the name of the ethics committee(s) or institutional review board(s), the number/ID of the approval(s), and a statement that participants gave informed consent before taking part. Proof of approval from an ethics committee must be provided on submission of the manuscript. All clinical trials should be registered in an internationally recognized Clinical Trials Registry and authors should submit the Trial Registration Number along with the manuscript.

For case reports, signed consent by the patients must be submitted with the manuscript. If the person described in the case report has died, then consent for publication must be sought from their next of kin. If the individual described in the case report is a minor, or unable to provide consent, then consent must be sought from their parents or legal guardians.

If consent cannot be obtained because the patient cannot be traced then publication will be possible only if the information can be sufficiently anonymised. Anonymisation means that neither the patient nor anyone else could identify the patient with certainty.

SUBMITTING MANUSCRIPT

Cover letter

Manuscripts should be submitted with a letter stating

1. that the contents have not been published elsewhere;
2. that the paper is not being submitted elsewhere (or provide information on previous publication);
3. the contributorship, competing interests, data sharing and ethical approval

The letter should acknowledge any potential conflict of interest (see Ethical Responsibilities above) and call the editors' attention to any possible overlap with prior publications. Include the name, full mailing address, telephone number and e mail address of the corresponding author.

Submit an original copy and 3 copies (photocopies are acceptable) of all parts of the manuscript.

The manuscript should be mailed, with adequate protection for figures, to the Editor, Jaffna Medical Journal, Jaffna Medical Library, Teaching Hospital, Jaffna

Manuscripts could also be submitted directly at the Jaffna Medical Library at the Teaching Hospital, Jaffna.

Author fees

No fee is charged from the authors

PREPARATION OF MANUSCRIPT

The *JMJ* will consider all manuscripts prepared in accordance with the uniform requirements for manuscripts submitted to biomedical journals developed by the International Committee of Medical Journal Editors. A summary of these and the requirements of the *JMJ* are given below.

Manuscript typing

All parts of manuscript, including tables and figure legends, must be typed with double spacing. The computer language must be set to English (UK).

References must also be double spaced. Manuscripts should be typed in capital and lower case letters, on white paper of A4 size (212x 297 mm).

Arrange components in the following order: title page, abstract, text, references, tables in numerical sequence, and figures in numerical sequence. Begin each component on a separate page.

Number all pages consecutively, starting with the title page.

Abbreviations and symbols

Use only standard abbreviations; use of nonstandard abbreviations can be confusing to readers. Avoid abbreviations in the title of the manuscript. The spelled-out abbreviation followed by the abbreviation in parenthesis should be used on first mention unless the abbreviation is a standard unit of measurement.

Title page

The title page should contain the following:

1. Main title, running title (less than 50 characters) and a maximum of 5 index words(or phrases).
2. Authors listed in the order in which they are to appear in the published article. **List authors names as surname and maximum of 2 initials.**
3. Institutional affiliation for each author and e mail address. The institutions listed should reflect the affiliations of the authors at the time of the study, not their present affiliations, if they differ.
4. ORCID Number for All authors should be indicated. This can be obtained from the website https://orcid.org/

5. Name, address, e-mail and telephone number of author responsible for correspondence.

6. Source(s) of support. These include grants, equipment, drugs, and/or other support that facilitated conduct of the work described in the article or the writing of the article itself.

7. In addition to submitting a Declaration Form, include a conflict of interest statement which describes authors' conflicts of interest, sources of support for the work including sponsor names and whether the authors had access to the study data. This statement should be signed by all authors.

8. The number of words in the manuscript, exclusive of the abstract, acknowledgments, references, tables, figures, and figure legends.

Abstract

The abstract should provide the context or background for the study and should state the study's purpose, basic procedures (selection of study participants, settings, measurements, analytical methods), main findings (giving specific effect sizes and their statistical and clinical significance, if possible), and principal conclusions. Clinical trial abstracts should include items that the CONSORT group has identified as essential. Clinical trials should give clinical trial registration number at the end of the abstract. Authors are recommended to consult the SAGER guidelines for the reporting of sex and gender information.

Abstract should include the sub-headings: Introduction, Objectives, Methods, Results and Conclusions. Number of words should be less than 250 words. Brief Reports should have an unstructured abstract limited to 150 words.

Main text

The text should contain the following categories;

Introduction
Methods
Results
Discussion
Acknowledgements
Conflicts of Interests
References
Tables and Figures

Under a subheading "Conflicts of Interests ", all authors must disclose any financial and personal relationships with other people or organisations that could inappropriately influence (bias) their work. If there are no conflicts of interest, authors should state that "There are no conflicts of interest".

References

Number references in the order in which they are first cited in the text.

Use Arabic numerals within parentheses e.g. (2).

Note that from 2018 the *JMJ* requires the PubMed abbreviation of the journal title (or a similar abbreviation if the journal is not indexed in PubMed) NOT the COMPLETE name of journal. Include year, volume and first and last page numbers.

References to articles or books accepted for publication but not yet published must include the title of the journal (or name of the publisher) and the year of expected publication.

Unpublished work (personal communication) may be cited by inserting a reference within parentheses in the text; authors must submit a letter of permission from the cited persons to cite such communications.

Sample references below are in the style required by the *JMJ*.

Journal articles

Jayatissa R, Gunathilaka MM, Fernando DN. Iodine nutrition status among school children after salt iodisation. *Ceylon Med J* 2005; **50**: 144-6.

List all authors when 6 or fewer; when more than 6 list only the first 3 and add *et al.*

Books

List all authors when 6 or fewer; when more than 6 list only the first 3 and add *et al.*

1. Author. Eisen HN. *Immunology: An Introduction to Molecular and Cellular Principles of the Immune Response*. 5th ed. New York: Harper and Row, 1974.

2. Editors. Dausset J. Colombani J, eds. *Histocompatibility Testing* 1972. Copenhagen: Munksgaard, 1973.

3. Chapter in a book. Hellstrom I, Helstrom KE. Lymphocyte-mediated cytotoxic reactions and blocking serum factors in tumor-bearing individuals. In: Brent L, Holbrow J, eds. *Progress in Immunology* II. v. 5. New York: American Elsevier, 1974: 147–57.

Websites

Preminger GM, Tiselius HG, Assimos DG, *et al.* Guideline for the management of ureteral calculi. American Urological Association, 2007. http://www.auanet.org/education/guidelines/ureteralcalculi (accessed on Feb 20, 2013)

Tables

All tables must be typed double-spaced. Tables should be numbered with Arabic numerals, in the order in which they are cited in the text. A table title should describe concisely the content of the table.

Figures and illustrations

Figures or illustrations should be professionally drawn or prepared digitally. A high resolution (300dpi) digital copy of the figure or illustration should be submitted. Lettering should be uniform in style. Free hand or typewritten lettering is not acceptable. Number the figures in the order in which they are cited in the text.

PRE-SUBMISSION CHECKLIST

In order to reduce the chance of your manuscript being returned to you, please check:

Author information: Have you provided details of all of your co-authors?

Manuscript length and formatting: Is text double-spaced? Does it use a 12-point Times New Roman font; employs italics, rather than underlining (except with URL addresses)? Have you checked that your manuscript doesn't exceed the requirements for word count, number of tables and/or figures, and number of references? Have you provided your abstract in the correct format? Have you supplied any required additional information for your article type?

Tables: Have they been cited in the text? Have you provided appropriate table legends?

Figures: Have you uploaded any figures separately from the text? Have they been supplied in an acceptable format and are they of sufficient quality? Have the files been labeled appropriately? Have the figures been cited in the text? Have you provided appropriate figure legends?

References: Have all of the references been cited in the text? Is it in the correct style required for the *JMJ*?

Statements: Have you included the necessary statements relating to contributorship, conflicts of interests, data sharing, clinical trial registration and ethical approval? The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).

Research reporting checklists: Have you either provided the appropriate statement for your study type, or explained why a checklist isn't required?

Permissions: Have you obtained from the copyright holder to re-use any previously published material? Has the source been acknowledged?

Reviewers: Have you provided the names of any preferred and non-preferred reviewers?

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