AJIM

Asian Journal of Internal Medicine

VOLUME 1 | ISSUE 2 - JULY 2022

The Official Journal of
Sri Lanka College of Internal Medicine

Asian Journal of Internal Medicine

Volume 1; Issue 2: 2022 July

The Official Journal of Sri Lanka
College of Internal Medicine

Published by:

Sri Lanka College of Internal Medicine

Asian Journal of Internal Medicine
Volume 1; Issue 2: 2022 July

ISSN 2950-6948

Editorial Assistance, Copy-editing and Formatting by:

Dr Madhusha Dhanukshi Liyanage

Cover page designed by:
Mr Dishan Fernando

Editorial correspondence:
The Editors,
Asian journal of Internal Medicine (AJIM),
Sri Lanka College of Internal Medicine,
PGIM new building,
85, Rodney Street, Borella,
Colombo 8, Sri Lanka.

E-mail: ajim.slcim@gmail.com

The Official Journal of
Sri Lanka College of Internal Medicine

BOARD OF EDITORS

ajim.slcim@gmail.com

Co-Editors

Editorial Board

ajim.slcim@gmail.com

Extended Editorial Board

The Official Journal of
Sri Lanka College of Internal Medicine

CONTENTS

ajim.slcim@gmail.com

EDITORIAL

LEADING ARTICLE

RESEARCH

AUDIT

RESEARCH LETTER

PERSPECTIVE

REVIEW

CONTENTS

ajim.slcim@gmail.com

LETTER TO EDITOR

SLCIM PICTURE QUIZ

By: Thushara Matthias and Geehan Shanaka Fernando

CASE REPORTS

APPENDIX

Maintaining universal healthcare and its sustainability in the Sri Lankan set up

Manilgama SR[1], Hettiarachchi NM[2], Liyanage ADMD[3]

[1] North Colombo Teaching Hospital, Ragama
[2] Teaching Hospital Peradeniya
[3] Primary Medical Care Unit, Kesbewa

Preamble

Despite being a fundamental human requirement, affordable healthcare is far from reality for many human beings. This formed the background for the concept of universal healthcare. In this editorial we explore how far universal healthcare has taken root in Sri Lanka. Here we take into discussion the notion of universal healthcare, healthcare models and healthcare financing in the world to create a premise on which the Sri Lankan healthcare system is subjected to analysis. We also present the authors' perspective on this matter and discuss a few working proposals to improve the sustainability of the healthcare system in Sri Lanka.

The concept of universal healthcare

Access to healthcare services for anyone in need is called universal healthcare (1). These healthcare services should include the complete range of health promotion, disease prevention, curative and palliative services.

However, providing equitable healthcare to everyone is challenging to many nations due to multiple reasons including lack of monetary funds, knowledge and scarcity of healthcare facilities. Poverty line is defined as the percentage of the population living on less than the required income to cover the minimal expenditure to meet basic needs. Those that are below the poverty line are said to be in 'extreme poverty'. Extreme poverty predisposes to unhealthy living conditions which further aggravates the situation giving rise to a never-ending vicious cycle. People use available money to fulfil their priorities: cost of basic food, clothing and shelter (2, 3). Currently, at least half of the world population does not receive the health services they need. About 100 million people are pushed into extreme poverty each year because of out-of-pocket expenditure on health (1).

To make healthcare for all a reality, we need: individuals and communities who have access to high quality health services, skilled healthcare workers providing quality people-centred care, and policy-makers committed to invest in universal health coverage (1).

Funding healthcare

The healthcare system is the totality of services offered by all health care disciplines. It consists of an organised structure which include healthcare institutions, infrastructure, a continuous supply of medical equipment and medicines, and the delivery of healthcare and ancillary services by trained personnel. The state or the private sector is fully or partially responsible for the establishment and maintenance of the healthcare system. Where the state is involved, it is non-profitable while the private sector maintains it as a profitable venture. Therefore the healthcare cost per individual mainly depends on the provider. The individual access to healthcare depends on the bearer of the healthcare cost. The bearer could be

the government, insurance scheme (community based or private) or the individual paying out-of-pocket.

Currently, there are four general mechanisms in which healthcare coverage is operated and funded in the world (4).

1. Single payer system with universal health coverage

According to this system a national healthcare plan which is fully funded by the government is in place. All citizens have access to healthcare and the government is the 'single-payer'

2. Multi payer system with universal health coverage

In this mechanism the government has a national healthcare plan in place that is accessible to all citizens. However there are competing insurers offering private options for those who can afford them.

3. Multi payer system without universal coverage

Here all do not have coverage. Specialised government programmes may cover selected groups while those who can afford receive coverage from private insurance schemes.

4. Out of pocket funding

In the out of pocket system, no national healthcare plan is in place to provide cover, at least for selected groups . Individual organisations offer various health services and only those who can afford such services have access.

When observing the world healthcare facilities and their delivery systems, historically, four healthcare models have been described/identified and these utilise the above funding concepts alone or in combination (4,5).

Healthcare models

The Beveridge Model

The United Kingdom launched its universal National Health Service in 1948. Social reformer William Beveridge designed the National Health Service in the UK. It is a form of healthcare financing system designed to meet the cost of healthcare needs from a publicly managed fund mainly raised through tax payments. Many countries have adapted this model since its introduction in the UK and they have slight variations from the original model. In the UK, many hospitals and clinics are owned by the government and employees are paid by the government (6). A few countries that practice this model are Spain, Scandinavia, New Zealand, Hong Kong and Cuba.

The Bismarck Model

This model was introduced by the Prussian Chancellor Otto von Bismarck, in Germany in the 19th century. It uses an insurance system usually financed jointly by employers and employees through payroll deduction. Bismarck-type health insurance plans have to cover everybody, and they do not make a profit. But there are multiple payers. Doctors and hospitals tend to be private in Bismarck countries. The Bismarck model is found in Germany, France, Belgium, the Netherlands, Japan, Switzerland, and, to a degree, in Latin America.

The National Health Insurance Model

This system shares features from both Beveridge and Bismarck models. It uses private-sector service providers, but payment comes from a government-run insurance programme that every citizen pays into. The universal insurance programmes are non-profit and cheaper as they do not need marketing. A single payer tends to have considerable market power to negotiate for lower prices. National Health Insurance plans also control costs by limiting the medical services they will pay for, or by making patients wait to be treated. The classic NHI system is found in Canada, but some newly industrialised countries such as Taiwan and South Korea have also adopted the NHI model.

The Out-of-Pocket Model

People pay the hospital bill out-of-pocket at the

time of their treatment. Rich get medical treatment while the poor stay sick or get suboptimal treatment because they cannot afford it.

Healthcare system in Sri Lanka

Sri Lanka is known for having one of the world's earliest established healthcare systems where organised hospitals were found in the ruins in Anuradhapura, Medirigiriya and Polonnaruwa as far back as the 4th century BC. There is archaeological and literary evidence that the State provided hospitals, "houses of delivery", convalescent homes, institutions for the crippled and hospitals for the blind (7, 8).

The current healthcare services placed in Sri Lanka are a combination of the indigineous and allopathic medicine practices. Ancient and traditional oriental healthcare systems such as Ayurveda, Siddha, Unani, acupuncture and Deshiya chikitsa are recognised by the Sri Lankan government. Both the state and private sectors deliver healthcare in both streams to which a limited contribution is made by non profit organisations (9).

Though established, accepted and recognized, the two arms of healthcare, allopathic and indigineous, do not overlap or have a mechanism of cross referral.

The allopathic arm of healthcare is recognised as the principal healthcare system and a comprehensive system is in operation throughout the country. This comprehensive system has enabled Sri Lanka to achieve universal health coverage. From this point onwards the allopathic arm of healthcare will be discussed and referred to as the Sri Lankan healthcare system.

The Sri Lankan healthcare system consists of both curative and preventive services that are well developed and deliver a comprehensive range of services. The preventive sector operates via the Medical Officer of Health (MOH) Institutions which are established in 354 geographically defined areas. Maternal health, child health and immunisation are some of the key areas that are successfully handled by preventive care. Curative care functions at different levels; primary, secondary and tertiary-care institutions and specialised hospitals organised into an hierarchical network.

The Sri Lankan healthcare system which has been providing free services at the point of delivery since 1951 is recognized as a high-impact, low-cost model internationally (10).

Sri Lanka has the basic framework in place to achieve universal health coverage but is challenged by epidemiological, demographic and economic transitions (11).

The Sri Lankan healthcare system is operated as a single payer system, and it pays for all healthcare costs delivered by it. Healthcare resources and personnel are owned and employed by the government. Most services in the country, including 95% of inpatient care and 50% of outpatient care are provided by the state sector (9).

The private sector has gradually expanded over the recent years. Those with means pay out-of-pocket or through private insurance schemes to fulfil their healthcare needs. But only a fraction of the population can afford such care due to high costs. Studies revealed that the quality of care delivered in both public and private sectors is comparable.

A dramatic change has been observed in the composition of the health financing in Sri Lanka during the last two decades. The current health expenditure (CHE) per capita has increased almost 4 folds from 2000 to 2019. Contribution to CHE from the domestic private health expenditure has just exceeded 50% from the year 2007, peaked in 2010 (58.4%) and reached 51.4% in 2019. The government contribution to CHE is only 47.2% in 2019. The out-of-pocket expenditure is the main source of the domestic private health expenditure (45.6% from CHE in 2019) (12).

Existence of a widely available and totally free government healthcare system for people in need, is the cardinal reason why Sri Lanka is positioned

higher in the healthcare indices – a higher life expectancy, a lower maternal and infant death rate - compared to other countries in the region (South East Asia and Western Pacific) (13, 14, 15)

A strong state healthcare system is responsible for the equity and efficiency of the delivery of healthcare services. The country has witnessed a steady increase in life expectancy among its people. Since late, Sri Lanka's health system has been facing challenges arising from a rapidly ageing population and an increase in the burden of non-communicable diseases.

In summary health funding in Sri Lanka is by two main sources: government revenue and out of pocket expenses. Government spending on health has remained around 1.7% of the gross domestic product (15). Sri Lanka has maintained high health indices comparable to developed countries at an unbearable cost to the government. However, the current demographic, epidemiological, social and economic transitions are challenging and require much effort in overcoming the obstacles, adding a huge burden to the government. With the present financial crisis of the country there's a question of sustainability of outcome due to the dilemma on our ability to continue with the existing free healthcare system.

Even though the country has well developed curative and preventive care, one of the main drawbacks of the system is the lack of a proper hierarchical referral system. The catchment areas of the institutions are not clearly demarcated, the mechanism of referrals lack consensus and policies are vague and deficient. Individuals are free to move across the provincial or district boundaries to access services at any state sector institution. While enhancing the equity it creates problems in the continuity of care which is essential in dealing with NCDs. This bypassing phenomenon is thought to be based on people's perceptions of better facilities, availability of medicines, and better quality of care and provider competency. Moreover, people abuse the current system by misusing the medicines and facilities. The gravity of the expenditure is unseen, as people are not responsible and unaware of their healthcare expenses. Cost per medical procedure to the government, is comparable to or even higher than that of the private sector. Our government institutions are overwhelmed and overcrowded with patients. The current economic crisis has curtailed the health budget drastically, limiting the expansion of health facilities. Only low-cost treatment options are available for patients due to restraints on healthcare delivery.

At this juncture, the new treatment modalities will be beyond the reach of the public who depend on state healthcare.

Suggestions

According to the world bank database, per capita CHE has increased by several folds over the last 20 years. Even though there is equal contribution from the domestic private health expenditure, it is mainly through out-of-pocket payments. Due to the current crisis, the government fund reserve is steeply declining and GDP per capita has shown a downtrend since 2017. The tax revenue which contributes to the government health fund is not adequate to continue the free government health services anymore.

Therefore, a compulsory insurance scheme for the working population is an essential requirement in the country. To regularise the tax revenue, a transparent mechanism should be introduced. Digitalisation of the medical record system will maintain transparency and limit duplication and misuse of facilities. People will not be able to afford out-of-pocket payments anymore due to the country's economic situation. Therefore, proper private health insurance policies should be introduced to cover the expenses incurred at the private sector.

Addition of inward care, in a paying ward complex with extra infrastructure facilities at the government healthcare institutions for affordable people will generate more funds. Additional income generated by these facilities can be utilised for the maintenance/upgrading of the existing facilities of the government sector. Continuous surveillance should be introduced to monitor the quality of healthcare provided by the

private institutions. Upgrading reliable quality inward care at the private institutions will attract more who can afford, reducing the burden and the overcrowding at the government institutions.

Authors feel that totally free healthcare in Sri Lanka is no longer a realty. Newer suggestions and modifications need to be incorporated into the existing system for its sustainability without compromising quality of care.

References

1 .World health organisation. Universal health coverage. [cited 2022 June 16]. Available from: https://www.who.int/health-topics/universal-health-coverage

2. The World Bank. Poverty. [cited 2022 June 18]. Available from: https://www.worldbank.org/en/topic/poverty

3. The World Bank. Poverty & Health. [cited 2022 June 18]. Available from: https://www.worldbank.org/en/topic/health/brief/poverty-health

4. World health forum. 2020 Oct 9. [cited 2022 June 20]. Available from: https://www.weforum.org/agenda/2020/10/covid-19-healthcare-health-service-vaccine-health-insurance-pandemic/

5. healthcare system. Four basic models. [cited 2022 June 20]. Available from: https://www.pnhp.org/single_payer_resources/health_care_systems_four_basic_models.php

6. The NHS constitution for England. [cited 2022 June 22]. Available from: https://www.nhs.uk/NHSEngland/thenhs/about/Pages/nhscoreprinciples.aspx

7. Uragoda C (1987). A history of medicine in Sri Lanka. Colombo: Sri Lankan Medical Association

8. https://en.unesco.org/silkroad/content/did-you-know-ancient-monastic-hospital-system-sri-lanka

9. Rajapaksa L, De Silva P, Abeykoon A, et al. Sri Lanka health system review. New Delhi: World Health Organization Regional Office for South-East Asia; 2021. Available from: https://apo.who.int/publications/i/item/sri-lanka-health-system-

10. Perera S, Nieveras O, de Silva P, et al. Accelerating reforms of primary health care towards universal health coverage in Sri Lanka. WHO South East Asia J Public Health. 2019 Apr;8(1):21-25. doi: 10.4103/2224-3151.255345.

11. de Silva A, Ranasinghe T, Abeykoon P. Universal health coverage and the health Sustainable Development Goal: achievements and challenges for Sri Lanka. WHO South East Asia J Public Health. 2016 Sep;5(2):82-88. doi: 10.4103/2224-3151.206257.

12. World Bank. World Health Organization Global health expenditure database. 2020 Jan 30. [cited 2022 July 4]. Available from:
https://data.worldbank.org/indicator/SH.XPD.CHEX.PC.CD?locations=LK
https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?locations=LK
https://data.worldbank.org/indicator/SH.XPD.GHED.CH.ZS?locations=LK
https://data.worldbank.org/indicator/SH.XPD.OOPC.CH.ZS?locations=LK

13. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) UHC Effective Coverage Index 1990-2019. Seattle, United States of America: Institute for Health Metrics and Evaluation (IHME), 2020.

14. Human development index. United Nations Development Programme. 2019. [cited 2022 Jun 25]. Available from: http://hdr.undp.org/en/content/human-development-index-hdi

15. World development indicators. World Bank. 2020 Jan 30. [cited 2022 Jun 25]. Available from: https://data.worldbank.org/country/sri-lanka

Internal Medicine in Sri Lanka: concepts, challenges, and prospects

Karunanayake P[1]

[1]Department of Clinical Medicine, University of Colombo

Abstract

The emergence of internal medicine as an approach to medical practice in western medicine and the role of Internal Medicine as a global medical specialty are introduced. The term 'internal medicine' was introduced to Sri Lanka only recently, but it has enjoyed wide recognition here in this brief period. Some local contextual features that formed the foundation for this introduction and recognition are considered. Specialists in Internal Medicine in Sri Lanka should take into account these features and other important issues, as they plan to navigate the future.

Correspondence to:

Panduka Karunanayake

Professor in Medicine, Department of Clinical Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

E-mail: panduka@clinmed.cmb.ac.lk

Key words: Internal Medicine, General Medicine, internist

Introduction

The term 'internal medicine' is a relatively recent addition to the local medical parlance. But in this short time, it has become firmly established in our healthcare system: the remarkable rise and wide recognition of the Sri Lanka College of Internal Medicine (SLCIM) is testimony to this. Due to its recentness, however, it is only natural that we may still have unresolved questions about both internal medicine as an approach to medical practice and Internal Medicine as a medical specialty. This article is a preliminary attempt to explore some of these questions.

I will first explore the meaning of the term 'internal medicine', and briefly describe the current position of Internal Medicine as a specialty. Next, I will note some local factors that are important in Sri Lanka. Finally, I will offer some personal observations on the direction that the specialty and the SLCIM should consider in the coming years.

Misunderstandings about terms

The specialty of Internal Medicine is misunderstood frequently and in different ways, and a good starting point would be to get these out of the way.

Internal Medicine is sometimes misunderstood as the opposite of Dermatology, because the former 'deals with internal organs'. It is also often misunderstood as the opposite of Surgery, because Surgery deals frequently with externally evident diseases (such as lumps and fractures) and externally applied interventions (such as excision and bone-setting). Even though these 'opposites' are valid to some extent, they do not represent the defining feature of Internal Medicine.

Specialists of Internal Medicine are known as 'internists', and this term is – all over the world – often confused with 'interns'[1], who are pre-registration doctors, and with 'intensivists'[2], who

[1]The term 'intern' is derived from the fact that these doctors are supposed to be on-call and available throughout the day, and are therefore interned (i.e., confined, impounded) in the official quarters.

[2]The term 'intensivist' relates to the fact that these specialists work in the intensive care environment.

are specialists in Critical Care Medicine (which to some extent is a subspecialty of Internal Medicine). But the effort to find an alternative to 'internist' has not been very successful, globally (1).

The emergence of internal medicine

The best way to understand internal medicine is to first understand it as an approach to medical practice, because this is its singular and unique contribution to medicine. For this, we must revisit how it emerged, sometime in the nineteenth century in western Europe, especially Germany (2). But this emergence itself took place on a background of significant changes in western medicine that had been unfolding over several preceding centuries. In a nutshell, these long-term changes represent the metamorphosis of western medicine into a healing practice that is firmly based on science which, of course, has now spread to the rest of the world (3).

Initially, western medicine was also like other forms of traditional medicine: its theories were mostly speculative (e.g., Hippocratic humoral theory) and dogmatic (e.g., Galenic Medicine). This began to change gradually and painstakingly with the work of empiricists, such as Paracelsus (1493-1541), Andreus Vesalius (1514-1564) and other Renaissance Anatomists, and William Harvery (1578-1657).

Thomas Sydenham (1624-1689) carefully observed external manifestations in patients (e.g., symptoms, signs, prognosis), and separated disease manifestations into those due to its cause and those due to the host response (such as the acute inflammatory response). This is considered as the beginning of a science of disease (4). He also laid the foundation for the appreciation of 'specificities': for instance, the Peruvian cinchona bark (which we now know to contain quinine) works only against malaria and not other causes of fever. This approach has become a hallmark of scientific medicine – as in cause-effect, antigen-antibody, receptor-ligand, and enzyme-substrate relationships today – and sets it apart from systems of traditional medicine.

On this background, towards the end of the eighteenth century, the experimental methods of the basic sciences (i.e., Physics, Chemistry, and Biology) were applied to the study of disease. Gradually, great strides were made in Pathology (especially pathological anatomy), Bacteriology, and Physiology, helping to elucidate the internal causes and processes of diseases that produced the external manifestations. This was championed by physicians and scientists such as Geovanni Morgagni (1682-1771), Rene Laennec (1781-1826), Claude Bernard (1813-1878), Rudolf Virchow (1821-1902), Louis Pasteur (1822-1895), and Robert Koch (1843-1910). Physicians carried out autopsies on patients and discovered the pathological anatomy of pneumonia and tuberculosis, set up side-room laboratories to identify bacteria under microscopes and in Petri dishes and correlated these findings with the clinical features recorded in the living patients.

The term innere Medizin was coined in Germany to portray this new approach, and it was this term that was translated into 'internal medicine' in the 1880s in the US by William Osler (1849-1919). We can see that internal medicine is not merely the study of internal organs. It combines both the careful observation of external manifestations in patients and the scientific understanding of internal processes. Internal medicine is both 'seeing the patient' and 'seeing into the patient'.

Introducing Internal Medicine to the US, Osler (1895) wrote (5):
"The time has come when able young men should be encouraged to devote themselves to internal medicine as a specialty. Content to labour and wait during the first 10 or 15 years of professional life, with pathology as the solid basis of development[3], such men will pass to the wards through the laboratories thoroughly equipped to study the many problems of internal medicine."

[3]During Osler's time, Pathology was still predominantly based on autopsies, which were performed by the same physicians who looked after patients in life. Experimental findings of new fields such as Physiology and Bacteriology were also entering the Pathology laboratory.

Osler himself operationalised and epitomised the role of internal medicine, by seamlessly combining three qualities each at their best: astute clinical observation, expertise in the autopsy room and the pathology laboratory, and a caring approach to the patient – in short: clinical skills, applied scientific knowledge, and humanism (6). This combination is what best defines internal medicine as an approach to medical practice (see Box 1).

Box 1: A description of Internal Medicine

Source: Fordtran et al (2004, pages 11-12) (1)

"No analytical description…can ever explain what it means to be an internist. You have to know some really good internists to be able to appreciate this specialty. Good internists are knowledgeable about all aspects of internal medicine, have an uncanny ability to diagnose an acute or chronic medical problem, know when to ignore extraneous information and when to order the decisive test, and have a primary commitment to their patients. Making a lot of money is not a concern of such internists, and they are not jealous of doctors in other specialties who often become relatively wealthy. They take pleasure in acknowledging the fact that they could not practise good internal medicine without outstanding support from radiologists, pathologists, medical subspecialists, and surgeons. Theirs is a lifetime of study, and this is something their patients and colleagues never see, so it remains unappreciated. They care deeply for their patients, sharing both the good and the bad. They communicate effectively and promptly with their patients and thereby relieve anxiety. Their appearance and demeanor reflect the attributes of character described above, best demonstrated by the respect and empathy shown to their patients. They are part of the conscience of the institutions where they work."

Internal Medicine as an international specialty

The subsequent development of Internal Medicine as a medical specialty has taken different trajectories in different countries. In the UK, it took on the name General Medicine, now reconciled to the name General Internal Medicine. As a result of these different developmental trajectories, the specialty in one country is not strictly comparable to the specialty in another. (See Box 2 for a description of the specialist in General Internal Medicine of Sri Lanka)

For instance, in the UK, General Medicine went on to develop several subspecialties (e.g., Cardiology, Endocrinology). In the US, in addition to these subspecialties, Internal Medicine also includes non-surgical aspects of Gynaecology, Ophthalmology, Orthopaedic Surgery, and Otorhinolaryngology, which are considered as surgical specialties in countries that follow the UK tradition (including Sri Lanka).

Furthermore, in the UK, it is a hospital-based, secondary care specialty (as it is in Sri Lanka). But in the US, sometimes, it is also a community-based primary care field.

Even the training programmes are variable across different countries. In the US (7), a doctor embarks on Internal Medicine training soon after graduation (rather than after a period of being 'a non-specialist medical officer', as in Sri Lanka, a practice derived from the traditional UK practice in the past). In the US it follows a three-year 'residency' programme, after which the trainee may opt to work as a 'general internist' or obtain 'dual specialisation' by following a further 'fellowship' programme in a subspecialty (such as Interventional Cardiology, Gastroenterology, etc.) for another 1-3 years. This is similar to our subspecialty senior registrar training, but in the US, there are no subspecialists who are not dual-specialised (unlike in Sri Lanka); in other words, in the US all subspecialists are also considered internists (8).

In the US, a general internist has several practice

pathways. First, a general internist may opt to become a 'hospitalist', who practises specialist medicine in the hospital, i.e., in wards and out-patient clinics (very similar to consultant physicians in Sri Lanka). Second, a general internist may become a specialist community-plus-hospital internist, who mainly practises specialist medicine for a large cohort of out-patients, and when necessary, admits them to hospital and treats them if within one's specialty or dual specialisation (very similar to consultant physicians' channel consultation practice in Sri Lanka). Third, a general internist may choose to be a primary care doctor in the community, but unlike Family Medicine, does not practise Paediatrics, Obstetrics, or Surgery (similar to general practitioners and family physicians in Sri Lanka). Fourth, a general internist may become a 'physician-scientist' devoted to research work. In contrast, in Sri Lanka these specialists confine themselves to being 'hospitalists', following the UK practice – although one might argue that their 'channel consultation practice' is increasingly taking on the form of the US's second pathway.

The scientific method that the internal medicine approach first championed in the nineteenth century has now become adopted more widely – including the surgical specialties. But while the scientific approach is now not Internal Medicine's sole preserve, it is still fair to think that the clinical skills and the humanistic qualities are (or should be) practised at their highest level in Internal (or General) Medicine.

The rise of Internal Medicine in Sri Lanka

On this background, it is easy to see that Internal Medicine is not a new medical specialty in Sri Lanka. We had inherited it from British colonial times – by the name used in the UK, viz., General Medicine. What is new is the adoption of the new name of Internal Medicine. Even then, our practice continues to be 'UK-like' in scope.

The adoption of the new name took place for specific reasons. Due to the wide scope of the specialty, it has come in contact – and often, conflict – with the scope and role of at least three other medical fields.

The first of these is the subspecialties of Medicine (such as Cardiology, Endocrinology, etc.). There has always been anxiety, at least since the 1990s,[4] about whether further sub-specialisation could further erode the intellectual repository of the specialty and its status.[5] This is not a merely local phenomenon (Godard 2015). (9)

Indeed, several subspecialties that originated in General Medicine have branched off to become completely independent specialties: e.g., Paediatrics, Psychiatry, and Dermatology.[6] Today, no one would deny that such separation has brought refinement to the overall medical endeavour and added quality to patient care. The process is therefore both inevitable and enriching.

The second field of contact or conflict is General Practice, which has given rise to confusion over terms such as 'general physician'. It has made the term 'Internal Medicine' preferable to the ambiguous 'General Medicine'.

The third, emerging field of contact is a collection of some disparate fields such as maternal medicine, perioperative medicine, exercise & sports medicine, clinical nutrition, etc.

The forces underlying the evolution of Internal Medicine

There are several reasons underlying this evolution. Perhaps the main reason is the expansion of human knowledge in all fields generally, which has made specialisation a real necessity in order to maintain standards, quality, and legitimacy.

[4] For instance, the theme of the Ceylon College of Physicians for the year 1997 was "The generalist and the specialist: duel or duet?"
[5] The situation is similar to what has happened to Physiology following the emergence of fields such as Biochemistry, Genomics, Immunology, Nutrition Science, Molecular Medicine, etc.
[6] Similarly, the specialty Obstetrics & Gynaecology originally started as a subspecialty of Surgery.

Box 2: Description of the specialist in General Internal Medicine in Sri Lanka

Source: Postgraduate Institute of Medicine (2016, pages 5-7) (11)

General physicians are those with expertise in the diagnosis and management of acute and complex, chronic and multisystem disorders in adult patients. They specialize in the diagnosis and treatment of general medical problems, especially those involving non-specific symptoms, atypical presentations, multiple problems or multi-system disorders. They are skilled in the management of acute unselected medical emergencies. They undertake a comprehensive, holistic assessment of a patient's problems, both biomedical and psychosocial. They are competent to provide coordinated care with the assistance of multidisciplinary teams to optimize health outcomes, including the quality of life, while working in hospitals and clinics.

…It is essential that the general physician is able to make a total evaluation of the patient and prioritize the treatment, which may include surgery. Although triage is one important aspect of the general physician's role, he/she is not merely a triage officer who transfers patients but continues to co-ordinate and provides the care for all the patients involving other specialists as required.

The general physician will function in a number of roles, including clinical, counselling, educating, leading and managing.

…General physicians adopt a scientific approach to the patient as a whole person, which requires a detailed knowledge of pathophysiology, diagnostics and therapeutics for a broad range of health problems.

Their breadth and depth of knowledge make them ideally suited to provide high quality consultant services across a wide spectrum of health and illness.

These competencies place general physicians in a unique position to give clinical expertise, teach, advocate for health promotion and conduct research, particularly where health problems are caused by several determinants, affect multiple organ systems, and/or require integration of multidisciplinary expertise.

In combination, general physicians and [subspecialists] provide high quality, advanced and comprehensive care that covers the health problems of all patients falling within this spectrum. Such a combination of generalist and specialist care is an internationally recognized phenomenon, in both developed and underdeveloped countries.

Board certified specialists in these fields have manned such services with success and effectiveness in our country, in state and private sectors, and abroad.

In many other parts of the world, the different specialties had responded to this trend by adopting a collaborative spirit across the specialties. In Sri Lanka, however, this spirit has been lacking. This may be due to the relative lack of probity and accountability of clinical decision-making – had that been present, it could have helped highlight the value of collaboration and risk-sharing among specialists from different fields.

This is ironic, especially in view of the fact that all these specialties have been launched by one institution (viz., Postgraduate Institute of Medicine of the University of Colombo) within which the training of the different specialties have been taking place with close cooperation. Furthermore, almost all of these arose from the same training programme and doctoral degree: viz., the MD in

Medicine established in 1959 (10). Perhaps this points to the potential benefits of re-conceptualising and re-designing these training programmes, giving greater weight for promoting mutual understanding and creating greater respect, reciprocity, and collaboration across the fields.

While knowledge expansion was taking place, societal trends have changed how we approach knowledge and use it. Several pressures have increased the need for this expanding knowledge, including the demand for technical sophistication and predictive and therapeutic precision, an expanded middle class and health consumerism, more intense marketing strategies, and a bigger private healthcare sector. At the same time, greater availability of knowledge has enabled contiguous specialties to acquire knowledge and create areas of overlap. All these forces have tended to intensify competitive behaviour rather than collaboration among medical professionals in general.

Unfortunately, Sri Lanka's education sector has also promoted competitive behaviour, through its highly competitive examinations. Students are selected to the medical profession for their sharp competitive skills, unlike in developed countries where selection to medical school specifically looks for collaborative and team-based behaviour and medical curricula increasingly adopt inter-professional training.

In view of these challenges and trends, an important issue that members of the specialty should pay attention to is defining the role of the internist. This should be a priority for the concerned professional bodies in Sri Lanka.

The future

The future shape of Internal Medicine in Sri Lanka will be determined by the outcome of a delicate balancing act between tendencies that promote separation of Internal Medicine from the fields it comes in contact with, and tendencies that promote collaboration and mutual cooperation with them. This balancing act takes place in several realms: organisation of postgraduate training, postgraduate curricula, terms of reference determined by authorities in the Ministry of Health (or, if not determined, the 'default positions' adopted by various specialists); recognition and facilities given by health authorities to different fields and specialties; interaction between medical professional organisations, the nature of private sector healthcare (including its norms and fee structures), engagement of medical professionals with other healthcare workers and with the public (including covert 'advertising'), and so forth.

Although this list may seem like a formidable list of disparate items, in the end a common thread runs through all of them: medical professionalism, which is something common to all specialties.

In brief, medical professionalism is the social contract that the profession collectively creates with its society – wherein all members of the profession promise society to put the patient's interests before one's self-interest and to provide a high standard of care, and in return the society gives the profession the right of self-regulation and autonomy. If all members of the medical profession from all specialties and fields adopt this, the balancing act will naturally tilt to the side of collaboration, the stature of the profession and all its specialties in the eyes of the public will rise, and every one of us will have satisfaction and contentment.

In such a landscape, it would not be that hard to hold in our hearts the example set by William Osler – and to rediscover Internal Medicine as the best example in the healing endeavour for the combined practice of clinical skills, applied scientific knowledge, and humanism.

References

1. Fordtran JS, Armstrong WM, Emmett M, et al. The history of internal medicine at Baylor University Medical Center, part 1. Proc (Bayl Univ Med Cent). 2004 Jan;17(1):9-22.

2. Masters PA. How internal medicine got its name. 2019 [cited 2022 Jun 19]. Available from: https://www.kevinmd.com/2019/10/how-internal-medicine-got-its-name.html

3. Jackson M. The History of Medicine: A Beginner's Guide. London: One world publication; 2014.

4. Porter R. The Greatest Benefit to Mankind: A Medical History of Humanity from Antiquity to the Present. London: HarperCollins Publishers; 1997

5. Osler W. President's Address. Transactions of the Association of American Physicians 1895; 10:11-13.

6. Roland CG. Sir William Osler 1849-1919: A Selection for Medical Students. Toronto: Hannah Institute for the History of Medicine; 1982

7. American College of Physicians [Internet]. 'About Internal Medicine'. [cited 2022 Jun 20]. Available from: https://www.acponline.org/about-acp/about-internal-medicine

8. American College of Physicians [Internet]: 'Subspecialties of Internal Medicine'. [cited 2022 Jun 20] Available from: https://www.acponline.org/about-acp/about-internal-medicine/subspecialties-of-internal-medicine

9. Godard, A. 'Specialty spotlight – general internal medicine (GIM).' 2015 [cited 2022 Jul 12] Available from: https://www.rcplondon.ac.uk/education-practice/advice/specialty-spotlight-general-internal-medicine-gim

10. Gunaratne M. Lessons from history: the life of Prof. K. Rajasuriya (Inaugural Professor Kumaradasa Rajasuriya Oration). Journal of the Ceylon College of Physicians. 1997; 30:27-32.

11. Postgraduate Institute of Medicine. Prospectus: Doctor of Medicine in General Medicine and Board Certification in General Medicine. Board of Study in Medicine. 2016. Available from: https://pgim.cmb.ac.lk/wp-content/uploads/2018/02/Amendment-to-the-MD-Medicine-2016-prospectus-1.pdf

Indications for hospital admission, prevalence of vascular and non-vascular complications and comorbidities among patients with diabetes mellitus admitted to a medical unit in a tertiary care hospital, Sri Lanka

De Silva PU[1], Kodithuwakku G[1], Imbulgoda NP[1], Samarawickrama MD[1], Palagasingha D[1], Nanayakkara SD[1], Weerarathna TP[2]

[1] Teaching Hospital, Karapitiya
[2] University of Ruhuna

Abstract

Background: Hospital admissions with diabetes-related complications are on the rise in Sri Lanka. We aimed to study indications for hospital admissions and the prevalence of micro, macrovascular and non-vascular comorbidities in patients with diabetes mellitus admitted to a medical unit in a tertiary care hospital.

Methods: A hospital-based, cross-sectional study was carried out in Teaching Hospital Karapitiya over six months. Four hundred in-ward patients with diabetes were studied. Evidence of diabetes nephropathy, non-vascular co-morbidities and indication for admission were extracted from medical records using a pretested data extraction form. Screening for Diabetic peripheral neuropathy (DPN), and diabetic retinopathy (DR) were carried out using standard protocols.

Results: The highest number of admissions (142) were due to infections of which 52.8 % were females. One-third (33.8%) of the patients had previous admissions during the past year with a significant female preponderance (66%). DPN and DR were detected in 55.4% and 52.9% respectively with a significant proportion of them being females. Diabetic nephropathy was diagnosed in 27.9%. Nearly half (47.3%) of the sample was on treatment for hypertension and 39.4% were on statins. Evidence of previous myocardial infarction was significantly higher among the females compared to males (72.8% vs. 27. 2%).

Conclusions: Infections were the most frequent indication for hospital admission among diabetic patients. DPN and DR are significantly higher among females than males. Use of statins for dyslipidaemia is suboptimal among the admitted patients.

Correspondence to:

PU De Silva
Senior Registrar in Internal Medicine
2/178, Barolin Street,
Walkavale, QLD, Australia

Tel: +61423523757
0773064584

E-mail:
desilvaput@gmail.com

Key words: Inpatients with diabetes, complications, Comorbidities of inpatients with diabetes

Introduction

Diabetes is a growing epidemic and has become a major public health problem worldwide. Statistics reveal that 382 million people had diabetes in 2013 and this figure is expected to rise to 592 million in 2035 (1). More than half of the diabetic population lives in Asia according to the World Health Organization (WHO) estimates. Out of these, Southeast Asian countries show a sharp rise in diabetes prevalence. Sri Lanka is a developing country and has a heavy burden of diabetes (2). The prevalence of diabetes in Sri Lanka was about 10.3% in 2008 and it is projected to increase up to 14% by 2030 (2, 3). Although there are several studies on prevalence and projections, very limited research has been conducted in hospital settings to assess the burden, comorbidities, and complications among patients with diabetes admitted to state hospitals in Sri Lanka. The available literature on complications of diabetes were mainly based on studies carried out in out-patient clinics (4, 5). Estimates of the in-hospital prevalence of comorbidities and complications can provide useful information for planning and allocation of resources for optimal delivery of care for patients with diabetes managed as inpatients in state-run hospitals in Sri Lanka.

In this study, we aimed to describe the indications for hospital admission and the prevalence of vascular and non-vascular complications and comorbidities in patients with diabetes mellitus admitted to a medical unit in a tertiary care hospital.

Methods

This was a hospital-based, cross-sectional, descriptive study conducted over six months (from August 2018) at Teaching Hospital Karapitiya.

A total of 400 (calculated required minimum sample 384) (6) patients with diabetes mellitus admitted to the University Medical Unit irrespective of the reason for admission were recruited. This included diabetic patients transferred from other wards (surgical, other specialized units). In addition, those who were newly diagnosed during the current admission were also recruited.

Recruits were considered to have 'diagnosed diabetes' if they have been previously diagnosed and are on treatment while new cases (previously unknown diabetes) were diagnosed according to the American Diabetes Association (ADA) and WHO criteria (7, 8).

Informed written consent was obtained prior to data collection using a pretested data extraction form.

For this study, Diabetic peripheral neuropathy (DPN) was diagnosed using the biothesiometer (9). Other microvascular and macrovascular complications were diagnosed/identified based on standard protocols and guidelines (10, 11, 12).

Regular follow-up was defined as patients with previously diagnosed diabetes having at least once a month visit to their regular place of follow-up (local hospital, general practitioner, tertiary care clinic, consultation with a specialist) during the three months prior to the current admission to the hospital.

Statistical analysis: This was carried out using SPSS software. Numerical data were presented as means and standard deviations and categorical data as percentages. The student t-test was used to compare numerical data and the Chi-square test was used to compare categorical data. The significant level was considered to be $p < .05$.

Results

Baseline characteristics (Table 1): Out of 400 pati ents with diabetes admitted during the study period, 197 were males and 203 were females. There was no statistically significant difference between the mean ages of males and females. The mean age (standard deviation (SD)) of the study sample was 59.5(12.8) years and the on-admission capillary blood sugar (CBS) of the study sample was 213.45 (125) mg/dL.

Table 1 - Baseline characteristics of the study sample

Baseline characteristics	Male	Female
Age - Mean (SD)	59.01 (13.06)	60 (12.61)
On admission CBS Mean (SD)	213.2 (124)	213 (127)
Duration of diabetes in years – Mean (SD)	6.9 (7.42)	7.4 (6.85)
Duration of hospital stay in days - Mean (SD)	3.5 (1.74)	3.2 (2.11)
Employed n(%)*	151 (75.5)	49 (24.5)
Newly diagnosed diabetes n(%)	22 (66.6)	11 (33.3)
Regular follow-up n(%)*	171 (46.9)	193 (53.1)
Previous hospital admissions n(%)*	46 (34)	89 (66)
Not on any treatment n(%)	3 (100)	0 (0)
On OHA n(%)	156 (49.4)	160 (50.6)
On insulin n(%)	23 (47.9)	25(52.1)
On OHA & insulin n(%)	15 (45.5)	18 (54.5)

*p=<.05
SD-standard deviation, **CBS**-capillary blood sugar, **n(%)**-number(percentage), **OHA**-oral hypoglycemic agents

Indications for hospital admission (Table 2): The highest number of admissions (142) were due to infections of which 52.8 % were females. Reasons unrelated to diabetes such as backache, headache, muscular pain, nonspecific abdominal pain, and drug allergy were the second commonest cause with 126 admissions (54%females). Uncontrolled hyperglycemia (on admission CBS > 400 mg/dL) was accounted for by 9.8% of the study population while hypoglycemia (on admission CBS <80 mg/dL) accounted for 3.5%.

Prevalence of comorbidities: Nearly half of the study sample (190) was previously diagnosed to have hypertension and were on treatment (54.2% female, p value >.05). Hundred and fifty eight were on statins for dyslipidemia out of which 53.8% were female (p value >.05).

Prevalence of micro and macrovascular complications (Table 3): Prevalence of microvascular complications namely retinopathy, neuropathy, and nephropathy were evaluated among the study participants. Neuropathy was the most prevalent microvascular complication (55.4% of the study population) with a female preponderance of 61.3% (p <.05). Diabetic retinopathy was detected in nearly half of the sample (52.9%) with a significantly higher percentage in females (58.5%).

Table 2 - Indication for hospital admission

*N.B.: Some patients had more than one indication for hospital admission

Indication	Male (%)	Female (%)
Cardiovascular diseases	41 (53.2)	36 (46.8)
Cerebrovascular diseases	9 (47.3)	10 (52.7)
Nephropathy	3 (21.4)	11 (78.6)
Neuropathy	4 (40)	6 (60)
Erratic glucose control	30 (52.6)	27 (47.4)
Infections	75 (52.8)	67 (47.2)
Unrelated to diabetes	58 (46)	68 (54)

Discussion

Gender differences in hospital admissions

In our study, there was a statistically significant number of first admissions and readmissions among unemployed females. Similarly Medagama et al have reported a higher proportion of female admissions (58.3%) with Diabetes (2). However, they have not reported any association between unemployment and hospital admissions. Elizabeth et al found that gender and low income affected diabetes-related hospital admissions and length of stay at hospitals in Australia. Their results showed 56.3% male and 43.7% female hospital admissions, and the findings were opposite to our findings (13). However, they revealed that people with a low income had a higher number of hospital admissions irrespective of gender variation.

The findings of our study showed that unemployment itself is a considerable factor in admission to state-sector hospitals. In Sri Lanka, the rate of hospital admissions is 22.3% with the majority being females. It is relatively higher in comparison to other countries (14). Therefore, it is important to establish national-level hospital admission guidelines similar to developed countries to minimize unnecessary hospital admissions.

In our study, more females with diabetes were attending government medical clinics regularly. Although Sri Lanka is a middle-income developing country, Sri Lanka provides free healthcare to the whole population. The high female unemployment rate, poverty, and availability of more free time may have influenced them to attend the state clinics. In some developed countries like England, where secondary prevention has become more equitable between men and women with diabetes, there was no reported gender-related variation in clinic attendance (15).

There is a higher prevalence of diabetes among females compared to males in Sri Lanka (16). This may be one of the reasons why more female admissions with diabetes were observed in our study.

Table 3 - Prevalence of micro and macrovascular complications

Prevalence of complication	Male (%)	Female (%)
Retinopathy*	88 (41.5)	124 (58.5)
Neuropathy*	86 (38.7)	136 (61.3)
Nephropathy	52 (46.4)	62 (53.6)
CAD	29 (42)	40 (58)
Silent ischemia	5 (55.6)	4 (44.4)
Previous Symptomatic MI or ischemia*	10 (27.8)	26(72.2) .
Positive stress test	11 (61.1)	7 (38.9)
Positive CA	0 (0)	3 (100)
CABG	2 (100)	0 (0)
CVD	12 (50)	12 (50)
Previous TIA	0 (0)	2 (100)
Old CVA	11 (52.4)	10 (47.6)
Medications for CVD	1 (100)	0 (0)
PAD	5 (55.6)	4 (44.4)

*p=<.05
CAD-coronary artery disease, **MI**-myocardial ischemia, **CA**-coronary angiography, **CABG**-coronary artery bypass grafting, **CVD**-cerebrovascular disease, **TIA**-transient ischemic attack, **CVA**-cerebrovascular accident, **PAD**-peripheral arterial disease

Indications for hospital admissions

The commonest cause of hospital admission in our study was infections (n=142) The three common types of infections were lower respiratory tract infections (LRTI) (31.7%), skin and soft tissue infection (23.9%) and urinary tract infections (UTI) (urethritis/ cystitis) (19%). The prevalence of infectious diseases was higher among individuals with diabetes compared to non-diabetic individuals in literature (17). Medagama et al reported a lower percentage of admissions with infections (2). Peleg et al found that respiratory tract infections were responsible for a significant number of medical appointments by individuals with diabetes compared to those without (18).

One-fourth of admissions in our study were due to combined coronary artery disease (CAD) and cerebrovascular disease (CVD). Madagama et al found that 22.6% of diabetes patients were admitted due to acute coronary syndrome (ACS)

while 11.3% of non-diabetic patients were admitted due to the same cause (2). Anthony et al showed whilst diabetes tripled admission rates for acute myocardial infarction in the male gender, while it increased by more than fourfold among women (19). Peters et al have reported double the risk of CAD among men with diabetes while it triples among women with diabetes (20).

Prevalence of comorbidities

Nearly half of the patients have high blood pressure as a comorbidity in our study. Perera et al found that prevalence of hypertension among patients on follow up for diabetes (n=147) was 70.7% (1). Faiza et al have reported the prevalence of hypertension among 118 diabetic patients to be 85.6% in Benghazi (21).

Prevalence of dyslipidemia based on the use of statin therapy was seen only in a third of our study. This is a relatively low percentage compared to studies from other countries. This could be due to the suboptimal use of statins in our patients compared to other countries. Studies have shown that the prevalence of dyslipidemia in the diabetes population is almost double in number compared to the general population (22).

Prevalence of complications

More than half of the patients had diabetic retinopathy (DR) (52.9%) and diabetic peripheral neuropathy (DPN) (55.4%) in this study. The prevalence of complications of DR, and DPN was significantly higher in females.

Prevalence rates of DR ranging from 17.6% to 50% have been reported in several studies (23). As an independent risk factor, the female gender was associated with the development of DR in the Japanese diabetes population (24). Studies conducted among Malays from Singapore showed that the female gender has a higher frequency of moderate to severe non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR) and vision-threatening diabetic retinopathy (VTDR) (25). However, there was no correlation found between gender and DR in studies conducted in northern China (23). Therefore, the exact role of gender on DR remains to be determined.

A wide range in the prevalence rates of diabetic peripheral neuropathy has been reported. The reported prevalence of DPN varies from 5 to 60 per cent (26) with an average standing at 26.4% (27). Studies from Western countries have reported that the male gender is more prone to get DPN than females (28). However, there was limited data available on Asian populations.

Among macrovascular complications, we found symptomatic myocardial infarction (MI) or ischemia to be more common in females ($p < .05$). Generally, females tend to get more cardiovascular disease after menopause, and disease risk increases with age. In our study, CVD, and CKD are higher in females although numbers are low. Several studies conducted in Asian regions reported that the variability in the prevalence rate of diabetic nephropathy ranges from 14.2% in Iran, 24.2% in Pakistan, to 36.3% in India (29).

Limitations

First, it is a single-center study in a tertiary care center and the generalizability of its findings are limited. Glycemic control of the study participants was also not measured using standard measures like glycosylated hemoglobin due to lack of resources in the hospital during the study period.

Conclusions

Infections accounted for the most frequent indication for admission among diabetic patients followed by causes unrelated to diabetes and combined cardiovascular diseases (coronary artery and cerebrovascular disease). DPN and DR were present in 52.9% and 55.4% of admitted patients with diabetes with a significantly higher female preponderance. Diabetic nephropathy was detected in 27.9% with no significant gender difference.

Recommendations: As a priority, vaccination against respiratory infections should be available for patients with diabetes in Sri Lanka. We also urge more effective measures to control blood glucose levels to reduce DPN and DR complications. Finally, we emphasize the need for more hospital-based studies with the inclusion of a higher number of inward patients in Sri Lanka.

Article Information

Ethical considerations: The study proposal was approved on 15.08.2018 by the Ethics Review Committee of the Faculty of Medicine, The University of Ruhuna Sri Lanka.

Consent: Data collection was carried out after obtaining informed written consent from the patients via an interviewer-administered questionnaire from all the interviewed patients.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

Authors' Contributions: PUDS, TPW and DP were involved in the creation of objectives and research proposals. PUDS and TPW were involved in evaluating, editing, and creating the final research proposal. PUD, GK, NPI, MDS, and SDN were involved in collecting the data. PUDS, SDN, and TPW were involved in analyzing data to make the final report. PUDS, DP and TPW were involved in evaluating, editing, and creating the final report with citations for publication.

All the authors read and approved the final version for publication.

References

1 .G.N.D Perera, V. Navarathnarajah, W.G.C Pradeep, et al. Assessment of factors relating to screening of diabetes complications in patients with Type 2 Diabetes Mellitus during follow up: A descriptive study in Sri Lanka; Journal of Diabetology October 2015; 3:1

2. Medagama AB, Bandara R, Wijetunge R, The High Burden of In-Hospital Diabetes Mellitus at A Tertiary Care Hospital in Sri Lanka; A Case Control Study. J Diabetes Metab 2015; 6: 502

3. Katulanda P, Shine B, Katulanda GW, et al. Diabetes mellitus among young adults in Sri Lanka role of GAD antibodies in classification and treatment: The Sri Lanka Young Diabetes study. Diabetologia 2008; 51:1368–1374

4. Sandini W, Chaminda H, RFagunathan MK, Diabetic care provided at a diabetes clinic at the largest Tertiary care Hospital in Southern Sri Lanka; an audit DOI: 10.4038/gmj.v14i1.1173 Galle Medical Journal 2009; Vol.14(1): 45-47

5. Balasuriya BMAC, Sumanatilleke MR, Jayasekera TI, et al. Prevalence of micro and macrovascular complications of diabetes detected at a single visit screening, Sri Lanka Journal of Diabetes, Endocrinology and Metabolism 2012; 2: 17-20

6. Lwanga SK, Lemeshow S, Sample size determination in health studies: A practical manual. Geneva: World Health Organization 1991

7. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2014;37 (Suppl. 1): S81–S90

8. International Expert Committee. International Expert Committee report on the role of the A1C assay in the diagnosis of diabetes. Diabetes Care 2009; 32:1327–1334

9. Jayaprakash P, Bhansali A, Bhansali S, Dutta P, Anantharaman R, Shanmugasundar G, Ravikiran M. Validation of bedside methods in evaluation of diabetic peripheral neuropathy. Indian J Med Res. 2011 Jun;133(6):645-9

10. Diabetic Retinopathy Guidelines, The Royal College of Ophthalmologists; 2012 December

11. Benjamin EJ, Blaha MJ, Chiuve SE, et al, for the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics-2017 update: a report from the American Heart Association. Circulation 201; 135 (10):146-603

12. Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults, JAMA 2001; vol. 285: (2486-97) (Adult Treatment Panel III)

13. Elizabeth Jean Comino, Mark Fort Harris, MD Fakhrul Islam, Duong Thuy Tran, Bin Jalaludin, Louisa Jorm, Jeff Flack and Marion Haas Impact of diabetes on hospital admission and length of stay among a general population aged 45 years or more: a record linkage study Comino et al. BMC Health Services Research 2015; 15:12

14. Chamikara Perera, Ravi P. Rannan-Eliya, Sunil Senanayake, Shanti Dalpatadu, Hirushaka de Silva and Ruki Wijesinghe. 2009. Public Hospital Inpatient Discharge Survey 2005. IHP Health Statistics Reports Series Number 1. Colombo: Institute for Health Policy.

15. Hamilton FL, Bottle A, Vamos EP, Curcin V, Ng A, Molokhia M, et al. Impact of a pay-for-performance incentive scheme on age, sex, and socioeconomic disparities in diabetes management in UK primary care. J Ambul Care Manag 2010;33(4):336–49

16. De Silva AP, De Silva SHP, Haniffa R, et al. Inequalities in the prevalence of diabetes mellitus and its risk factors in Sri Lanka: a lower-middle-income country. International Journal for Equity in Health 2018; 17:45

17. Muller LM, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman AI, et al. Increased risk of common infections in patients with type 1 and type 2 diabetes mellitus. Clin Infect Dis 2005; 41:281-8

18. Peleg AY, Weerarathna T, McCarthy JS, Davis TM. Common infections in diabetes: Pathogenesis, management, and relationship to glycaemic control. Diabetes Metab Res Rev 2007; 23:3-13

19. Anthony A. Laverty, Alex Bottle, Sung-Hee Kim, Bhakti Visani, Azeem Majeed, Christopher Millett, and Eszter P. Vamos* Gender differences in hospital admissions for major cardiovascular events and procedures in people with and without diabetes in England: a nationwide study 2004–2014, Cardiovasc Diabetol 2017; 16:100

20. Peters SA, Huxley RR, Woodward M. Diabetes as a risk factor for incident coronary heart disease in women compared with men: a systematic review and meta-analysis of 64 cohorts including 858,507 individuals and 28,203 coronary events. Diabetologia. 2014; 57(8):1542–51

21. Nouh, Faiza & Omar, Mariam & Younis, Manal. (2017). Prevalence of Hypertension among Diabetic Patients in Benghazi: A Study of Associated Factors. Asian Journal of Medicine and Health 2017;6: 1-11

22. Vakkilainen J, Steiner G, Ansquer JC. Relationships between low-density lipoprotein particle size, plasma lipoproteins, and progression of coronary artery disease. The Diabetes Atherosclerosis Intervention Study (DAIS). Circulation 2003; 107: 1733-1737

23. Cui Y, Zhang M, Zhang L, et al. Prevalence and risk factors for diabetic retinopathy in a cross-sectional population-based study from rural southern China: Dongguan Eye Study. BMJ Open. 2019; 9(9):023586

24. Kajiwara A, Miyagawa H, Saruwatari J, et al. Gender differences in the incidence and progression of diabetic retinopathy among Japanese patients with type 2 diabetes mellitus: a clinic-based retrospective longitudinal study. Diabetes Res Clin Pract 2014; 103:7–10

25. Wong TY, Cheung N, Tay WT, et al. Prevalence and risk factors for diabetic retinopathy: the Singapore Malay eye study. Ophthalmology 2008; 115:1869–7.

26. Thomas PK, Eliasson SG: Diabetic neuropathy. In: Peripheral Neuropathy. 2nd Edition. P.J.Dyck, P.K.Thomas, E.H. Lambert, and R. Bunge. Eds. Philadelphia: Saunders 1984; 1773-18103

27. Davies-M, Brophy-S, Williams-R, Taylor-A. The prevalence, Severity, and Impact of Painful Diabetic Peripheral Neuropathy in Type-2 Diabetes. Diabetes Care. July 2006; Volume 29. No.7: 1518-1522.

28. Booya F, Bandarian F, Larijani B, Pajouhi M, et al. Potential risk factors for diabetic neuropathy: a case-control study. BMC Neurology 2005; 5:24.

29. Wu AY, Kong NC, De Leon FA, Pan CY, Tai TY, Yeung VT, et al. An alarmingly high prevalence of diabetic nephropathy in Asian type 2 diabetic patients: The microalbuminuria prevalence (MAP) study. Diabetologia 2005; 48:17–26.

Hand hygiene practices among healthcare workers – An audit conducted in a tertiary care hospital in the central province of Sri Lanka

Jayasinghe IK[1], Perera UAWL[1], Manilgama SR[2], Hettiarachchi NM[3], Abeywickrama UK[4], Dayaratna UHJP[1], Premaratne BG[1], Amarasinghe WGMD[1], Kularatne WLR[5], Rotuwegama RSHT[5]

[1] National Hospital Kandy
[2] North Colombo Teaching Hospital, Ragama
[3] Teaching Hospital Peradeniya
[4] Faculty of Medicine University of Kelaniya
[5] Faculty of Medicine University of Peradeniya

Abstract

Background: Proper hand hygiene (HH) is of utmost importance in reducing the prevalence of healthcare associated infections. The World Health Organisation (WHO) HH strategy has been shown to be the most effective approach leading to practice improvements. An audit was conducted to assess the adherence to HH recommendations amongst the healthcare workers (HCW) at a medical unit in National Hospital Kandy (NHK) in July 2021.

Methods: Audit standards were set to WHO five-moments HH. Four medical personnel were trained using WHO HH audit tool and asked to discreetly observe up to four HCW to assess HH over 20-minute sessions. HH compliance in total (TC), each moment and each HCW category were calculated in percentages and compared. HH compliance of 100% is the gold standard.

Results: Total of 1134 opportunities were observed. TC was 49%. Moments specific compliance were, before touching a patient (moment1): 51%, before an aseptic procedure (moment2): 67.4%, after body fluid exposure risk (moment 3): 65.2%, after touching a patient (moment 4): 69.2% and after touching patient's surrounding (moment 5): 26.7%. HCW specific compliance of doctors, nurses, healthcare assistants (HCA), medical students, allied healthcare workers (AHC), and nursing students were 54%, 49.6%, 44.8%, 4.7%, 37.1% and 11.7% respectively. Doctors were significantly more likely to be compliant overall (in all moments), and specifically in moment 4 and moment 5 HH.

Conclusions and recommendations: Overall HH compliance among HCW was inadequate at the observed study setting. Doctors demonstrated a better HH compliance than other healthcare categories. HH compliance was better in moment 4 and moment 2 than other moments. After reinforcement of HH practices, a re-audit is recommended to assess the improvement.

Correspondence to:

Kumudini Jayasinghe
Consultant Physician,
National Hospital Kandy
Sri Lanka

Tel: 077 341 0719

E-mail:
kumujay@gmail.com

Key words: A Hand hygiene (HH), HH compliance, WHO HH audit tool

Introduction

Every year, millions of patients suffer from healthcare associated infections (HAI) (1). The burden of HAI is several folds higher in low- and middle-income countries than in high-income countries (2). HAI is the most frequent adverse event in healthcare delivery (3). Its exact global burden remains unknown due to the unavailability of reliable data (1). In Asia, although there is a paucity of studies exploring this subject, the prevalence of HAI is predicted to be high (4,5,6).

Proper HH is the most important, simplest and least expensive measure in reducing the prevalence of HAI (7, 8, 9). HH improvement programmes can prevent up to 50% of HAI (1). The assessment of the compliance of HH hygiene among the HCW is important to identify deficient areas and to improve the practice. Data on compliance of HH from many parts of the world are not favourable. In Asian countries, the compliance is reported to be between 18 and 46% (10, 11, 12). In Sub-Saharan African countries HH compliance is between 8 to 39%. (13, 14, 15). A systematic review which was done in intensive care units from developed countries showed that median compliance rates were between 30–40% (16). A study conducted at the National Hospital of Sri Lanka showed that more than 60% of the nursing staff had substandard HH practices during aseptic procedures (17).

The World Health Organisation (WHO) HH strategy has been shown as the most effective approach leading to practice improvements. WHO started the “SAVE LIVES: Clean Your Hands" campaign in 2009. This programme is based on five crucial steps/moments where the HCW should comply with HH. Five steps included in WHO’s five moments of HH are moment1: before touching a patient, moment 2: before an aseptic procedure, moment 3: after a body fluid exposure risk, moment 4: after touching a patient and moment 5: after touching a patient’s surroundings (18). The Ministry of Health Sri Lanka has issued a circular on HH in 2015 requesting all health care units to carry out HH audits quarterly (19).

HH was reinforced in all health care institutions during the Covid-19 pandemic since appropriate HH undoubtedly reduces the Covid-19 infection (20). With the surge of Covid-19 infection in HCW, we wanted to assess HH practices among them. Hence, we decided to conduct a study to assess the adherence to HH recommendations amongst the HCW in a healthcare setting.

Methods

Design and setting: A descriptive cross-sectional study was conducted at a single medical unit, NHK within the month of July 2021, to assess the current practices of HH among HCW categories [doctors, nurses, healthcare assistants (HCA), medical students (MS), allied healthcare workers (AHC), nursing students (NS)] according to the moments of HH aiming to reduce HAIs.

Audit standards and the audit tool: Audit was carried out according to the audit standards of the WHO (1). WHO HH audit tool (Fig 1) was used to collect data. Four medical personnel were trained as auditors (observers) by the principal investigator.

Procedure of data collection and analysis: Auditors observed up to four HCW discreetly to assess HH over 20-minute sessions. Number of observation sessions were decided according to the standing operating procedure introduced by the Royal College of Physicians of Ireland. They have recommended 30 observations per ward in their HH observation audit (21). The estimated requirement for our study with a two ward medical unit was 60 observations. Ethical approval was taken from the institutional ethical review committee and permission was taken from the relevant authorities.

Each HH opportunity and the action taken were entered into the WHO HH audit tool according to the standard format. Each opportunity was entered in one of the following ways: moment1 - before touching a patient (bef-pat.), moment 2 - before an aseptic procedure (bef-asept.), moment 3 - after body fluid exposure risk (aft-b.f.),

Observation Form

Facility:		**Period Number*:**		**Session Number*:**	
Service:		**Date:** (dd/mm/yy)	/ /	**Observer:** (initials)	
Ward:		**Start/End time:** (hh:mm)	: / :	**Page N°:**	
Department:		**Session duration:** (mm)		**City**:**	
Country:**					

Prof.cat			Prof.cat			Prof.cat			Prof.cat		
Code			Code			Code			Code		
N°			N°			N°			N°		
Opp.	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**
1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves

* To be completed by the data manager.
** **Optional**, to be used if appropriate, according to the local needs and regulations.

Figure 1 - WHO HH audit tool

moment 4 - after touching a patient (aft-pat.) and moment 5 - after touching a patient's surroundings (aft-p.surr.). Data were analysed independently by two investigators, using SPSS 20 version to get total number of observations, compliance at each of the 5 moments and HCW category. Compliance of HCW categories were compared in each moment using the chi square.

Compliance of 100% is considered as the gold standard in HH.

The correct action was defined as either washing hands with soap and water or rubbing with a standard alcohol solution in accordance with a HH opportunity.

Total HH compliance was calculated using the formula mentioned below:

$$\text{Total Compliance (\%)} = \frac{\text{Total correct moments}}{\text{Total observed moments}} \times 100$$

Job category specific HH compliance was calculated using the formula given below, e.g.:

$$\text{Compliance of Nurses (\%)} = \frac{\text{Total correct moments (nurses)}}{\text{Total observed moments (nurses)}} \times 100$$

Moment specific HH compliance was calculated as follows, e.g.:

$$\text{Compliance of moment1 (bef-pat.) (\%)} = \frac{\text{Total correct moment 1}}{\text{Total observed moment 1}} \times 100$$

Results

Total of 1134 opportunities were documented in 60 observations during the audit period. Total compliance was 49%. Distribution of opportunities according to the moments: moment 1, moment 2, moment 3, moment 4 and moment 5 were 29.9%, 3.8%, 1.8%, 29.8% and 34.6% respectively. Distribution of opportunities according to the healthcare categories: doctors, nurses, HCA, MS, AHC, NS were 46.2%, 33.8%, 13.6%, 3.1%, 1.8% and 1.5% respectively. Further details regarding the distribution of opportunities according to the moments among the HCW are shown in Table 1.

Moment specific compliance rates were calculated according to the WHO audit standards. Overall compliance rates for bef-pat. and aft-pat. were 51% and 69.2% respectively. Overall compliance rates for bef-asept. and aft-b.f. were 67.4% and 65.2% respectively. Overall compliance rate for aft-p.surr. was only 26.7% (Table 2). Both washing hands and rubbing hands using a standard sanitation solution were considered as the correct HH procedure. As the HH measure,

Table 1 - Distribution of observed opportunities among the health care worker categories

	Opportunities n (%)					
	Doctor	Nurse	HCA	MS	AHC	NS
Moment 1	164 (48.4)	112 (33.0)	41 (12.1)	9 (2.6)	10 (2.9)	3 (0.9)
Moment 2	7 (16.3)	30 (69.8)	1 (2.3)	2 (4.6)	0 (0)	3 (7.0)
Moment 3	2 (9.5)	6 (28.6)	11 (52.4)	2 (9.5)	0 (0)	0 (0)
Moment 4	149 (44.1)	114 (33.7)	49 (14.5)	13 (3.8)	6 (1.8)	7 (2.1)
Moment 5	202 (51.4)	121 (30.8)	52 (13.2)	9 (2.3)	5 (1.3)	4 (1.0)
Total	524 (46.2)	383 (33.8)	154 (13.6)	35 (3.1)	21 (1.8)	17 (1.5)

using hand rub was practised in 91.5% and washing hands was done in the rest (8.5%) of the occasions (Table 2).

The compliance rates for the HCW were calculated overall and at each moment. The category specific overall HH compliance for doctors, nurses, HCA, MS, AHC and NS were 54%, 49.6%, 44.8%, 37.1%, 4.7% and 11.7% respectively (Table 3).

A chi-square test was performed to examine the relationship of category specific HH compliance among the main three healthcare worker categories (doctors, nurses and healthcare assistants) in relation to all moments (overall), moment 1, moment 4 and moment 5 separately. Chi-square test was not applied to moment 2 and moment 3 due to a smaller number of observed opportunities.

There was a significant difference of $p<.05$ in overall HH compliance ($p=.02$), in moment 4 ($p=.00$) and in moment 5 ($p=.00$) among the healthcare worker categories. Doctors were significantly more likely to be compliant with overall (in all moments), moment4 and moment5 HH than other two categories. There was no significant difference in HH compliance ($p=.13$) of moment1 among the healthcare worker categories.

Discussion

Hand hygiene is the single most effective preventive measure against HAIs, and can contribute to shorter hospital stay, reduction in patient morbidity and healthcare costs (1, 22, 23). Therefore, efforts on maintaining good HH should be made with the aim of reducing the burden of HAIs globally (1). Within the audit period of our study, there were 1134 opportunities. Out of the total, 95% were obtained in moment1, moment4 and moment5. Most observations (93.6%) were based on three main healthcare categories: doctors, nurses, and HCA. In our study, doctors showed the highest compliance (54%) among all categories, while the nurses performed better (49.6%) than HCA (44.8%). Similarly, doctors performed better in a study done in India (24). Few studies pointed out that compliance of HH among nurses is poor due to the heavy workload (24, 25, 26). In contrast, few other studies showed that the nurses performed better than doctors (23, 27, 28).

As observed, the total compliance of 49% was

Table 2 - Moment specific hand hygiene (HH) compliance

		Moments					Total HH (all moments)
		Moment 1	Moment 2	Moment 3	Moment 4	Moment 5	
Correct Hand hygiene (HH)	Handwash	20	4	7	15	1	47
	Handrub	153	25	8	219	104	509
	Total	173	29	15	234	105	556
Total observed		339	43	21	338	393	1134
Moment specific HH compliance (%)		51.0	67.4	65.2	69.2	26.7	-
Total HH compliance (%)		-	-	-	-	-	49.0

Table 3 - Distribution of observed opportunities among the health care worker categories

	Doctor	Nurse	HCA*	MS*	AHC*	NS*
Moment 1: Before touching a patient						
Total correct	82	68	19	2	1	1
Total observed	164	112	41	9	10	3
Category specific HH compliance (%)	50	60.7	46.3	22.2	10	33.3
Moment 2: Before an aseptic procedure						
Total correct	7	21	1	0	-	0
Total observed	7	30	1	2	-	3
Category specific HH compliance (%)	100	70	100	0	-	0
Moment 3: After a body fluid exposure risk						
Total correct	2	3	10	0	-	-
Total observed	2	6	11	2	-	-
Category specific HH compliance (%)	100	50	90.9	0	-	-
Moment 4: After touching a patient						
Total correct	122	76	25	10	0	1
Total observed	149	114	49	13	6	7
Category specific HH compliance (%)	81.9	66.7	51	76.9	0	14.3
Moment 5: After touching a patient's surroundings						
Total correct	72	22	10	1	0	0
Total observed	202	121	52	9	5	4
Category specific HH compliance (%)	35.6	18.2	19.2	11.1	0	0
All moments (Moment 1 + 2 + 3 + 4 + 5)						
Total correct	285	190	65	13	1	2
Total observed	524	383	154	35	21	17
Category specific HH compliance (%)	54.0	49.6	44.8	37.1	4.7	11.7

***HCA**-healthcare assistant, **MS**-medical student, **AHC**-allied healthcare, **NS**-nursing student

highly inadequate especially during the pandemic, where maintaining good HH was of utmost importance. Our total HH compliance was very similar to observations made in studies done in Sri Lanka, Sierra Leone, Southwest Nigeria and Ghana (17, 29, 30, 31). The moment1, "bef-pat." that can introduce infection to the patient showed a lower compliance rate (51%) than moment4 "aft-pat." (69.2%) in our study. Similar findings of lower compliance in moment1 (21%) than moment4 (47%) were observed in a systematic review published in 2010 (16). It might imply that HCW were more concerned about protecting themselves than protecting patients. Satisfactory compliance was shown for moment2 "bef-asep." (67.4%) and moment3 "aft-b.f." (65.2%). Similarly, compliance of 63% after body fluid exposure was reported in Nigeria (32). A study done in Nepal showed that the compliance after exposure to body fluids was remarkably high (99%) in all HCW (33). Moreover, in moment2, doctors showed the gold standard (100%) compliance whereas nurses showed only 70% in our study. Maintaining good HH practice in moment5 reduces cross infections among patients and HCW. Out of the moment specific compliance rates, moment5 "aft-p.surr." recorded the lowest (26.7%). Similarly, a study done in London showed low compliance after touching a patient's surroundings (34). HH compliance was not significantly different among the HCW before touching a patient, which might indicate that HCW' perception is the same in this practice. The difference in hand washing practice among different groups of medical personnel could be due to differences in workload, accessibility to hand washing areas, irritation and dryness of the hands due to chemical irritants and the level of awareness regarding HH. Few studies done in India have identified the factors which can influence HH as knowledge of HH practice, training opportunities, availability of essential logistics for maintaining good HH and knowledge and the presence of infection prevention committees (35, 36, 37, 38).

The presence of alcohol-based hand rub (ABHR) was positively associated with HH compliance. Those who had access to ABHR in a clinical setting were 6.5 times more likely to be compliant than those who did not have access (39). It is also noted that in our study the use of alcohol rub was 91.5% compared to washing hands with soap and water (8.5%). The availability of essential logistics to maintain good HH may have an impact on HH compliance. In some other countries, HH compliance was low due to the unavailability of ABHR. A study done in Geneva showed that HH compliance significantly improved from 47·6% to 66·2% after increasing the availability of ABHR (39). In Sri Lanka during the Covid-19 pandemic the increase in the availability of alcohol rubs in the hospitals may have contributed to the results observed in our study.

Limitations

Our study was done in a medical unit of a tertiary care hospital and therefore its findings cannot be generalised. We have observed only the practices of HH but the reasons for the differences were not assessed. It is imperative to know why compliance is higher for "after patient" than for "before patient" and why differences exist between different HCW.

Hand hygiene technique and the duration of hand washing were not assessed in our study. The observed opportunities were inadequate and/or unequal for different categories of HCW for each moment during the observation period. Some HCW categories do not get the exposure to some moments due to the nature of their profession (e.g., AHC do not get the opportunities to do aseptic procedures). Trainees like medical and nursing students have less exposure because their role in ward management is limited. Therefore, the comparison of compliance in each moment among all HCW is not possible. As observations were done anonymously, there is a chance that the same person may be observed repeatedly. The level of HH compliance of that person may affect the ultimate outcome. Limitations of facilities (lack of hand washing materials and hand sanitiser solutions, limited sink-bed ratio etc.) may affect the compliance of the HCW, and therefore overall results.

Conclusions

Overall HH compliance among the HCW was inadequate at the observed study setting. Doctors demonstrated a better HH compliance than other health care categories. HH compliance was better "after patient" and "before aseptic procedure" than other moments. The comparison was limited only to the doctors, nurses and HCA. Limited opportunities for AHC, medical and nursing students in some moments had restricted their comparison with others. After reinforcement of HH practices, a re-audit is recommended to assess the improvement.

Recommendations: Further studies are needed to get better information on HH compliance at different levels of the healthcare facilities. The findings may provide important inputs for policy makers. Since a significant gap was observed in HH practices against the gold standard, further measures are needed to improve the practice. The following measures to upgrade HH compliance are recommended: to conduct workshops for all HCW, use role modelling by the experienced HCW, increase the availability of hand washing materials and hand sanitiser solutions, improve the sink-bed ratio, and display visuals on HH practices. A re-audit needs to be done in order to complete the audit cycle to assess the improvement.

References

1 .WHO, Hand hygiene, the evidence for clean hands https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene

2. World Health Organization. The burden of health care-associated infection worldwide. https://www.who.int/news-room/feature-stories/detail/the-burden-of-health-care-associated-infection-worldwide

3. llegranzi B, Bagheri Nejad S, Combescure C, et.al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. Lancet. 2011 Jan 15;377(9761):228-41. doi: 10.1016/S0140-6736(10)61458-4.

4. Sureshkumar et al.: Hand hygiene compliance in India. BMC Proceedings 2011 5 (Suppl 6):P259.

5. Anwar MA, Rabbi S, Masroor M, et al. Self-reported practices of hand hygiene among the trainees of a Teaching Hospital in a resource limited country. Journal of Pakistan Medical Association. 2009; 59 (9):631-634

6. Patarakul K, Tan-Khum A, Kanha S, et.al. Cross-sectional survey of hand-hygiene compliance and attitudes of health care workers and visitors in the intensive care units at King Chulalongkorn Memorial Hospital. J Med Assoc Thai. 2005; 88 Suppl 4: S287-93.

7. World Health Organization. Patient safety. WHO guidelines on hand hygiene in healthcare. http://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf;jsessionid=74

8. Pittet D, Hugonnet S, Harbarth S, et al. (2000): Effectiveness of a hospital wide programme to improve compliance with hand hygiene. The Lancet, 356(9238):1307-12. doi:10.1016/s0140-6736(00)02814-2

9. Stone SP, Fuller C, Savage J, et al. Evaluation of the national Cleanyourhands campaign to reduce Staphylococcus aureus bacteraemia and Clostridium difficile infection in hospitals in England and Wales by improved hand hygiene: four year, prospective, ecological, interrupted time series study. BMJ. 2012 May 3;344:e3005. doi: 10.1136/bmj.e3005.

10. Ye LP, Zhang XP, Lai XQ. Does hospital ownership influence hand hygiene compliance? J Huazhong Univ Sci Technolog Med Sci. 2017 Oct;37(5):787-794. doi: 10.1007/s11596-017-1806-9.

11. Marjadi B, McLaws ML. Hand hygiene in rural Indonesian healthcare workers: barriers beyond sinks, hand rubs and in-service training. J Hosp Infect. 2010 Nov;76(3):256-60. doi: 10.1016/j.jhin.2010.06.021.

12. Han K, Dou FM, Zhang LJ, et al. [Compliance on hand-hygiene among healthcare providers working at secondary and tertiary general hospitals in Chengdu]. Zhonghua Liu Xing Bing Xue Za Zhi. 2011 Nov;32(11):1139-42.

13. Allegranzi B, Sax H, Bengaly L, et al. World Health Organization "Point G" Project Management Committee. Successful implementation of the World Health Organization hand hygiene improvement strategy in a referral hospital in Mali, Africa. Infect Control Hosp Epidemiol. 2010 Feb;31(2):133-41. doi: 10.1086/649796.

14. Yawson AE, Hesse AA. Hand hygiene practices and resources in a teaching hospital in Ghana. J Infect Dev Ctries. 2013 Apr 17;7(4):338-47. doi: 10.3855/jidc.2422.

15. de Graft-Johnson J, Vesel L, Rosen HE, et al. Cross-sectional observational assessment of quality of newborn care immediately after birth in health facilities across six sub-Saharan African countries. BMJ Open. 2017 Mar 27;7(3):e014680. doi: 10.1136/bmjopen-2016-014680.

16. Erasmus V, Daha TJ, Brug H, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital

care. Infect Control Hosp Epidemiol. 2010 Mar;31(3):283-94. doi: 10.1086/650451.

17. Batuduwaarachchi VR, Balasubramanium M, Balasooriya D, et al. Compliance with aseptic procedures during intravenous access among the nursing staff at the National Hospital of Sri Lanka. International Journal of Infection Control. 2011; 7 (13):1-6.

18. WHO, save lives- Clean your hands campaign. https://www.who.int/campaigns/world-hand-hygiene-day

19. Ministry of health and indigenous medicine- circular number 01-23/2015- Hand hygiene compliance – introduction of hand hygiene tools

20. World hand hygiene day 2021, WHO. https://www.who.int/campaigns/world-hand-hygiene-day/2021

21. Hand hygiene observation audit standard operating procedure 2014, Royal College of Physicians, Ireland. https://www.hpsc.ie/az/microbiologyantimicrobialresistance/infectioncontrolandhai/handhygiene/handhygieneaudit/handhygieneaudittools/File,12660,en.pdf

22. Trampuz A, Widmer AF. Hand hygiene: a frequently missed lifesaving opportunity during patient care. Mayo Clin Proc. 2004 Jan;79(1):109-16. doi: 10.4065/79.1.109.

23. Haque M, McKimm J, Sartelli M, et al. Strategies to Prevent Healthcare-Associated Infections: A Narrative Overview. Risk Manag Healthc Policy. 2020 Sep 28;13:1765-1780. doi: 10.2147/RMHP.S269315.

24.Sharma S, Sharma S, Puri S, et al. Hand hygiene compliance in the intensive care units of a tertiary care hospital. Indian J Community Med. 2011 Jul;36(3):217-21. doi: 10.4103/0970-0218.86524.

25. Abd Elaziz KM, Bakr IM. Assessment of knowledge, attitude and practice of hand washing among health care workers in Ain Shams University hospitals in Cairo. J Prev Med Hyg 2009; 50(1): 19-25.

26. Jang JH, Wu S, Kirzner D, et al. Focus group study of hand hygiene practice among healthcare workers in a teaching hospital in Toronto, Canada. Infect Control Hosp Epidemiol 2010; 31(2): 144-50.

27. Meengs MR, Giles BK, Chisholm CD, et al. Hand washing frequency in an emergency department. Ann Emerg Med. 1994 Jun;23(6):1307-12. doi: 10.1016/s0196-0644(94)70357-4.

28. Joshi S, Joshi A, Park BJ, et al. Hand washing practice among health care workers in a teaching hospital. J Nepal Health Res Counc. 2013 Jan;11(23):1-5.

29. Kamara GN, Sevalie S, Molleh B, et al. Hand Hygiene Compliance at Two Tertiary Hospitals in Freetown, Sierra Leone, in 2021: A Cross-Sectional Study. Int J Environ Res Public Health. 2022 Mar 3;19(5):2978. doi: 10.3390/ijerph19052978.

30. Irek EO, Aliyu AA, Dahiru T, et al. Healthcare-associated infections and compliance of hand hygiene among healthcare workers in a tertiary health facility, southwest Nigeria. J Infect Prev. 2019 Nov;20(6):289-296. doi: 10.1177/1757177419848141.

31. Abuosi AA, Akoriyea SK, Ntow-Kummi G, et al. Hand hygiene compliance among healthcare workers in Ghana's health care institutions: An observational study. Journal of Patient Safety and Risk Management. 2020;25(5):177-186. doi:10.1177/2516043520958579

32. Shobowale EO, Onyedibe KI, Adegunle KB, et al. An observational and trend analysis study of hand hygiene practices of healthcare workers at a private Nigerian Tertiary Hospital. Ann Med Health Sci Res. 2017;7:84-9.

33. Joshi SK, Joshi A, Park BJ, et al. Hand Washing Practice among Health Care Workers in a Teaching Hospital. J Nepal Health Res Counc 2013 Jan;11(23):1-5

34. FitzGerald G, Moore G, Wilson AP. Hand hygiene after touching a patient's surroundings: the opportunities most commonly missed. J Hosp Infect. 2013 May;84(1):27-31. doi: 10.1016/j.jhin.2013.01.008.

35. Anargh V, Singh H, Kulkarni A, et al. Hand hygiene practices among health care workers (HCWs) in a tertiary care facility in Pune. Med J Armed Forces India. 2013 Jan;69(1):54-6. doi: 10.1016/j.mjafi.2012.08.011.

36. Tyagi M, Hanson C, Schellenberg J, et al. Hand hygiene in hospitals: an observational study in hospitals from two southern states of India. BMC Public Health. 2018 Nov 27;18(1):1299. doi: 10.1186/s12889-018-6219-6.

37. Anargh V, Singh H, Kulkarni A, et al. Hand hygiene practices among health care workers (HCWs) in a tertiary care facility in Pune. Med J Armed Forces India. 2013 Jan;69(1):54-6. doi: 10.1016/j.mjafi.2012.08.011.

38. Pittet D, Hugonnet S, Harbarth S, et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Infection Control Programme. Lancet. 2000 Oct 14;356(9238):1307-12. doi: 10.1016/s0140-6736(00)02814-2.

39. Abdella NM, Tefera MA, Eredie AE, et al. Hand hygiene compliance and associated factors among health care providers in Gondar University Hospital, Gondar, North West Ethiopia. BMC Public Health. 2014 Jan 30;14:96. doi: 10.1186/1471-2458-14-96.

Evaluation of anaemia in geriatric patients: a retrospective hospital-based study from Northern Sri Lanka

Sujanitha V[1], Sooryakumar T[1], Kumarasiri T[1], Rajeshkannan N[2],Tharmiga S[1]

[1]Teaching Hospital Jaffna, Sri Lanka
[2]Civic Park Medical Centre, Australia

Abstract

Background: Anaemia in older adults is a common medical problem but it is often not evaluated as a sole clinical entity and its importance is undermined. The gravity of anaemia in older adults and its impact on other diseases is not well known in Sri Lanka.

Methods: This was a cross-sectional descriptive study where data was extracted retrospectively from the database and clinical records of patients who were referred to the haematology unit of Teaching Hospital Jaffna, Sri Lanka for the evaluation of anaemia, from September 2020 to February 2021. The common types of anaemia, their severity, aetiological classifications and association with other diseases were analysed.

Results: A total of 1121 medical records of patients above 60 years were analysed during the study period. The main source of referrals was from medical wards. The female to male ratio was 51.2:48.8.The majority belonged to the age group of 60-69 years. Two-third of the patients had normocytic anaemia (70.3%) followed by microcytic (23.7%) and macrocytic anaemia (6.0%). A moderate degree of anaemia was seen commonly, but 28.3% were found to have severe anaemia. Aetiological classification revealed anaemia of chronic disease as the commonest type of anaemia in older adults accounting for 37% of the study sample, followed by multifactorial aetiology and iron deficiency anaemia. Common chronic diseases identified along with anaemia were diabetes, hypertension, ischaemic heart disease and chronic kidney disease.

Conclusions: Normocytic anaemia was the commonest type identified and the majority were of a moderate degree. Though the commonest aetiological cause identified is anaemia of chronic disease, there was a considerable percentage of multifactorial causes indicating the need to be on the lookout for other possibilities. Identifying the prevalence of anaemia in all hospitalised older adult patients in the local setting, the causes and the impact on chronic and acute illnesses will immensely help in the management of older adult patients and improve their quality of life.

Correspondence to:

V Sujanitha,
Senior Lecturer and Consultant Physician
University Medical Unit
Teaching Hospital Jaffna
Sri Lanka

Tel: 077 773 3432

E-mail:
vsujanitha@univ.jfn.ac.lk

Key words: Anaemia, older adults, anaemia of chronic disease, normocytic normochromic anaemia

Introduction

Anaemia in older adults, being one of the commonest medical problems in clinical practice, often goes unnoticed unless it is severe or causes deterioration of the underlying medical condition (1). Older adults have many age-related physiological changes which make the clinical presentation of anaemia atypical and unnoticeable (2). The onset of anaemia is often insidious and patients tend to adapt to the clinical deterioration (3, 4).

Prevalence of anaemia in older adults is higher in developing countries ranging between 20.6%-49.5% (5). However, its exact prevalence in hospitals and the community is not known. A huge burden of anaemia in older adults is seen in many developing countries with a very high prevalence in Africa and South-East Asia (6). Sri Lanka, being a South Asian country is not an exception to this, however it lacks the exact data on anaemia in older adults.

Good health standards have led to a rise in the older adult population surviving with many comorbidities. Thus anaemia, being common with many chronic illnesses increases exponentially causing significant morbidity and mortality (1). Anaemia in hospitalised elderly patients is a critical clinical problem and often multifactorial (4, 7). Often anaemia in hospitalised patients is complicated by acute illnesses and will not truly reflect the anaemia prevalence in the community. There are no major studies done on anaemia in hospitalised patients in Sri Lanka except a published abstract that reported 41.3% of anaemia among 230 older adults patients who attended the teaching hospital Peradeniya and chronic inflammation was reported as the main aetiological cause (8).Anaemia in older adults has many underlying aetiologies of which the common causes are chronic disease or chronic inflammation and nutritional deficiency. Many patients may have more than one aetiology while in some it is unexplained (9). Any degree of anaemia, whether mild or severe, contributes to hospitalization, morbidity, mortality and negative impact on quality of life and it was shown that even a mild degree of anaemia can compromise patient-well-being and survival regardless of the cause and need for evaluation(2, 6,10-18). Mortality is higher among anaemic patients with IHD, heart failure, and chronic kidney disease (19, 20).

Anaemia can be easily diagnosed and reversed. Identifying the type of anaemia, aetiology and associated comorbidities will help in the management of older adults with significant improvement in quality of life, morbidity and mortality. The treatment of anaemia starts with the correct diagnosis of the underlying condition (1). Though anaemia in older adults is very common in clinical practice, there was no research carried out to identify the types, aetiology, and common comorbidities in the local setting. Hence this retrospective study was initiated to understand the anaemia in older adults, its types and associated comorbidities. Our main objective was to identify the common types of anaemia in hospitalised older adults.

Methods

This was a cross-sectional descriptive study and data were extracted retrospectively from the database and clinical records of patients who were referred to the Haematology Unit of Teaching Hospital Jaffna for evaluation of anaemia during the study period.

The study included all the patients above 60 years of age who underwent haematological evaluation for anaemia over a period of 6 months (1st September 2020 to 28th February 2021).

Proportions from a study conducted in India was referenced for the calculation of sample size (21, 22). The minimum sample size was determined to be 403. We were able to collect data from 1121 medical records of patients who fulfilled the inclusion criteria.

Data were collected using data extraction sheets by a trained medical officer.

For the diagnosis of anaemia WHO classification was used. Haemoglobin of <13 g/dL in men and <12 g/dL in women were identified as anaemic. It was further classified into mild, moderate and severe based on blood haemoglobin levels (6).

The diagnosis of different types of anaemia was done based on the standard criteria (7, 9, 21, 23) and is concluded by the Consultant Haematologists (24). Anaemia of multifactorial aetiology was diagnosed when they fulfilled more than one aetiology.

Data analysis: Data were analysed using a recommended statistical package (SPSS version 28.0). Quantitative variables were expressed as percentages with CI while mean values were calculated with SD for numeric variables. The chi-squared test was used to identify associations where a p value <.05 was considered statistically significant.

Results

Out of 1121 records analysed, most of the patients were referred from medical wards (79.1%). A further 7.9% were referred from surgical wards. The remaining 13% were referred from other wards such as gynaecology, orthopaedic, cardiac, etc. Background characteristics of patients are summarized in Table 1.

Table 1 - Background Characteristics of older adults with anaemia (n=1121)

Variable	Categories	No	Percentage (%)
Age (years)	60-69	491	43.8
	70-79	473	42.2
	≥ 80	157	14.0
Sex	Male	547	48.8
	Female	574	51.2
Marital Status	Married	1081	96.4
	Single	20	1.8
	Widowed	20	1.8
Smoking Status	Yes	202	18.0
	No	919	82.0
Alcohol consumption	Yes	225	20.1
	No	896	79.9
Being vegetarian	Yes	238	21.8
	No	883	78.8

The mean age of patients was 71.3 years (range: 61 to 99). The majority were aged 60-69 years (43.8%) closely followed by the 70-79 year group (42.2%). Female participants were slightly higher (51.2%) compared to males (48.8%). Further 21.8% were vegetarian. Mean (SD) Hb of the 1121 patients was 8.88±1.95 with a minimum of 2 to a maximum of 12.9 g/dL.

Table 2 - Distribution of study subjects according to their age, sex and the comorbidities

Age group (years)	Male n (%)	Female n (%)	Total n (%)
60-69	232(42.4)	259(45.1)	491 (43.8)
70-79	222 (40.5)	251(43.7)	473 (42.2)
80 and above	93(17.1)	64(11.2)	157 (14.0)
Total	547 (100)	574(100.0)	1121 (100.)
Comorbidities			
Diabetes Mellitus	233 (42.6)	263 (45.8)	496 (44.2)
Hypertension	256 (46.8)	290 (50.5)	546 (48.7)
Cerebrovascular Accident	41 (7.5)	27 (4.7)	68 (6.1)
Bronchial Asthma	49 (9.0)	56 (9.8)	105 (9.4)
Chronic obstructive pulmonary disease	34 (6.2)	6 (1.0)	40 (3.6)
Rheumatoid Arthritis	6 (1.1)	28 (4.9)	34 (3.0)
Peptic Ulcer Disease	11 (2.0)	18 (3.1)	29 (2.6)
Chronic kidney disease	71 (13.0)	57 (9.9)	128 (11.4)
Hypothyroidism	17 (3.1)	52 (9.1)	69 (6.2)
Malignancies	17 (3.1)	20 (3.5)	37 (3.3)
Dyslipidaemia	34 (6.2)	59 (10.3)	72 (6.5)
Epilepsy	10 (1.8)	7 (1.2)	17 (1.5)
Psychiatric illness	6 (1.1)	7 (1.2)	13 (1.2)
Tuberculosis	12 (2.2)	5 (0.95)	17 (1.5)
Chronic liver cell disease	13 (2.3)	9 (1.6)	22 (2.0)
Dementia	1 (0.2)	1 (0.2)	2 (0.2)

Comorbidities among participants:

The commonest comorbidities observed among older adult patients with anaemia were hypertension (48.7%) and diabetes mellitus (44.2%). Among the patients with CKD, five were in stage 3a (0.4%), another 29 of them (2.6%) in stage 3b, further 47(4.2%) in stage 4 and 42 were in stage 5.

Majority (56.6%) had moderate anaemia (Hb=8.0-10.9 g/dL) while 28.3% were of the severe category (Hb<8g/dL). About 15.1% accounted for mild anaemia (Hb=11.00-11.9 g/dL).

Bleeding History and blood transfusion:

Of 1121 patients, 10% had a bleeding history while 16.6% had reported blood transfusion. Of the study population, 9.5% had had a blood transfusion within the past three months. Among the patients with a bleeding history, 35.7% have had a blood transfusion while among those without a bleeding history only 14.5% have had a blood transfusion.

This study also examined the common medications linked to anaemia and the results are summarized in Table 3.

Patterns (Types), severity and aetiology of anaemia:

Majority of the participants (70.3%) had normocytic anaemia followed by microcytic (23.7%) and macrocytic anaemia (6.0%) respectively. Aetiological causes of anaemia are summarised in Table 4. The commonest aetiology was anaemia of chronic disease (ACD) (37.0%).

Iron deficiency anaemia (IDA):

There was no significant difference in gender observed among those with IDA. Similarly, no significant difference was observed between vegetarians and non-vegetarians. Among the 101 who had iron deficiency as a sole aetiological cause, 14.9% had a bleeding history while among 1020 patients who had other forms of anaemia only 9.5% had a bleeding history.

Table 3 - Common relevant medication usage among older adults with anaemia

Medication	Number	Percentage (%)
Aspirin	285	25.4
Clopidogrel	174	15.5
NSAIDs	16	1.4
Iron Tablets	64	5.7
Vitamin B12	17	1.5
Folate	62	5.5
Metformin	213	19.0
PPI (Proton pump inhibitor)	136	12.1
Methotrexate	11	1.0
Anti-epileptics	19	1.7

Table 4 - Types of anaemia based on Mean Corpuscular Volume & aetiology

Type of anaemia	Number	Percentage % (95% CI)
MCV<80 (microcytic)	266	23.7 (21.3-26.3)
MCV-80-100 (normocytic)	788	70.3 (67.6-72.9)
MCV>100 (macrocytic)	67	6.0 (4.7-7.7)
Diagnosis (aetiological classification)		
Anaemia of chronic disorders (ACD)	415	37.0 (34.2-39.9)
Multifactorial	169	15.1 (13.1-17.3)
Iron Deficiency Anaemia (IDA)	101	9.0 (7.4-10.8)
Anaemia of Renal disease	92	8.2 (6.7-9.9)
Mixed deficiency anaemia	80	7.1 (5.7-8.8)
B12/folate deficiency	74	6.6 (5.3-8.2)
Haematological malignancy	36	3.2 (2.3-4.4)
Non-immune haemolytic anaemia	33	2.9 (2.1-4.1)
Anaemia of acute illness	31	2.8 (1.9-3.9)
Anaemia of acute blood loss	31	2.8 (1.9-3.9)
Anaemia associated with Hypothyroidism	7	0.6 (0.3-1.3)
Autoimmune haemolytic anaemia	5	0.4 (0.2-1.0)
Others (diagnosis not confirmed)	7	0.6 (0.3-1.3)

Anaemia due to B12/folate deficiency:

Of those with B12/folate deficiency 50% had macrocytic anaemia while another 50% was normocytic. Among 74 patients who had B12 deficiency anaemia, 48.6 % were vegetarian while among 1047 patients who did not have B12 deficiency, only 19.3 % were vegetarian (p<.05). Among the patients with B12 deficiency, 54.1% were males and 45.9% were females (p=.349).

Anaemia of Chronic Disease:

The commonest aetiological cause in the study population (Table 5) was ACD (37.0%). Diabetes mellitus (55.2%) and Ischaemic Heart Disease (21.9%) were the commonest chronic diseases among them. Majority were normocytic (86.3%), followed by the microcytic (12.5%) and macrocytic (1.2%) respectively.

Anaemia with Multifactorial aetiology

Sub-analysis of anaemia due to multifactorial aetiologies shown in Table 6.

Table 5 - Distribution of chronic diseases among patients with anaemia of chronic disease

Disease	Number	Percentage %
Diabetes Mellitus	194	55.2
IHD	77	21.9
RA(Rheumatoid arthritis)	19	5.41
Non haematological malignancies	17	4.84
COPD	12	3.43
Chronic wound	8	2.28
Bronchiectasis	8	2.28
Tuberculosis	6	1.71
HIV	3	0.86
HTN	1	0.28
Others(including missing)	70	19.94

Table 6 - Distribution of patients as per underlying causes in anaemia with multifactorial aetiology *patients (n-169).

Cause	Number	Percentage %
ACD + Acute blood loss	10	5.9
ACD+B12 Deficiency	5	3.0
ACD+IDA	59	34.9
ACD+ Acute illness	18	10.6
ACD+ Mixed deficiency	11	6.5
ACD+ Renal failure	29	17.1
IDA+ Acute Blood Loss	6	3.6
Liver Disease +Acute Blood loss	1	0.6
Others	30	17.8

Discussion

A study done in North India found that the mean age of patients with anaemia was 68.1±7.8 years, male to female ratio was 1.6:1 and mean value of Hb was 8.8± 2.3 g/dL,(21). Many other studies also found that men have a higher prevalence of anaemia than women in older adults (25). In comparison, our study population revealed a mean age of 71.3 years with a slight female predominance. The majority was in the 60-69 years and 70-79 years age group with female predominance. However, males were more in the age group >80 years.

The commonest type of anaemia based on mean corpuscular volume in our study was normocytic anaemia (70.3%) followed by microcytic anaemia (23.7%) and macrocytic anaemia (6.0%). This was in keeping with a study done in Ethiopia where normocytic anaemia was identified as the commonest cause of anaemia in hospitalised older adult patients (2, 26).

Majority had a moderate severity(56.6%), followed by severe anaemia (28.8%) in our study. A hospital-based study done in Tanzania revealed that more than two-third of the participants were having either moderate or severe anaemia (27). However, there were contrasting results in other studies where mild anaemia was mainly identified in the older adult population (2, 5). Studies done in the community and elder homes revealed mild anaemia as the commonest type of anaemia (28-32). As our study included the patients who were referred for haematological evaluation, there is a high possibility that mild cases of anaemia may have been evaluated in general wards without being referred to haematology. The common medication usages among older adult patients with anaemia were aspirin, metformin, clopidogrel and PPI in our study. However, the high percentage of non-communicable diseases notably DM, hypertension and IHD in the study population justify these medication usages. Our analysis revealed among patients using aspirin, only 6.7% reported bleeding while bleeding history was noted in 11.1% of non-aspirin users. It is likely that the patients on aspirin were on regular medical clinic follow up for underlying diseases where anaemia had been detected and treated. This finding is in line with a previous study where they found anaemia was 42% less common among aspirin users (33). But in contrast, a clinical trial conducted among older adults from Australia and US reported the use of low-dose aspirin for primary prevention resulted in a significantly higher risk of major haemorrhage (34). Whether aspirin use has a causal relationship with anaemia in older adults needs a thorough evaluation.

As in other studies, anaemia of chronic disease (37%) was the most common type identified in the hospitalised older adult patients followed by anaemia due to multifactorial causes and IDA(35,36).The common aetiologies identified in the multifactorial causes were IDA, CKD, acute illnesses, etc. IDA is the 3rd common cause of anaemia and the second most common single cause in the study population. Presence of multifactorial aetiology indicates the need to identify additional factors in the evaluation of anaemia in older adults. Table 7 shows a comparison of common aetiological causes of anemia among developing and developed countries with the current study. Here it was observed that our study had more patients with anaemia of chronic disease and multifactorial causes in comparison to developing countries.

Conclusion

Normocytic anaemia was identified as the common type of anaemia in hospitalised older adults and the common aetiological cause identified was anaemia of chronic disease followed by multifactorial causes and IDA. The majority were of a moderate degree and there was a considerable percentage of multifactorial causes indicating the need to be on the lookout for other possibilities.

Limitations

This study involved only the patients referred to

Table 7 - Comparison of common aetiological causes studies from developing countries and developed countries with the current study

Diagnosis	Current study % (CI)	In Developing countries % (CI) ref:(21, 36)	In Developed countries % (CI)ref: (35-38)
Anaemia of chronic disorders (ACD)	37.0 (34.2-39.9)	22.9 (15.6-31.6)	36.5 (32.1-41.2)
Multifactorial	15.1(13.1-17.)	7.6 (3.6-14.0)	28.1 (24.0-32.4)
Iron deficiency anaemia (IDA)	9.0 (7.4-10.8)	24.8 (17.2-33.8)	4.6 (2.5-7.9)
Anaemia of renal disease	8.2 (6.7-9.9)	12.4 (7.1-19.8)	19.4 (14.7-24.8)
Mixed deficiency anaemia	7.1 (5.7-8.8)	-	2.0 (1.0-3.8)
B12 deficiency	6.6 (5.3-8.2)	2.8 (0.7-7.6)	5.9 (3.4-9.5)
Haematological malignancy	3.2 (2.3-4.4)	20 (13.2-28.5)	7.5 (4.2-12.1)
Nonimmune haemolytic anaemia	2.9 (2.1-4.1)	-	-
Anaemia of acute illness	2.8 (1.9-3.9)	-	-
Anaemia of acute blood loss	2.8 (1.9-3.9)	2.17 (0.1-9.5)	-
Anaemia associated with Hypothyroidism	0.6 (0.3-1.3)	-	6.6 (4.3-9.8)
Others (unexplained)	0.6 (0.3-1.3)	8.6 (4.3-15.1)	43.7 (36.4-51.1)
Autoimmune haemolytic anaemia	0.4 (0.2-1.0)	-	-

the haematology department for further assessment of anaemia during the study period. Patients who have not been referred, especially cases of mild anaemia have therefore been missed in the study. Hence it does not reflect the true prevalence of anaemia in hospitalised patients. Further due to the retrospective design this study is impacted by the limitations/deficiencies in documentation. This study depended on investigations available in the government sector for diagnosis and therefore was limited by it. e.g., B12 level was not assessed to diagnose B12 deficiency because it was unavailable. Diagnosis of different types of anaemia on such occasions were made based on consensus reached by local haematologists.

Recommendations: A large prospective hospital-based study, as well as a community-based study, is needed in Sri Lanka as the prevalence and aetiology of anaemia in both settings differ and need a different approach to evaluation and management. Further adopting a systematic evaluation protocol in anaemia to identify the underlying cause of anaemia in older adults is of paramount importance as it will guide the treatment, improve the outcome and help to improve quality of life.

Article Information

Ethics approval and consent to participate: Ethical approval for this study was obtained from the Ethical Review Committee, Faculty of Medicine of the University of Jaffna. All methods were performed in accordance with the relevant guidelines and regulations. Informed consent was waived off by the Ethical Review Committee, Faculty of Medicine, University of Jaffna.

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: None

Funding: The Authors have not received any funds for the study, authorship or publication.

Authors' contributions: VS, TS, TK and NR designed the study, ST,TS and TK collected the data, NR analysed the data, VS and NR wrote the manuscript and the final manuscript was read and approved by all authors.

Acknowledgements: The authors acknowledge Ms Mary Vijitha Mariyathas, an assistant in the haematology unit for the immense help rendered in collecting all the data from the data base and clinic records and the assistance given in the data entry.

References

1 .Maccio`A, Madeddu C. Management of Anaemia of Inflammation in the Elderly. *Anaemia*. 2012.doi:10.1155/2012/563251

2. Melku M, Asefa W, Mohamednur A, et al. Magnitude of Anemia in Geriatric Population Visiting Outpatient Department at the University of Gondar Referral Hospital, Northwest Ethiopia: Implication for Community-Based Screening.Current Gerontology and Geriatrics Research.2018.https://doi.org/10.1155/2018/9869343

3. Partridge J, Harari D, Gossage J, Dhesi J. Anaemia in the older surgical patient: a review of prevalence, causes, implications and management. J R Soc Med. 2013: 106: 269–277. doi: 10.1177/0141076813479580

4. Mehta S, Goyal LK, Parmar R, Dhayal GL, Jain G. Anaemia in Elderly: A Review. Journal of The Indian Academy of Geriatrics.2018; 14: 74-78)

5. Styszynski A , Mossakowska M , Chudek J et al. Prevalence of anaemia in relation to socio-economic factors in elderly polish population: the results of polsenior study. Physiology Pharmacol.2018;69(1): 75-81.| doi: 10.26402/jpp.2018.1.08

6. WHO, Worldwide Prevalence of Anaemia 1993-2005,WHO Global Database on Anaemia, Geneva, Switzerland, 2008.

7. Price EA, Mehra R, Holmes TH, Schrier SL. Anaemia in older persons: aetiology and Evaluation. Blood Cells Mol Dis.2011;46(2): 159–165

8. Wickramasinghe WAON, Rathnayake RMPM, Jayasinghe HBVS, Jayasinghe, MWCJ. prevalence and aetiology of anaemia in the elderly: a cross-sectional study among attendees of an elderly care unit,1st International Conference on Gerontology and Geriatric Medicine 2019 abstract book1-14.

9. Stauder R, Valent P, Theurl I. Anaemia at older age: aetiologies, clinical implications, and management. Blood. 2018; 131(5):505-514

10. Stauder R, Thein S L. Anaemia in the elderly: clinical implications and new therapeutic concepts. Haematologica.2014; 99(7). doi:10.3324/haematol.2014.109967

11. Gaskell H, Derry S, Moore RA, McQuay HJ. Prevalence of anaemia in older persons: systematic review. BMC Geriatrics. 2008; 8:1 doi:10.1186/1471-2318-8-1

12. Izaks GJ, Westendorp RG, and Knook DL. The definition of anaemia in older persons. JAMA, 1999. 281(18): p. 1714-7.

13. Kikuchi, Five-year survival of older people with anaemia: variation with haemoglobin concentration. J Am Geriatr Soc.2001. 49: 1226-1228.

14. Zakai NA, Katz R, Hirsch C et al.. A prospective study of anaemia status, haemoglobin concentration, and mortality in an elderly cohort: the Cardiovascular Health Study. Arch Intern *Med*. 2005; 165(19): 2214-20.

15. Chaves PHM, Ashar B, GuralnikJM, Fried LP. Looking at the relationship between haemoglobin concentration and prevalent mobility difficulty in older women. Should the criteria currently used to define anaemia in older people be re-evaluated? *J Am Geriatr Soc*.2002. 50(7): 1257-64.

16. Penninx BWJH, Guralnik JM, Onder G et al.Anaemia and decline in physical performance among older persons. Am J Med. 2003. 115(2):104-10

17. Penninx BW, Pahor M, Woodman RC, Guralnik JM. Anaemia in old age is associated with increased mortality and hospitalization. J Gerontol A BiolSci Med Sci. 2006; 61: 474-479

18. Bianchi VE. Anaemia in the Elderly Population. J Hematol. 2014; 3(4):95-106

19. Culleton BF, Manns BJ, Zhang J et al. Impact of anaemia on hospitalization and mortality in older adults. Blood. 2006;107(10):3841-6

20. Corona LP, Duarte OY, Lebrão ML. Prevalence of anaemia and associated factors in older adults: evidence from the SABE Study. Rev SaúdePública. 2014; 48(5):723-731

21. Sharma D, Suri V, Pannu AK et al. Patterns of geriatric anaemia: A hospital-based Observational study in North India. *J Family Med Prim Care*. 2019; 8:976-80

22. Lwanga SK and Lemeshow S. Sample size determination in health studies: a practical manual; World Health Organization 1991

23. Goodnough LT and Schrier SL evaluation and management of anaemia in the elderly, Am J Hematol. 2014 Jan; 89(1): 88–96. doi: 10.1002/ajh.23598

24. Hoffbrand AV,Higgs DR,Keeling DM,Mehta AB; Postgraduate Haematology,Seventh Edition; 419-37; Oxford, UK; John Wiley & Sons, Ltd, 2016.

25. Beghe C, Wilson A, Ershler WB. Prevalence and outcomes of anaemia in geriatrics: a systematic review of the literature. Am J Med. 2004 Apr 5; 116 Suppl 7A:3S-10S. doi: 10.1016/j.amjmed.2003.12.009.

26. Jain V. Pattern of anaemia in elderly patients. Int J Res Med Sci. 2019;7(7):2524-2529

27. Chamba C, Nasser A, Mawalla WF, Masamu U, Budodi Lubuva N, Tebuka E, Magesa P. Anaemia in the Hospitalized Elderly in Tanzania: Prevalence, Severity, and Micronutrient Deficiency Status. Anaemia. 2021 Feb 26; 2021:9523836. doi: 10.1155/2021/9523836. PMID: 33728063; PMCID: PMC7935608.

28. Joosten E, Pelemans W, Hiele M, et al. Prevalence and causes of anaemia in a geriatric hospitalized population. Gerontology.1992. 38(1-2): 111-7.

29. Smith DL. Anaemia in the elderly. *Am Fam Physician*. 2000 Oct 1;62(7):1565-72. PMID: 11037074.

30. Pathania A,Haldar P, Kant S et al. Prevalence of anaemia among elderly persons residing in old age homes in national capital territory, Delhi, India. *Indian Journal of Public Health*.2019;63(4):288-292

31. Yildirim T, Yalcin A, Atmis V, Cengiz OK, Aras S, Varlı M, Atli T. The prevalence of anaemia, iron, vitamin B12, and folic acid deficiencies in community dwelling elderly in Ankara, Turkey. *Arch Gerontol Geriatr.* 2015;60(2):344-8. doi: 10.1016/j.archger.2015.01.001. Epub 2015 Jan 14. PMID: 25616321.

32. Tettamanti M, Lucca U, GandiniF et al. Prevalence, incidence and types of mild anaemia in the elderly: the "Health and Anaemia" population-based study.Haematologica.2010;95, (11): 1849–1856.

33. Hammerman-Rozenberg R, Jacobs JM, Azoulay D, Stessman J. Aspirin prophylaxis and the prevalence of anaemia. Age Ageing. 2006 Sep; 35(5):514-7. doi: 10.1093/ageing/afl066. PMID: 16905794.

34. McNeil JJ, Wolfe R, Woods RL, et.al. Effect of Aspirin on Cardiovascular Events and Bleeding in the Healthy Elderly. N Engl J Med.2018; 379:1509-1518.DOI: 10.1056/NEJMoa1805819

35. Randi ML, Bertozzi I, Santarossa C et al. Prevalence and Causes of Anaemia in Hospitalized Patients: Impact on Diseases Outcome. J Clin Med. 2020;9(4):950.doi:10.3390/jcm9040950

36. Geisel T,Martin J,Schulze B et al. An Etiologic Profile of Anaemia in 405 Geriatric Patients. Anaemia. 2014. doi.org/10.1155/2014/932486

37. Artz AS, Thirman MJ. Unexplained anaemia predominates despite an intensive evaluation in a racially diverse cohort of older adults from a referral anaemia clinic. J Gerontol A BiolSci Med Sci. 2011 Aug; 66(8):925-32. doi: 10.1093/gerona/glr090. Epub 2011 Jun 9. PMID: 21659341.

38. Vitale G, Fatti LM, Prolo S, Girola A, Caraglia M, Marra M, Abbruzzese A, Gerli G, Mari D. Screening for hypothyroidism in older hospitalized patients with anemia: a new insight into an old disease. J Am Geriatr Soc. 2010;58(9):1825-7. doi: 10.1111/j.1532-5415.2010.03040.x. PMID: 20863360.

The inner 'aragalaya' of a medical teacher: a reflective Q and A

Fernando ADA[1]

[1] Faculty of Medicine, University of Colombo

Preamble

Aragalaya is a Sinhala word with multiple meanings. In one set of meanings given in a leading Sinhala- English dictionary, *aragalaya* refers to war, fight, protest, turmoil, struggle, or uprising. In a second set of meanings, *aragalaya* means a huge noise, voice or outcry. In this perspective, I have taken a mix of meanings of both sets to explain the title, my *struggle* in responding to my inner *voice* during the current crisis.

The current acute economic crisis of Sri Lanka started in the aftermath of Easter bombings in April 2019, lowering us from an upper middle-income country to a lower middle-income country. The tourism boom buckled, and there was a reduction in foreign investments. COVID-19 pandemic in 2020 and 2021 led to lockdowns and brought a near halt to the economy, which annihilated the slight recovery we were making. Foreign exchange reserves reached near-depletion. Tax cuts, money creation and the national policy shift towards sole organic farming contributed to the crisis. By the beginning of 2022, the first signs of shortages of fuel, cooking gas, food and medicines emerged. As the shortages steadily worsened, sporadic civilian protests began, mostly in urban localities. The power outages that had started a few months ago were now extending up to 10 hours a day amidst a sweltering pre-monsoonal heat, driving people to the edge of their tolerance. On the night of 31st of March 2022, a group of protestors marched to the suburban residence of the President of Sri Lanka demanding relief. With each passing hour, the peaceful protest gathered momentum and people became increasingly agitated partly from confrontations with police and military. The dawn of 1st April saw several people, including members of the security forces, injured and many more arrested. Members of the Bar Association of Sri Lanka (BASL) pledged their support to the protest by flocking at nearby police station in hundreds, to appear on behalf of the arrested protestors, free of charge. In the next couple of days, the urban middle class youth camped out in Galle Face Green (GFG) and started a 'protest village' that would be 'sleepless'. The main theme was to call for the expulsion of the President. Dozens of professional and academic organisations in the private and public sectors joined the protests on their own volition. An extensive social media campaign was launched by the digitally empowered Generation Z protestors. Anti-government hashtags went viral and trended in several countries like the US, the UK, Germany and Singapore. Simultaneous protests in solidarity were held in several capitals overseas. The portrait of a protesting young mother with her infant sleeping on her shoulder became iconic of the civilian uprising in social media. Attempts to ban social media and declaration of emergency law backfired, as it only intensified the protests, and attracted artists, social activists, professionals and skilled workers form various fields, university students, businessmen, sports personalities and Buddhist, Christian and other clergy to the protest village at GFG in large numbers. Satellite protest villages sprang up in a number of major cities.

Pressure was mounting on the government, and a number of ministers in the current regime, including the prime minister resigned. 9th May 2022 was a fateful day in the GFG protest, when the peaceful protestors were attacked by thugs.

They were allegedly sponsored by a few key members of the regime and had streamed out of the Prime Minister's official residence. The country looked on in shock as more violence erupted in retaliation. Properties belonging to nearly 80 parliamentarians were set on fire almost simultaneously in several parts of the country by unruly mobs. Several lives were lost including that of a sitting MP. Memories of the horrors of Black July 1983 came back to haunt.

A new Prime iMnister was sworn in. However, the opposition declined the President's and the newly appointed Prime Minister's invitation to make a multi-party government. The economic crisis escalated with inflation rates sky-rocketing to more than 50%. The general public and the essential workers began spending their precious working hours in fuel queues, many having to turn back with an empty tank. The competition for fuel created a rift between the general public and the essential service workers, often leading to scuffles in the queues. Talks with donor agencies such as the IMF ended unsuccessfully in the first round, without any agreement for an immediate bailout. The initial fiery protests fizzled out, possibly because the people were now more preoccupied with making ends meet. The collapse in the public transport hampered organising protests and people reaching the protest sites. The transformation of peaceful protests into those that condone violence had a negative impact on peace-loving people who supported it at the outset.

A state of sovereign default was declared for the first time since Independence in 1948. Still there are no signs of solid plans by the government towards a fiscal solution. The opposition has failed to unite for the common good of the country. With the worsening of the economic situation, further larger protests are being planned. This is the state of the country, at the time of writing this reflection.

Questions and answers

Like many of my peers, I have been pondering on my interpretation, and my role in the ongoing civilian protests. Like many of my contemporaries, I have spoken from the beginning, in favour of rising of the masses, and joined many protests as an individual as well as a member of professional organisations. The move by the BASL to appear for the arrested unarmed, non-violent protesters on the 1st of April was a catalyst for many including me to support the protests actively. It was clear that the government's abysmal and irresponsible fiscal management of the state coffers has brought the crisis to catastrophic levels. It was a matter of days before the political and economic crisis turned into a vast humanitarian crisis. For academics and professionals of my level, the BASL initiative provided a much needed validation, to convince us that it was our moral obligation to intervene, at this point.

One of the very first questions I asked myself at the beginning was, what justification I had, to support these youth-led protests. Being mother of three *zoomers*, I could relate to the frustrations of Generation Z and understand the apprehensions of my *Gen Z* students. A popular hashtag of the initial protests "You messed with the wrong generation" sang the message loud and clear. Our passive generation had failed them, and now they had to bear the ramifications. Their education and future employment prospects both here and overseas were fading, the physical comforts and leisure activities they enjoyed were fast disappearing, and their mental health was taking a heavy toll. Therefore, supporting them was the responsible thing to do. Apart from this sanctimonious indication, there were many other serious ones. The country was heading for a shortage of essential medicines. One of the worst brain drain of doctors in Sri Lanka's history had already begun. Many of my present and former students were considering immigration seriously, while those already undergoing postgraduate training in affluent countries had decided not to return. It was devastating to see the comprehensive health services that were so painstakingly developed to a high standard were on the brink of reducing to square one. One example was the field of child psychiatry. Of the handful of specialists, more than half had left or are leaving for greener pastures. Brain drain was

expanding to paraclinical services such as nursing and physiotherapy. All of this, along with the fuel crisis foretold the imminent collapse of health services. The dreams of many young medical professionals who were just beginning to enjoy a high-quality life were being shattered. Thus, as we stepped out to protest, the posters we held in our hands bore our justifications; the posters called for accountability, meritocracy, technocracy, and in the same breath, denounced nepotism, corruption and crony capitalism that had infiltrated all levels of political hierarchy like a disseminated cancer. There were enough reasons to get up and protest as a responsible civilian, let alone a medical teacher.

As the protests continued, a second question loomed. What actually was our role in the protests as medical teachers? The prospects of doing protest marches with our unions and holding placards at the GFG, or helping at the first-aid tent at the protest village were adventurous but seemed superficial and short-lasting. As daunting as it was, it seemed more profitable in the long run to lend our voices to strengthen our weak collective conscience. We were in a privileged position and had the capacity to do so. The local education system, particularly in the state sector, had neither encouraged nor tolerated challenging of the system by the students. As a result, we had been trained to accept things without questioning, and perpetuate the habit of not tolerating difference in opinion. Now, the time was ripe to make use of the opportunity, as there were signs of a sudden moral awakening and a freedom of speech that was not prevalent before. Improving our political and economic literacy at every available opportunity became a necessity, in order to share it in a meaningful manner. Vocalising against racial and religious stigma, lack of transparency and dishonesty had to be acknowledged as essential components of role-modelling for the juniors. It was necessary to look beyond the immediate nuisances that were interfering with our comfortable lifestyles, towards eliminating the root causes such as ethnic division that would bring autocratic and corrupt regimes to power in voter-based democracies like ours. The juniors needed to learn 'real-time' lessons from their seniors, not from imaginary case scenarios they had to role-play in small group discussions.

With time, and particularly in the aftermath of the violence on 9th of May and the resignation of the incumbent Prime Minister, the vibes of the protests changed. What started as an apolitical civilian protest, was dominated by a few vocal groups. Those who disagreed were rejected. Some leading voices in ethnic minorities expressed their disappointment over *aragalaya*'s under-representation of their peoples. The key messages from *aragalaya* started having connotations of the political rhetoric of main leftist parties. The professionals, civilians, artists and entrepreneurs who frequented the protests gradually distanced themselves.

In the context of the changed face of the protests, a few other questions needed answers. How would free-thinking professional colleagues want the aragalaya to evolve? What are their expectations? Are they aligned with my expectations of the aragalaya? What were the younger generation's expectations? These questions were hard to answer. There were a few obvious outcomes one can think of; that it ends following a change in the regime, it is vanquished by the regime or it dies a natural death with time. The outcome nobody wanted was for it to culminate in another 'Arab Spring', a vicious cycle of short-lived, ineffective governments and more protests while the economy goes from bad to worse and never recovers. Even Professor Jayadeva Uyangoda, one of the most seasoned political analysts in the country, could not make predictions. He famously said that he cannot ever expect to teach the aragalaya, but he can only learn from it. None of us were naïve enough to believe that there would be immediate restoration of economic and political stability, even if the protests ended victoriously following a regime change. The expectations consisted of a bigger picture. The initial protests at GFG offered space for expressions of democracy through multiple forms of art, postmodernist intellectual fellowship, and empowerment of civilians with constitutional and legislative literacy. All these were signs of a greater inclusivity and a progressive nation.

This progress needed to continue and flourish.

End notes

The key short-term objective for most of us still remains achieving a parliamentary solution to stabilise the economy, without bloodshed. We keep hoping that the required re-structuring of the government will happen soon, and there will be an acceptable plan for a bailout without delay. We also know, as per the warnings of the national and international economic experts, that salvage is going to take time, and there will be much suffering in between. My students expect that their education will continue uninterrupted, and we hope that somehow, we will be able to provide it. Even for my junior colleagues who still want to remain in the country, job satisfaction is minimal because they cannot practise medicine they learnt due to unavailability of medicines, investigations and adequate staff. We all need to return to at least some degree of normalcy in our domestic and work environments.

Amid all the untold difficulties, my colleagues and students steadily engage in fundraising activities to supply essential medicines to hospitals, and venturing beyond their call of duty, to sustain community kitchens, to arrange scholarships and provide supplies to school-going children to name a few. Some of them derive inspiration from the survivor stories of holocaust, and at a closer range, from the survivor stories of the 30-year civil war. They keep their fighting spirit unbroken against all odds. They keep resisting violation of their rights, but they acknowledge that corruption, deceit and thuggery has permeated through all societal strata, and a mere change of regime is not enough. It is sad that many in the country have had to come down to a lower level in Maslow's hierarchy of needs in such a short time. But a closer look at the protests unearths a collective voice transcending political, class and ethno-religious divide. It is a voice that yearns to seek higher truths and higher moral values, a possible beginning of a societal ascent, back to the higher levels of the pyramid.

This article presents the author's personal opinion and does not reflect those of the organisation.

Home Blood Pressure Monitoring (HBPM): The way forward for Sri Lanka; a review article

T Kumanan[1], M Guruparan[1], Charles JC[1]

[1] Teaching Hospital Jaffna

Abstract

Hypertension is a major preventable cause of cardiovascular and kidney related morbidity and mortality. It affects one third of the Sri Lankan population and is the single leading cause of death annually. Home blood pressure monitoring (HBPM) gained interest compared to office BP measurement (OBPM) after several studies demonstrated its superior prognostic value in predicting cardiovascular risk. White coat uncontrolled hypertension (WUCH) and masked uncontrolled hypertension (MUCH) may be overlooked in office BP measurement. Both of these phenomena are correctly identified in HBPM. Behavioural modification, patient involvement and initiation of antihypertensive medications at the right point are important in the management of hypertension. HBPM allows healthcare providers to make behavioural and pharmacological modification at the crucial point, because of the accuracy in BP measurement. Further it reduces health expenditure in the long run by reducing outpatient clinic visits and preventing adverse cardiovascular and kidney related outcomes. Given the challenges posed by the pandemic, HBPM is a better option in managing hypertension with the help of technology and telehealth. However further studies are needed on HBPM in Sri Lanka to analyse the efficacy in our own context.

Correspondence to:

Charles JC
Medical Officer,
Teaching Hospital Jaffna
Sri Lanka

E-mail:
chrishtheboss@gmail.com

Key words: Home blood pressure monitoring, Office blood pressure, out-of-office blood pressure

Introduction

Hypertension is a major modifiable risk factor in the prevention of cardiac events, stroke and kidney disease (1). It is a public health problem which has been a leading cause of premature death globally (2). It is estimated that as much as 7.6 million deaths occur due to hypertension in a calendar year worldwide (13.5% of total) which is more than that of any other cause (3). Its prevalence has been estimated to be 28.5 % and 31.5% in high and low middle income countries respectively (4). The prevalence of hypertension in Sri Lanka too, shows an increase, and it is estimated to be nearly one third of the adult population (1). According to WHO statistics it was 26.2 % in 2014 (1). . Early accurate diagnosis, initiation of treatment and keeping the blood pressure within optimal targets are mandatory to prevent hypertension mediated target organ damage (HMOD) and improve the outcome (5).

This article is a narrative overview to emphasise the importance of home blood pressure monitoring in Sri Lanka. Articles related to HBPM were screened in EMBASE, SCOPUS, LILACS, PubMed and Google scholar electronic databases using “home based blood pressure monitoring” and “tele monitoring of blood pressure” as key words. Key articles were selectively reappraised for the synthesis of this review article.

Accuracy of measurement and importance of longitudinal monitoring

Accuracy of BP measurement plays a pivotal role in initiating treatment and long term control (6). It depends on various factors including environment, diurnal changes, posture and emotional state of patient, equipment, presence of health care worker and presence of other non-communicable diseases (5). Minimising BP measurement errors through standardised technique would be necessary in the long-term management strategy (7). Though, there are few consensuses reached regarding BP measurement technique by different associations such as American College of Cardiology (ACC), American Heart Association (AHA) and European Society of Cardiology (ESC), they have not been put forth into the practice, because multiple readings are time consuming and there's a lack of awareness regarding measurement accuracy.(8–10)

Blood pressure should be monitored by the patient or healthcare provider throughout the period of treatment to identify uncontrolled hypertension. Regular BP monitoring would help to determine the need for additional antihypertensive medication and assess treatment efficacy. Further, HBPM promotes active involvement of patients in the management which improves compliance (9,11). The monitoring frequency can be decided based on the risk of complications (5,11,12).

There are a few ways in which a BP measurement could be obtained. Making a BP recording at an office or screening setting is considered as office blood pressure measurement (OBPM) (2,10). Measuring BP at a healthcare or home setting other than office is known as out-of-office BP monitoring (OOBP). Ambulatory blood pressure measurement (ABPM) is taken while the patient performs routine daily activities (2,3,11). Home BP Measurement is done using automated devices by a healthcare worker (HCW) or the patient himself (4,7).

White coat uncontrolled hypertension and Masked uncontrolled hypertension

White coat phenomenon is often encountered when blood pressure is measured in the clinic setting(13–15). It is further classified into white coat hypertension (WCH) and white coat effect (WCE) (13–16). A transiently high BP in the clinic setting with a normal OOBP is considered to be a WCE, whereas a persistently high OBP with a normal OOBP is labelled as white coat hypertension (13,14). Although it was considered as a clinically innocent phenomenon until recently, growing evidence suggests that the adverse metabolic and cardiovascular outcomes cumulating to morbidity and mortality are higher in WCH when compared to treated hypertensive individuals(14,15).

Prevalence of WCH varies in different populations in accordance with age, sex and ethnicity (7,16,17). It is not studied yet in the Sri Lankan setting. Of the available data, it is 15 % and 40% in the general and hypertensive population respectively (15). Recent guidelines on hypertension claim that WCH is found in more than 50% of the older population with hypertension (17). Considering the expenditure spent for adverse CV events, there is still an unmet need for research in WCH in Sri Lanka. (7,14,17).

Masked hypertension (MH) is diagnosed when high BP is detected in HBPM or ABPM while having normal OBPM.(13). Further, in treated patients, if they have normal OBPM with increased BP in HBPM or ABPM, it is considered as masked uncontrolled hypertension (MUCH) (13,18). Prevalence of MH ranges from 10-40% in the Caucasian population and it's not yet estimated in our country (13,14). Evidence suggests, MH can be identified in14% and 11% people by ABPM and HBPM respectively (14,15,18). MH increases adverse CV events by 2 and 2.28 times in normotensive and treated hypertensive patients respectively (13). MH leads to high incidence of unfavourable outcomes and HBPM helps in identification of true hypertensive patients unidentified otherwise (19).

ABPM or HBPM; which is better in Sri Lanka?

ABPM is the gold standard in the diagnosis of hypertension (20,21). Even though most of the guidelines recommend using ABPM as a tool to evaluate HMOD and CV outcomes, it is difficult to practise in the Sri Lankan setting for various reasons. Inability to afford ABPM devices in our state health sector is a major limiting factor. The inconvenience experienced by both the patients and healthcare workers when recording BP readings throughout a single day, consuming much time and needing a technician to handle ABPM are the other drawbacks in using ABPM. HBPM could be a better option in screening, diagnosis, long-term follow up and titration of drug therapy in management of hypertension in the Sri Lankan setting compared to ABPM (3,11,22).

Measurement of BP at home

Patients are educated regarding hypertension, adherence to pharmacological management and lifestyle modification, together with the advice on measurement technique. Resting for five minutes before taking a reading is advised (24). Avoidance of tight clothing around the arm is preferred. Smoking, eating, consumption of tea or coffee and exercise should be avoided 30 minutes before the measurement. Supine position is preferable (18,24,25).

If BP measurement is taken in a seated position, the back should be supported with feet on the ground without crossing the legs(24). Alternatively, another family member can measure the BP if the patient is unable to measure. The cuff is placed on the arm with the lower edge of the cuff being kept 2 cm above the elbow joint. Also, the forearm is rested at chest level while the BP measurement is taken (24). Measurements have to be taken from both arms and the higher systolic BP reading is considered. Previously recorded BP readings are compared with new readings (25).

Indications and Advantages of HBPM

The advantages of HBPM are that it identifies white coat hypertension, avoids white coat effect and unusual variations in between measurements and also helps in diagnosing masked hypertension (21,26,27). It is used to assess the treatment efficacy (28). Doses of the medications can be titrated precisely to optimise long term control. It improves compliance, patient awareness and prognosis (20,22). It is a relative indication for screening in people with BP in prehypertension range. HBPM can also be used in certain groups of patients who require stringent control such as progressive kidney disease and preeclampsia (29,30). As the incidence of resistant hypertension (RH) is also on the rise for several reasons, HBPM plays a crucial role in precise monitoring of BP (31).

HBPM has been recommended in several hypertension guidelines for reducing cardiovascular morbidity and mortality over OBPM (23,29). It has a significant impact on achieving the desired BP targets. HBPM also has better correlation with identifying LVH early (14,32). In summary, deriving an average BP value from multiple readings helps to avoid errors and identify WCE, WCH and MH (14,18). It also helps to improve the long-term monitoring of hypertension and patient related factors such as compliance, convenience, and economic benefits (33,34).

Scope of HBPM in the pandemic

Since the emergence of COVID 19 infection, adverse cardiovascular thrombotic events are on the rise, mostly due to active or post COVID complications as evidenced by many studies. (26). Presence of multiple cardiovascular risk factors in addition to hypertension increases the risk for adverse cardiac outcomes (16,35). Thus, monitoring of blood pressure is important in post COVID patients with hypertension and multiple comorbidities (8). Telemonitoring, fine adjustments in management, reduction in clinic visits and maintenance of self-health records by patients themselves are all made possible through HBPM (34).

Limitations and timely intervention

Measuring the blood pressure using an automated device is a matter of concern compared to the manual measurement as machine related errors

and interpersonal technique errors can occur (19). But, multiple measurements with an average value reduces the risk of inaccurate measurement (35). Inability to employ trained staff to supervise the measuring technique is a limitation of HBPM (11). Further, compliance may be affected by high or normal readings. Few normal readings may make them skip medications and higher readings may cause anxiety. Explaining to patients beforehand will help to overcome these problems. The main disadvantage of conventional HBPM is the high cost of purchasing and maintaining the equipment (replacement of batteries).

Patients with uncontrolled hypertension need timely intervention (13,14). Together with behavioural modifications, antihypertensive medications need to be started or titrated (36). When patients maintain a self-health registry regarding their blood pressure, they can approach health providers without a delay when an alarming reading is noted (37). This indicates active participation of the patient in their management and allows health providers to identify people at high risk for adverse cardiovascular outcomes (37). Further, longitudinal monitoring of BP reduces the health expenditure that is spent for adverse coronary events, stroke and chronic renal disease (29,33,36). Research evidence regarding cost effectiveness of HBPM is scarce. Therefore, further studies are needed to assess the long-term effectiveness of HBPM.

Table 1 - important Studies in Home Blood Pressure Monitoring

Author	Year	Type	Number of participants	Outcomes and Conclusion
McManus et al (4)	2011-2013	RCT	n=450	Among patients with hypertension at high risk of cardiovascular disease, self-monitoring with self-titration of antihypertensive medication compared to usual methods, resulted in lower SBPs.
Margolis et al (33)	2013	RCT	n=450	HBPM, telemonitoring and pharmacist case management achieved better than usual clinic care with intervention.
Bray et al (2010) (40)	2010	Meta-analysis	n=6038	Self-monitoring of BP reduces BP by small but significant amounts
Sega et al (2003-2004) (41)	2003-2004	Prospective cohort	n=2051	Cardiovascular mortality is increased in elevation in HBPM and ABPM than OBP
Fagard et al (1990-2003) (22)	1990-2003	Prospective cohort	n=391	Prognostic value of HBP is better than that of OBP in older patients in primary care.
Tsunoda et al (1993-1998) (42)	1993-1998	Prospective cohort	n=209	HBP was more effective than Clinic BP (CBP) as a predictor of changes in LVH in hypertensive patients who are on treatment.

RCT– Randomised controlled trial, **HBP** – Home based blood pressure, **OBP** – Office blood pressure, **CBP** – Clinic BP, **LVH** – Left ventricular hypertrophy

Studies regarding HBPM

Ward et al conducted a systematic review and meta-analysis on home based blood pressure (HBP) in relation to all causes of CV outcomes in 2012. They have reviewed 8 prospective studies (n = 17698) for all causes of mortality and concluded that HBP remained a significant predictor of CV mortality and an important prognostic variable over office blood pressure (OBP) (38). A study conducted by Niiranen et al concluded that population based, outcome driven thresholds for HBP are slightly lower than OBP proposed in current hypertension guidelines (39).

The study conducted by Stergiou et al on the need for HBP on MH and WCH in patients suspected and treated for hypertension concluded that HBP had prognostic significance. (20)

Conclusion

HBPM is a feasible, novel and cost-effective way of assessing BP control. Indications for HBPM are WCH, MH and monitoring of resistant hypertension. . It has a prognostic superiority over clinic-based blood pressure measurement in predicting adverse CV endpoints and HMOD and shows a better correlation with LVH.

Further, longitudinal monitoring in people with WCH and MH yields better outcomes The proactive role played by the patient in HBPM and self maintenance of health records optimises management of hypertension. Considering multiple factors such as work overload at clinics, limited access to new technology that contribute to suboptimal management of hypertension at the state hospital setup in Sri Lanka, HBPM appears to be an effective way forward.

References

1. Katulanda P, Ranasinghe P, Jayawardena R, et al. The prevalence, predictors and associations of hypertension in Sri Lanka: a cross-sectional population based national survey. Clin Exp Hypertens. 2014 Nov;36(7):484–91.

2. Grezzana GB, Stein AT, Pellanda LC et al. 24-Hour Ambulatory Blood Pressure Monitoring Predicts Outcomes of Hypertensive Patients in Primary Care: A Cohort Study. Int J Cardiovasc Sci [Internet]. 2017 [cited 2022 Jun 5]; Available from: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S2359-56472017000400285

3. Setia S, Subramaniam K, Teo BW, et al. Ambulatory and home blood pressure monitoring: gaps between clinical guidelines and clinical practice in Singapore. Int J Gen Med. 2017 Jul;Volume 10:189–97.

4. McManus RJ, Little P, Stuart B, et al. Home and Online Management and Evaluation of Blood Pressure (HOME BP) using a digital intervention in poorly controlled hypertension: randomised controlled trial. BMJ. 2021 Jan 19;m4858.

5. Persell SD, Peprah YA, Lipiszko D, et al. Effect of Home Blood Pressure Monitoring via a Smartphone Hypertension Coaching Application or Tracking Application on Adults With Uncontrolled Hypertension: A Randomized Clinical Trial. JAMA Netw Open. 2020 Mar 2;3(3):e200255.

6. Le T, Ellington F, Lee TY, et al. Continuous Non-Invasive Blood Pressure Monitoring: A Methodological Review on Measurement Techniques. IEEE Access. 2020;8:212478–98.

7. Kario K. Home Blood Pressure Monitoring: Current Status and New Developments. Am J Hypertens. 2021 Aug 9;34(8):783–94.

8. Anbarasan T, Rogers A, Rorie DA, et al. Factors influencing home blood pressure monitor ownership in a large clinical trial. J Hum Hypertens. 2022 Mar;36(3):325–32.

9. Parati G, Stergiou GS, Asmar R, et al. European Society of Hypertension guidelines for blood pressure monitoring at home: a summary report of the Second International Consensus Conference on Home Blood Pressure Monitoring. J Hypertens. 2008 Aug;26(8):1505–26.

10. Ogedegbe G, Schoenthaler A. A Systematic Review of the Effects of Home Blood Pressure Monitoring on Medication Adherence. J Clin Hypertens. 2006 Mar;8(3):174–80.

11. Grossman E. Ambulatory Blood Pressure Monitoring in the Diagnosis and Management of Hypertension. Diabetes Care. 2013 Aug 1;36(Supplement_2):S307–11.

12. Zhu H, Zheng H, Liu X, et al. Clinical applications for out-of-office blood pressure monitoring. Ther Adv Chronic Dis. 2020 Jan;11:204062232090166.

13. Barroso WKS, Feitosa ADM, Barbosa ECD, et al. Prevalence of Masked and White-Coat Hypertension in Pre-Hypertensive and Stage 1 Hypertensive patients with the use of TeleMRPA. Arq Bras Cardiol [Internet]. 2019 [cited 2022 Jun 5]; Available from: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0066-782X2019001100970

14. Celis H, Fagard RH. White-coat hypertension: a clinical review. Eur J Intern Med. 2004 Oct;15(6):348–57.

15. Cohen JB, Lotito MJ, Trivedi UK, et al. Cardiovascular Events and Mortality in White Coat Hypertension: A Systematic Review and Meta-analysis. Ann Intern Med. 2019 Jun 18;170(12):853.

16. Asayama K, Fujiwara T, Hoshide et al. Nocturnal blood pressure measured by home devices: evidence and perspective for clinical application. J Hypertens. 2019 May;37(5):905–16.

17. Okorie M, Ali K, Bremner S, et al. Treatment of White Coat HYpertension in the Very Elderly Trial (HYVET 2) - Feasibility of a Randomized Controlled Trial (Study Protocol): Artery Res. 2019;25(1–2):19.

18. Kario K, Thijs L, Staessen JA et al. Blood Pressure Measurement and Treatment Decisions: Masked and White-Coat Hypertension. Circ Res. 2019 Mar 29;124(7):990–1008.

19. Karnjanapiboonwong A, Anothaisintawee T, Chaikledkaew U, et al. Diagnostic performance of clinic and home blood pressure measurements compared with ambulatory blood pressure: a systematic review and meta-analysis. BMC Cardiovasc Disord. 2020 Dec;20(1):491.

20. Stergiou GS, Kario K, Kollias A, et al. Home blood pressure monitoring in the 21st century. J Clin Hypertens. 2018 Jul;20(7):1116–21.

21. Wang J, Bunyi ML, Chia YC, et al. Insights on home blood pressure monitoring in Asia: Expert perspectives from 10 countries/regions. J Clin Hypertens. 2021 Jan;23(1):3–11.

22. Fagard RH, Van Den Broeke C, De Cort P et al. Prognostic significance of blood pressure measured in the office, at home and during ambulatory monitoring in older patients in general practice. J Hum Hypertens. 2005 Oct 1;19(10):801–7.

23. Shetty S. Home Based Blood Pressure Monitoring in Indian Setting: A Consensus Document. J Clin Diagn Res [Internet]. 2018 [cited 2022 Jun 5]; Available from: http://jcdr.net/article_fulltext.asp?issn=0973-709x&year=2018&volume=12&issue=1&page=OA01&issn=0973-709x&id=11048

24. Flack JM, Adekola B. Blood pressure and the new ACC/AHA hypertension guidelines. Trends Cardiovasc Med. 2020 Apr;30(3):160–4.

25. Unger T, Borghi C, Charchar F, et al. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. :24.

26. Silva Andrade B, Siqueira S, de Assis Soares WR, et al. Long-COVID and Post-COVID Health Complications: An Up-to-Date Review on Clinical Conditions and Their Possible Molecular Mechanisms. Viruses. 2021 Apr 18;13(4):700.

27. Shimbo D, Artinian NT, Basile JN, et al. Self-Measured Blood Pressure Monitoring at Home: A Joint Policy Statement From the American Heart Association and American Medical Association. Circulation [Internet]. 2020 Jul 28 [cited 2022 Jun 5];142(4). Available from: https://www.ahajournals.org/doi/10.1161/CIR.0000000000000803

28. Villar R, Sánchez RA, Boggia J, et al. Recommendations for home blood pressure monitoring in Latin American countries: A Latin American Society of Hypertension position paper. J Clin Hypertens. 2020 Apr;22(4):544–54.

29. McGrath BP. Home monitoring of blood pressure. 2015;38(1):4.

30. Recommended Standards for Assessing Blood Pressure in Human Research Where Blood Pressure or Hypertension Is a Major Focus. Kidney Int Rep. 2017 Jul;2(4):733–8.

31. Nagai M, Dote K. Treatment-resistant hypertension assessed by home blood pressure monitoring: a new target for intervention? Hypertens Res. 2022 Jan;45(1):167–9.

32. Abdullah A, Othman S. The influence of self-owned home blood pressure monitoring (HBPM) on primary care patients with hypertension: A qualitative study. BMC Fam Pract. 2011 Dec;12(1):143.

33. Margolis KL, Asche SE, Bergdall AR, et al. Effect of Home Blood Pressure Telemonitoring and Pharmacist Management on Blood Pressure Control: A Cluster Randomized Clinical Trial. JAMA. 2013 Jul 3;310(1):46.

34. Lee CJ, Park S. The Role of Home Blood Pressure Telemonitoring for Blood Pressure Control. Pulse. 2016;4(2–3):78–84.

35. Muntner P, Shimbo D, Carey RM, et al. Measurement of Blood Pressure in Humans: A Scientific Statement From the American Heart Association. Hypertension . 2019 May ;73(5). Available from: https://www.ahajournals.org/doi/10.1161/HYP.0000000000000087

36. Saito I, Kario K, Kushiro T, et al. Home blood pressure and cardiovascular outcomes in very elderly patients receiving antihypertensive drug therapy: a subgroup analysis of Home blood pressure measurement with Olmesartan Naive patients to Establish Standard Target blood pressure (HONEST) study. Clin Exp Hypertens. 2018 Jul 4;40(5):407–13.

37. Rodriguez S, Hwang K, Wang J et al.. Connecting Home-Based Self-Monitoring of Blood Pressure Data Into Electronic Health Records for Hypertension Care: A Qualitative Inquiry With Primary Care Providers. JMIR Form Res. 2019 May 23;3(2):e10388.

38. Ward AM, Takahashi O, Stevens R, et al. Home measurement of blood pressure and cardiovascular disease: systematic review and meta-analysis of prospective studies. J Hypertens. 2012 Mar;30(3):449–56.

39. Niiranen TJ, Asayama K, Thijs L, et al. International Database of Home blood pressure in relation to Cardiovascular

Outcome Investigators. Outcome-driven thresholds for home blood pressure measurement: international database of home blood pressure in relation to cardiovascular outcome. Hypertension. 2013 Jan;61(1):27-34. doi: 10.1161/HYPERTENSIONAHA.111.00100.

40. Bray EP, Holder R, Mant J, et al. Does self-monitoring reduce blood pressure? Meta-analysis with meta-regression of randomized controlled trials. Ann Med. 2010 Jul;42(5):371–86.

41. Sega R, Facchetti R, Bombelli M, et al. Prognostic Value of Ambulatory and Home Blood Pressures Compared With Office Blood Pressure in the General Population: Follow-Up Results From the Pressioni Arteriose Monitorate e Loro Associazioni (PAMELA) Study. Circulation. 2005 Apr 12;111(14):1777–83.

42. Tsunoda S, Kawano Y, Horio T, et al. Relationship between Home Blood Pressure and Longitudinal Changes in Target Organ Damage in Treated Hypertensive Patients. Hypertens Res. 2002;25(2):167–73.

ajim.slcim@gmail.com

Strategies to overcome barriers to hypertension control in a resource-poor setting

Mohideen MR[1]

[1]International Medical University, Malaysia

Introduction

High blood pressure is extraordinarily common. Approximately one-third of the world's adult population suffer from arterial hypertension. High blood pressure is the world's leading cause of mortality with nearly 10.7 million deaths per year worldwide (1). Although treatment for hypertension is safe, effective, and low-cost, only 15% of people with hypertension worldwide achieve target blood pressure levels. (2). The direct medical costs associated with hypertension treatment globally are estimated to be USD 370 billion a year. Health care savings from effective management of blood pressure is projected to be roughly $100 billion per year (3).

Evidence-based interventions such as dietary salt reduction and antihypertensive medications are well known strategies for prevention and management of hypertension. Implementation of these interventions in low-resource settings is suboptimal (4).

Poor integration of healthcare systems is a major obstacle for optimal blood pressure control (5). Shortage of skilled health professionals, unaffordability and lack of antihypertensive medications are strongly associated with inadequate blood pressure control in most developing countries (6,7). Scarcity of community engagement, low health literacy and poor understanding about the disease are other contributory factors.

Significant barriers to ensure continuity of care in developing countries include fragmented healthcare information systems, inadequate health financing mechanisms and deficiency of operational support (8).

Novel innovative strategies to overcome these challenges and to optimise hypertension control are desperately needed in lower and middle income countries.

Screening and diagnosis

Since screening protocols for hypertension are not standardised in many countries, an opportunity to make an early diagnosis is missed causing diagnostic inertia. Inaccurate blood pressure measurement compounds the problem further. Without accurate diagnosis, a patient will not receive appropriate treatment and management.

Efforts to decrease the global burden of cardiovascular disease must include widespread hypertension screening programmes to facilitate early diagnosis and treatment of hypertension. Proper blood pressure measurement, using accurate devices, is essential to avoid over or under diagnosis.

Accessing an accurate blood pressure measuring device is a challenge faced by health professionals in low-resource settings. Mercury sphygmomanometer, when used by trained observers, has long been considered the gold standard for non-invasive blood pressure measurement (9). However, with the phasing out of mercury-column sphygmomanometers in many countries, clinically validated automated digital monitors are required for effective hypertension management. Automated devices require less training for its use but attention to integrity of tubing and cuff is essential to maintain accuracy

over time (10). Quality of hypertension screening and diagnosis in these settings may also be hindered by lack of skilled training and difficulties in obtaining multiple blood pressure measurements when required for clinical diagnosis (11).

Home blood pressure monitoring has a well-established primary role in management of hypertension and current guidelines recommend its wide use in clinical practice. The cost of the device is the biggest barrier for home blood pressure monitoring in most low-resource settings (12).

In busy hospital clinics either rushing through the blood pressure measurements or prescribing medications without measurements aggravate the problem. Even though different cuff sizes are recommended to be used in individuals with different arm circumferences, one standard size is used for all individuals in low-resource settings. Training a range of healthcare workers to measure the blood pressure accurately using automated monitors is suggested to overcome these practical problems.

Treatment and adherence

Many patients fail to reach blood pressure goals despite the improvements seen in overall management of hypertension. A continuing challenge for these patients is the day-to-day burden of managing their chronic disease, which entails complex medication regimens, lifestyle behavioural changes.

Most guidelines advise to diagnose hypertension and initiate treatment if the systolic blood pressure is more than 160 mmHg and/or the diastolic more than 100 mmHg on several occasions (two or more readings) on a single day, or more than 140/90 mmHg on two different days. Still the borderline values leave room for confusion (13).

When blood pressure readings are in the range of 140-159/90-99 mmHg the recommendation to assess after lifestyle changes for three months before starting treatment runs the risk of losing the patient for follow-up.

Guidelines developed for high-income countries are not suited for resource-poor settings. Hence, the low-income countries should have their own guidelines. The Ministry of Health in Sri Lanka has taken steps to develop such guidelines with more practical and simpler drug and dose specific protocols to be used in different care levels.

Treatment adherence is the cornerstone of effective management of hypertension. Individuals with high adherence to antihypertensive medications are 45% more likely to achieve blood pressure control than those with medium or low adherence (14). Therefore, efforts to identify and rectify the underlying reasons are vital and rewarding.

Simplification of the medication regimen stands out as one of the most effective ways to improve adherence. Simplifying the dosing, use of pill boxes and reminders for prescriptions are useful to maintain medication regularity. The use of a fixed-dose combination of antihypertensive drugs reduces the pill burden while improving adherence and clinical outcomes. Majority of patients (>60%) with hypertension require two or more drugs to achieve optimal blood pressure control but only less than one-third of those treated receive such therapy (15).

In Sri Lanka, a randomised controlled trial showed that low-dose triple combination of anti-hypertensive therapy with an angiotensin receptor blocker, calcium channel blocker, and thiazide diuretic led to a significantly increased proportion of patients achieving their target blood pressure compared to usual care at six months (16). This randomised controlled trial provides evidence to support a polypill approach as initial treatment for hypertension, particularly in low-resource settings. When combined, drugs work synergistically, and blood pressure control improves at lower dosages (17). As fixed dose combinations are available, dose changes of individual drugs are not possible. The inclusion of fixed-dose combinations in the WHO essential medicines list, leads to better

availability and affordability of medications.

Implementation strategies

Several innovative and pragmatic strategies have been tried out in the quest to improve hypertension control with varying success.

Community-based interventions such as measuring blood pressure at home and community centres are a critical pillar in prevention and control of hypertension (5). In addition, these programmes could provide a platform to raise awareness of hypertension and increase community participation in healthcare services. One such programme adopted in South Asian countries including Sri Lanka has demonstrated the feasibility of using community health workers (CHWs) for home-based screening, monitoring, health education and referral (18). Checklists are available to guide, coordinate and triage.

A patient-centred model improves the quality of care provided for individuals with complex diseases such as hypertension. It involves a patient-health provider partnership that is of mutual benefit. It empowers health literacy enabling the patient to make personalised decisions about their health (19).

Patient involvement in decision-making is one of the core principles of management of chronic diseases. During the clinical encounter, the patient's preferred level of involvement should be gauged, and therapeutic choices be explored aiming at better adherence to therapy (20). The pivotal role played by effective communication, consistency, and patient satisfaction should not be underestimated in hypertension management.

Engaging trained nurses, pharmacists and CHWs in a limited role of routine hypertension management under the supervision of primary care physicians, supported by computer-based treatment algorithms is a strategy that needs trialling in the local contexts (21). Non-physician healthcare workers are generally not authorised to prescribe, modify, or refill medications in many countries. Appropriate training and regulatory approval can be used to address shortfalls in the availability of health professionals.

In several countries including Sri Lanka, a high proportion of patients seek treatment from the private sector. Although the quality of service varies, it is a convenient and popular access point for care for some patients. The necessary training should be provided to stakeholders in the private sector to improve hypertension management.

The reduction in the mean population salt intake to reduce the prevalence of elevated blood pressure is one of the population level strategies of the WHO Global Action Plan for Control of Non-Communicable Diseases. However, implementation of such policies and interventions are challenging. Introducing salt substitution and increasing taxation as a policy appears to be the most effective among these (22, 23).

Emerging evidence suggests that barriers to hypertension control can be overcome at a personal and population level through effective policies and interventions. However, further research is needed to explore how to implement these to adapt to local context and needs.

References

1 .GBD 2016 Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017;390:1345-1422.

2. Mills KT, Bundy JD, Kelly TN, et al. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation. 2016;134:441-45.

3. Gaziano TA, Bitton A, Anand S, Weinstein MC; International Society of Hypertension. The global cost of nonoptimal blood pressure. J Hypertens. 2009;27(7):1472-1477.

4. Chow CK, Teo KK, Rangarajan S, et al. Prevalence, awareness, treatment, and control of hypertension in rural and urban communities in high-, middle-, and low-income countries. JAMA.2013;310(9):959-968.

5. Mercer T, Nulu S, Vedanthan R. Innovative Implementation Strategies for Hypertension Control in Low- and Middle-Income Countries: a Narrative Review. Curr Hypertens Rep. 2020;22(5):39. doi: 10.1007/s11906-020-01045-1.

6. Khatib R, McKee M, Shannon H, et al. Availability and affordability of cardiovascular disease medicines and their effect on use in high-income, middle-income, and low-income countries: an analysis of the PURE study data. Lancet. 2016;387(10013):61–9.

7. Anyangwe SC, Mtonga C. Inequities in the global health workforce: the greatest impediment to health in sub-Saharan Africa. Int J Environ Res Public Health. 2007;4(2):93–100.

8. Frieden, T. R., Varghese, C. V., Kishore, S. P., et al. (2019). Scaling up effective treatment of hypertension-A pathfinder for universal health coverage. Journal of clinical hypertension (Greenwich, Conn.)2019;21(10):1442–1449.

9. Grim, C. E., & Grim, C. M. (2016). Auscultatory BP: Still the gold standard. Journal of the American Society of Hypertension, 10, 191–193.

10. Brady TM, Padwal R Blakeman DE, et al. Blood pressure measurement device selection in low-resource settings: Challenges, compromises, and routes to progress. J Clin Hypertens (Greenwich). 2020;22(5):792-801.

11. Rakotz MK, Townsend RR, Yang J, et al. Medical students and measuring blood pressure: results from the American Medical Association Blood Pressure Check Challenge. J Clin Hypertens. 2017;19(6):614-619

12. Buranakitjaroen P, Wanthong S, Sukonthasarn A. Asian management of hypertension: Current status, home blood pressure, and specific concerns in Thailand. J Clin Hypertens (Greenwich). 2020;22(3):515-518. doi:10.1111/jch.13800

13. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH guidelines for the management of arterial hypertension: the Task Force for the Management of Arterial Hypertension of the European Society of Cardiology and the European Society of Hypertension. J Hypertens 2018;36:1953–2041.

14. Burnier M, Egan BM. Adherence in hypertension. Circ Res. 2019;124(7):1124–40.

15. Salam A, Huffman MD, Kanukula R, et al. Two-drug fixed-dose combinations of blood pressure lowering drugs as WHO essential medicines: An overview of efficacy, safety, and cost. J Clin Hypertens. 2020;22:1769–1779.

16. Webster R, Salam A, de Silva HA, et al. Fixed low-dose triple combination antihypertensive medication vs usual care for blood pressure control in patients with mild to moderate hypertension in Sri Lanka: a randomized clinical trial. JAMA. 2018;320(6):566–79.

17. Salam A, Kanukula R, Atkins E, et al. Efficacy and safety of dual combination therapy of blood pressure-lowering drugs as initial treatment for hypertension: a systematic review and meta-analysis of randomized controlled trials. J Hypertens. 2019;37(9):1768-1774.

17. Salam A, Kanukula R, Atkins E, et al. Efficacy and safety of dual combination therapy of blood pressure-lowering drugs as initial treatment for hypertension: a systematic review and meta-analysis of randomized controlled trials. J Hypertens. 2019;37(9):1768-1774.

18. Jafar TH, Gandhi M, de Silva HA, et al. A community-based intervention for managing hypertension in Rural South Asia. N Engl J Med. 2020;382(8):717–26.

19. Jeemon P, Séverin T, Amodeo C, et al. World Heart Federation Roadmap for Hypertension - A 2021 Update. Glob Heart. 2021;16(1):63. Published 2021 Sep 10. doi:10.5334/gh.1066

20. Fang A, Abdelgadir D, Gopalan A, et al. Engaging patients in population-based chronic disease management: A qualitative study of barriers and intervention opportunities. Patient Educ Couns. 2022;105(1):182-189.

21. Schwalm JD, McCready T, Lopez-Jaramillo P, et al. A community-based comprehensive intervention to reduce cardiovascular risk in hypertension (HOPE 4): a cluster-randomised controlled trial. Lancet. 2019;394(10205):1231-1242.

22. Bernabe-Ortiz A, Sal Y Rosas VG, Ponce-Lucero V, et al. Effect of salt substitution on community-wide blood pressure and hypertension incidence. Nat Med. 2020;26(3):374-378.

23. Schorling E, Niebuhr D, Kroke A. Cost-effectiveness of salt reduction to prevent hypertension and CVD: a systematic review. Public Health Nutr. 2017;20(11):1993–2003.

ajim.slcim@gmail.com

Doctor as an activist in the current crisis

Karunatilake H[1]

[1]National Hospital Sri Lanka

Needless to say, we live in difficult times. Uncertainties at every front. The country is virtually at a standstill with a struggling economy pronounced bankrupt by authorities. The scarcity of fuel grinding everything else to a halt. Schools, universities closed and government institutions barely functioning with citizens finding it extremely hard to make ends meet. This has resulted from colossal prolonged mishandling of the economy by the authorities and equally massive unprecedented scale of corruption leading to empty coffers.

The economic decline has affected the health system gravely. Lack of essential drugs has made healthcare provision of health institutions challenging. Routine surgical operations have been cancelled and some critical emergencies are being managed suboptimally to counter the lack of best options.

We see protesters occupying street corners and almost daily silent vigils, very vocal street side demonstrations, meetings, processions and these at times having altercations with armed forces and an occasional politician. This spontaneous citizen movement has eventually evolved into a significant political force. These non-violent people uprisings are not rare in recent times. People's non-violent defiance has brought down non-democratic governments and dictatorships world over. Ultimate aim of the non-violent movement will be a change in the power structure between the rulers and people who are ruled.

Foucault when describing power says “Do not regard power as a phenomenon of mass and homogeneous domination—the domination only one individual over others, of one group over others, or of one class over others; keep it clearly in mind that power is not something that is divided between those who have it and hold it exclusively, and those who do not have it and are subject to it. Power functions only when it is part of a chain. It is never only in the hands of some. They are in a position to both submit to and exercise this power”.(1)

According to Gene Sharp who has studied dictatorships, resistance movements, revolutions, governmental systems, and especially nonviolent struggle: “Dictators require the assistance of the people they rule, without which they cannot secure and maintain the sources of political power.” (2)

People allow themselves to be ruled with the belief that the regime is legitimate, and that they have a moral duty to obey it. Rulers make sure that sanctions or punishments are threatened or applied, against the disobedient and noncooperative to ensure the submission and cooperation needed. Not only that, subjects supply the regime with human resources, skills and knowledge needed to perform specific actions (3).

Gene Sharp says “all governments can rule only as long as they receive replenishment of the needed sources of their power from the cooperation, submission, and obedience of the population and the institutions of the society.” (2) Once the people start non-consenting, disobedience, refusal and non-cooperation rulers start losing power, and with that the resources needed to maintain it. That is when the power changes hands according to Gene Sharp. This is what Foucault implies by “power functions only when it is part of a chain”.

This is the basis of non-violent struggle used to topple dictatorships world over in the recent past, proven to be the most effective way in which dictatorships could be successfully collapsed with minimum loss and suffering to citizens.

Since 1980 dictatorships have collapsed before the predominantly nonviolent defiance of people in Estonia, Latvia, Lithuania, Poland, East Germany, Czechoslovakia, Slovenia, Madagascar, Mali, Bolivia, and the Philippines. Nonviolent resistance has furthered the movement toward democratisation in Nepal, Zambia, South Korea, Chile, Argentina, Haiti, Brazil, Uruguay, Malawi, Thailand, Bulgaria, Hungary, Nigeria.(2)

According to Sharp "negotiations are not a realistic way to remove a strong dictatorship in the absence of a powerful democratic opposition". When the issues at stake are fundamental, affecting human freedom, future development of the society and a threat to democracy, negotiations do not provide an effective way of reaching a mutually satisfactory solution.(2)

Nonviolent struggle is a much more complex and varied means of struggle than violence (3). Instead, the struggle is fought by psychological, social, economic, and political weapons applied by the population and the institutions of the society (3). These have been known under various names of protests, strikes, noncooperation, boycotts, occupation, silent vigils and people power including "satyagraha" and "aragalaya".

Medical profession cannot be isolated from the events that occur around them. What is the role of a medical professional in this demanding time?

Doctor as a political activist or physician advocacy in politics, is not a new concept. In the history of modern medicine, physicians have been political advocates. German physician Rudolph Virchow, known by various medical terms named after him, including Virchow's Triad, has served in political office as a civic reformer. Noting the similarities between medicine and politics, he said: "Medicine is a social science, and politics is nothing else but medicine on a large scale. The physicians are the natural attorneys of the poor, and social problems fall to a large extent within their jurisdiction" (4, 6).

More recently, Dr. Herbert Abrams, a radiologist who won the Nobel Peace Prize for his work with The International Physicians for the Prevention of Nuclear War, termed physician activism "the fourth dimension of biomedicine", where patient care, research, and teaching are the first three dimensions (5, 6)

Doctors have been reluctant participants of social political activities. We have seen our fair share of doctors in politics and trade unionists actively playing the role of "political activist". However what stemmed from their actions is nothing but empty rhetoric. Some trade unionists' deviations from their role from health advocacy into non-health themes have led to and precipitated the current crisis.

COVID pandemic saw an upsurge of social activities by doctors and medical associations as groups which were more obligatory rather than voluntary in terms of providing guidance and leadership in prevention and control of spread of the pandemic. Ably led Sri Lanka Medical Association, Ceylon College of Physicians, Sri Lanka College of Internal Medicine and intercollegiate committees were involved in the advocacy in many areas related to pandemic control. These advocacy activities are hardly considered political. However the measures and decisions taken based on knowledge provided by medical specialists had far reaching political effects controlling human life. According to Foucault, this is biopolitics "new knowledge exerts a positive influence on life, that endeavours to administer, optimise, and multiply it, subjecting it to precise controls and comprehensive regulations" (1). In that sense we have been political activists inadvertently.

An "activist doctor" is supposed to use his professional standing and his privilege to leverage for social change. Activism entails organising demonstrations, convening meetings with stakeholders, and being a vocal supporter for the issue at hand in media and being in dialogue with political leaders. While engaged in political activism it is important that physicians maintain medical neutrality, especially in situations of conflict.

There are many reasons why doctors are

disinclined participants in social-political activism. First, physicians may view themselves as apolitical and intervening on social and political determinants apart from healthcare as outside their domain of influence. Most unwillingly participate with the belief that activism is beyond the scope of medical practice. Secondly physicians' resistance to activism may arise from ideological differences. Finally, health professionals might feel deterred from practising activism because they do not think that they have the time or the expertise to do so (7).

Being in the medical profession bound by finely calibrated work ethic we cannot acquiesce to refusal, non-consenting and disobedience while providing health care during a protest or a resistance action. But the social standing a doctor has in the society at large and the moral obligation of this noble profession call out for the doctor to be an active participant at a time of crisis. This is more so when the issues are fundamental and struggle is for freedom and social justice. Especially in a trying time like ours. We cannot be passive onlookers hiding in our own academic hubris.

Once a wise man said "we don't choose the times we live in. The only choice we have is how we respond to the times we live in."

References

1 .Foucault, M. 'Society Must be Defended': Lectures at the Collège de France, 1975–1976. New York: Picador. 2003.

2. Sharp G.'From dictatorship to democracy: a conceptual framework for liberation' Albert Einstein Institution. 2010.

3. Sharp G. 'How non-violent struggle work' Albert Einstein Institution. 2013.

4. Virchow RLK. *Collected essays on public health and epidemiology*. Vol 1. Rather LJ, ed. Sagamore Beach, MA: Science History Publications; 1985: 217.

5. Abrams H. Fourth dimension of biomedicine. *Stanford University Dean's Newsletter*. June 18, 2007.

6. Huddle TS, Maletz KL, Physician Involvement with Politics—Obligation or Avocation? AMA Journal of Ethics 2011;13(11): 757-764.

7. Pallok N, Ansell DA, Should clinicians be activists? AMA Journal of ethics 2022;24(4):E254-60

Prepared by:

Dr Geehan Shanaka Fernando

Consultant Dermatologist (Acting)
Base Hospital Panadura

Dr Thushara Matthias

Consultant Physician and Senior Lecturer,
Faculty of Medical Sciences, University of Sri Jayewardenepura

(1) A 59-year-old man presents with proximal muscle weakness and is found to have the following appearance in his nails. (See A)

What is the most likely diagnosis?

(A) Polymyositis
(B) Dermatomyositis
(C) Systemic sclerosis
(D) Systemic lupus erythematosus

(2) A 60-year old man presents with a changing appearance of face. He works as a gardener. (See B)

What is the diagnosis?

(A) Leprosy
(B) Chronic actinic dermatitis
(C) Pellagra
(D) Jessner-kanof syndrome

(3) A 25-year-old man presents with a history of cut injury eight months back. It has gradually increased in size. (See C)

What is the diagnosis?

(A) Fish tank granuloma
(B) Hypertrophic lichen planus
(C) Pagetoid reticulosis
(D) Chromoblastomycosis

(4) A 20-year-old woman presents with the following appearance on her skin for six months which is distributed on her legs, buttocks and trunk. (See D)

What is the dermatological diagnosis?

(A) Livedo reticularis
(B) Erythema ab igne
(C) Cutis marmorata
(D) Livedo recemosa

(5) A 29-year-old previously healthy man presents a painful grouped lesion on his face. He has been treated by a general practitioner with a topical steroid ointment. (See E)

What is the diagnosis?

(A) Herpes simplex incognito
(B) Sycosis barbae
(C) Ecthyma gangrenosum
(D) Mucormycosis

*Refer Appendix on page 75 for answers and explanatioins.

Subarachnoid haemorrhage as a late complication of infective endocarditis: a case report

Samarawickrama T[1'2], Karunarathna TASL[2], Govindapala BGDS[1'2], Jayasekara MMPT[1'2], Sirimanna R[2], Wijesinghe RANK[1'2], Biyanwila AI[2]

[1] Department of Clinical Medicine, Faculty of Medicine, General Sir John Kotelawala Defence University, Sri Lanka.
[2] University Hospital, General Sir John Kotelawala Defence University, Sri Lanka.

Abstract

Rupture of an infectious intracranial aneurysm causing subarachnoid haemorrhage is a rare complication of infective endocarditis. We report a case of subarachnoid haemorrhage that occurred as a late complication, in an infective endocarditis patient, on the 30th day of successful treatment, which is an extremely rare occurrence. He was a mainline drug addict with a history of rheumatic valvular heart disease.

Key words: infective endocarditis, subarachnoid haemorrhage, rheumatic valvular heart disease

Correspondence to:

Thisara Samarawickrama
Consultant Interventional Cardiologist &
Senior Lecturer in Medicine
Faculty of Medicine
General Sir John Kotelawala Defence University
Sri Lanka

E-mail:
thisaradoc@yahoo.com

Introduction

Despite advances in diagnostic modalities and treatment options, mortality of infective endocarditis (IE) has remained unchanged at 30% over the past few decades, as per the population-based registry study in Finland in 2021(1). This is a case of subarachnoid haemorrhage (SAH) that has occurred almost a month after successful intravenous antibiotic therapy for IE.

Case Presentation

A 36-year-old male presented with intermittent fever and generalised body weakness for two months and worsening exertional dyspnea for two weeks. He is an intravenous heroin addict with a background of rheumatic valvular heart disease. A transthoracic echocardiogram (TTE) done 12 years ago revealed grade III mitral and grade II aortic regurgitation. He had defaulted clinic follow-up and antibiotic prophylaxis for the past 10 years.

On examination he was clinically stable with a temperature of 37.4 ^{0}C. Auscultation revealed bi-basal crepitations and a grade III pansystolic murmur at the apex. He had no peripheral stigmata of IE, focal neurological signs or evidence of meningeal irritation.

His investigations revealed leukocytosis with predominant neutrophils (WBC 15840 /µL), a high C-reactive protein (CRP) level (160 mg/L) and microscopic hematuria in urine full report. Streptococcus species were isolated in three blood cultures with antibiotic sensitivity to Cefotaxime, Ceftriaxone and Vancomycin. Electrocardiogram demonstrated sinus tachycardia and possible left atrial enlargement.

His TTE revealed severe mitral regurgitation with a damaged anterior mitral valve leaflet and a restricted posterior mitral valve leaflet. He also had moderate to severe aortic regurgitation. There was a 1.39 cm x 0.384 cm size linear vegetation on the anterior mitral valve leaflet with valve leaflet perforation. Left atrium and left ventricle were enlarged. (Figures 1A and 1B)

Empirically intravenous Gentamicin and Ceftriaxone were started as per the guidelines.

Treatment response was monitored both clinically and biochemically with CRP levels and renal functions. As the CRP levels were rising, Ceftriaxone was changed to intravenous Cefotaxime on Day 11, based on microbiology opinion. His CRP continued to rise until day 20 and then gradually declined. Repeated 2D echo after three weeks of therapy, confirmed improvement with a small residual vegetation (0.28 x 0.29 cm). (Figure 2)

Figure 1 - Linear vegetation (Arrow) attached to anterior mitral valve leaflet in the modified parasternal long axis view of the 2D echocardiogram(A) and apical four chamber view(B)

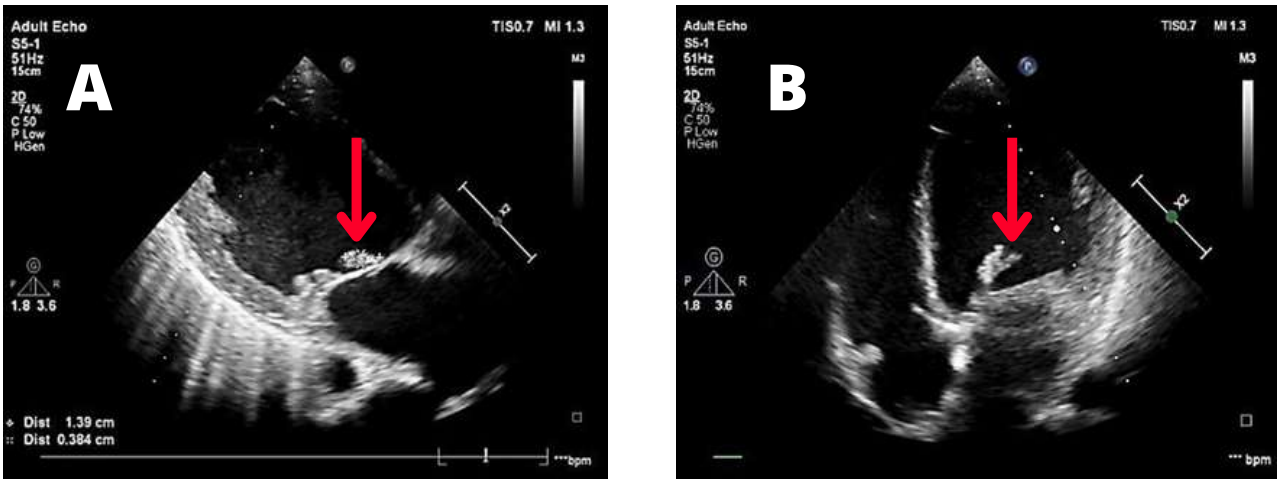

Figure 2 - Resolving small residual vegetation on the anterior mitral valve leaflet

Thirty days after admission, he developed a severe headache with short term memory loss. On examination his GCS was 15/15 without focal neurological signs. Non-contrast Computed Tomography (NCCT) brain demonstrated a subarachnoid haemorrhage with mild hydrocephalus. (Figure 3)

CT Angiogram of cerebral vasculature demonstrated an aneurysm in the M2 segment of right middle cerebral artery (MCA) (Figure 4). Urgent surgical repair was done with clipping of the aneurysm. His postoperative period was complicated by a left sided upper and lower limb weakness which developed on day seven. Repeat NCCT of the brain showed a new infarction on the right side. He was managed appropriately and discharged with a plan to undergo dual valve replacement later.

Figure 3 - Horizontal planes at different levels of non-contrast CT brain

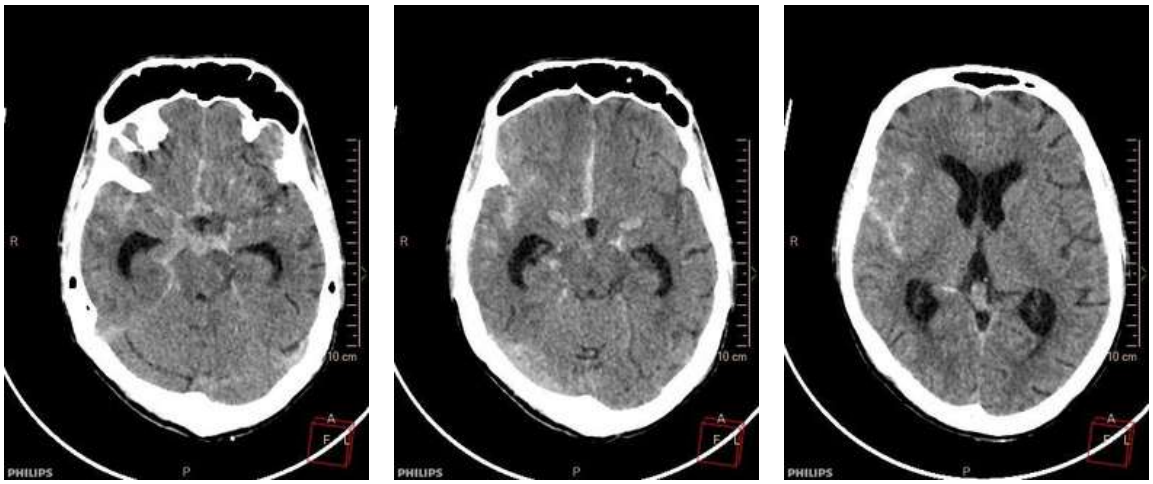

Figure 4 - CT angiogram showing right middle cerebral artery aneurysm (Arrows showing the aneurysm)

Discussion

Neurological complications occur in 30-40% of cases of IE which include strokes, transient ischaemic attacks, intra cerebral haemorrhage (ICH), cerebral abscesses, spinal epidural abscesses, infectious intracranial aneurysms, mononeuropathy, seizures, meningitis and toxic encephalopathy (2). While ischaemic stroke is the most common neurological complication, intra cerebral haemorrhage constitutes 12-30% of the complications (2,3) However, asymptomatic micro bleeds due to immunologic vasculitis are increasingly being recognised as the commonest neurological complication (2).

ICH following an embolus in IE, can occur by three methods; the most common method is infarction due to a sterile embolus resulting in secondary haemorrhage; secondly, septic embolus causing acute erosive arteritis and rupture; thirdly, septic embolus during effective antimicrobial therapy forming a subacute aneurysm leading to latent rupture as in our patient. However, the offending infected emboli may escape clinical recognition due to its small size, incomplete obstruction of the flow or collateral circulation which prevents infarction (4).

Aneurysms created by septic emboli are known as infectious intracranial aneurysms or mycotic aneurysms. Infectious intracranial aneurysms are a relatively rare complication of IE, found only in 2-4% of patients and accounts for 5-12% of patients with neurological complications due to IE. However, the actual incidence is probably higher, as they can be clinically silent and subsequently resolved with antibiotic therapy. Moreover, their uncertain risk of rupture also may influence the rate of detection (3).

SAH as a complication of IE is uncommon and is associated with rupture of an infectious intracranial aneurysm (5). Patients may present with a spectrum of non-specific constitutional symptoms or neurological symptoms such as seizures, focal neurological deficits, encephalopathy and ophthalmoplegia (2,3). Our patient only had a severe headache and short-term memory loss to indicate an intracranial pathology in the setting of IE.

Imaging plays a major role in the management of a patient with suspected SAH. CT angiography (CTA), magnetic resonance angiography (MRA) or digital subtraction angiography are the imaging modalities used. Our patient's CTA revealed an aneurysm in the M2 segment of the right MCA. MCA and its branches are the most common sites that infectious intracranial aneurysms form and accounts for 78% of IE related aneurysms (6). Cerebral aneurysms that are ≥3mm and ruptured aneurysms can be easily diagnosed using CTA and MRA, which have high sensitivity and specificity (2).

Management of infectious intracranial aneurysms depends on the size of the aneurysm, location, availability of resources and expertise, and most importantly, whether the aneurysm has ruptured or not. Although antibiotics have improved the outcome of IE, there is no significant reduction of neurological complications (5). An infectious intracranial aneurysm develops with a septic embolus that lodges in a cerebral artery which weakens the arterial wall. Aneurysms are more likely to develop before or within the first week of initiation of antibiotics (3). Treatment with sensitive antibiotics do not prevent aneurysm development, but may prevent their early rupture (5).

Recommendations include antibiotics and serial imaging for stable, small, unruptured aneurysms and endovascular repair or open surgical clipping for large or ruptured aneurysms (3). Surgery was encouraged for our patient as he developed neurological manifestations following rupture of the aneurysm.

Conclusions

This case report signifies the possibility of SAH late in the course of IE, even after antibiotic treatment and clinical, biochemical and echocardiographic improvement. Hence the

possibility of intracranial aneurysm should also be considered in patients without neurological manifestations as timely diagnosis, investigation and intervention are paramount for a favourable outcome.

Article Information

Conflict of Interest: None

Funding: None

Ethical Approval: Not Required.

Consent: Written informed consent was obtained from the patient.

References

1 .Ahtela E, Oksi J, Vahlberg T, Sipilä J, Rautava P, Kytö V. Short- and long-term outcomes of infective endocarditis admission in adults: A population-based registry study inFinland. PLoS One. 2021 Jul 15;16(7):e0254553. doi: 10.1371/journal.pone.0254553. PMID: 34265019; PMCID: PMC8282023.

2. Asif T, Mohiuddin A, Hasan B, Masoud A, Infective Endocarditis Presenting as Subarachnoid Hemorrhage: An Appeal for Caution, Cureus 9(4):e1176, 2017. https://doi.org/10.7759/cureus.1176.

3. Morris NA, Matiello M, Lyons JL, Samuels MA, Neurologic complications in infective endocarditis: identification, management, and impact on cardiac surgery, The Neurohospitalist 4(4):213–222, 2014. https://doi.org/10.1177/1941874414537077

4. Aziz F, Perwaiz S, Penupolu S, Doddi S, Gongireddy S, Intracranial hemorrhage in infective endocarditis: A case report, Journal of thoracic disease *3*(2):134–137, 2011. https://doi.org/10.3978/j.issn.2072-1439.2010.11.13

5. Schold C, Earnest MP, Cerebral hemorrhage from a mycotic aneurysm developing during appropriate antibiotic therapy, Stroke 9(3):267–268, 1978. https://doi.org/10.1161/01.str.9.3.267

6. Allen LM, Fowler AM, Walker C, Derdeyn CP, Nguyen BV, Hasso AN, Ghodke BV, Zipfel GJ, Cross DT 3rd, Moran CJ, Retrospective review of cerebral mycotic aneurysms in 26 patients: focus on treatment in strongly immunocompromised patients with a brief literature review, American journal of neuroradiology *34*(4):823–827, 2013. https://doi.org/10.3174/ajnr.A3302

Infective endocarditis with *Escherichia coli* secondary to urosepsis: a case report

Karunathilake P[1], Kularatne WKS[1], Bowaththage S[1], Kobbegala KGVJ[1], Fasrina MZF[1], Nasim FN[1], Costa MN[1], Jezeema ZKM[1], Rajapaksha RMID[1], Ranawaka RAND[1]

[1]National Hospital Kandy, Sri Lanka

Abstract

Infective endocarditis (IE) is a multisystem disease that results from infection, usually bacterial, of the endocardial surface of the heart. The main causative organisms of IE are gram-positive streptococci, staphylococci, and enterococci Although *Escherichia coli (E. coli)* is among the most common causes of gram-negative bacteremia, IE due to this pathogen is rare. Here we report a case of a 68-year-old woman who presented with a 10-day history of fever and was diagnosed with IE according to Modified Duke Criteria. *E. coli* was isolated from her blood culture. On day two of admission, the patient developed an episode of atrial fibrillation. The patient was treated with intravenous cefotaxime 2g 8 hourly for six weeks, and made a complete recovery without any complications.

Correspondence to:

Parackrama Karunathilake,
Medical Officer
National Hospital Kandy,
Kandy, 20000, Sri Lanka.

Tel No: 071 146 4807

E-mail:
parackramawk@gmail.com

Key words: Infective endocarditis, *Escherichia coli*, *E. coli* sepsis

Introduction

Infective endocarditis (IE) is a multisystem disease that results from infection, usually bacterial, of the endocardial surface of the heart (1). IE is a relatively rare but life-threatening disease. The crude incidence of IE ranges from 1.5 to 11.6 cases per 100,000 person-years. Even with the best available therapy, mortality rates from IE are approximately 25% (1). The main causative organisms of IE are gram-positive streptococci, staphylococci, and enterococci. Together, these three groups account for 80% to 90% of all cases. Apart from that, other common colonisers of the oropharynx, such as the HACEK organisms (*Haemophilus, Actinobacillus, Cardiobacterium, Eikenella*, and *Kingella*) can less frequently be the culprit bacteria. Fungal endocarditis represents only about 1% of the cases. However, in the immunocompromised population IE is a typical fatal complication of systemic Candida and Aspergillus infection (2). Although *E. coli* is among the most common causes of gram-negative bacteraemia, IE due to this pathogen is rare (3). Here we report a case of IE caused by *E. coli* following a urinary tract infection.

Case Report

A 68-year-old woman presented with a 10-day history of mild to moderate fever with chills. She complained of dysuria, haematuria, frequency, and urgency at the onset of fever which had persisted throughout the illness. There was a history of intermittent episodes of constipation, (passing stools once in four days) for the preceding few weeks.

She had exertional dyspnoea (NYHA class III), orthopnoea, and paroxysmal nocturnal dyspnoea with bilateral lower limb swelling up to mid-calf level. The onset of symptoms of heart failure was about 4 days after the onset of fever. Rest of the systemic inquiry was normal.

Her past medical history revealed bilateral knee joint osteoarthritis which had been treated with long-term non-steroidal anti-inflammatory drugs and proton pump inhibitors. She had undergone a total abdominal hysterectomy with bilateral salpingo-oophorectomy at 51 years.

On examination, she was obese (body mass index of 31.2 kg/m²), febrile 100 ˚F, had a blood pressure of 150/90 mm Hg and a heart rate of 96/minute. She did not have any peripheral stigmata of infective endocarditis. However, she had mild hepatomegaly which was tender. The rest of the cardiovascular, respiratory, and neurological system examination was unremarkable.

On admission, she had a white cell count of 24.99 × 10^3 /µL (neutrophils 86.9%), a haemoglobin level of 12.1 g/dL and platelet count of 154 × 10^3 /µL. C-reactive protein was 148.4 mg/L, and ESR was 100 mm/1st hour. The blood picture was suggestive of severe sepsis. Urinalysis revealed a moderate field full of pus cells and 12 – 15 red cells/high power field. There was a significant percentage of urinary dysmorphic red cells. She had a normal high-sensitive troponin I level of 82.6 ng/L (<14 ng/L). *E. coli* was isolated from her urine culture (>10^5 CFU), as well as two out of three separate blood culture samples taken more than one hour apart. The ultrasound scan of the kidneys-ureters and bladder revealed evidence of cystitis and the kidneys were normal.

The 2D echocardiogram showed an oscillating mass suggestive of vegetation, attached to the posterior valve leaflet of the mitral valve. A diagnosis of infective endocarditis secondary to bacteraemia following a urinary tract infection due to *E. coli* was made.

On day two of admission, the patient was treated for an episode of atrial fibrillation which converted to sinus rhythm eventually. On admission, the patient was started on intravenous(IV) co-amoxiclav which was converted to IV Cefotaxime with the sensitivity pattern . The patient was treated with IV antibiotics of the IE regime for a period of six weeks. The patient made a complete recovery. The follow-up blood cultures were negative and the 2D echocardiogram done in 6 weeks after the completion of antibiotics did not show any vegetations or valvular defects, and the ejection fraction was more than 55%.

Discussion

The diagnosis of IE anchors on both microbiologic and echocardiographic evidence of infection. Diagnosis has long been predicated on the Modified Duke Criteria which requires satisfaction of either two major criteria, one major and three minor criteria, or five minor criteria (5). Our patient met the criteria for the diagnosis of IE.

The first major criterion involves confirmation of bacteraemia. The Modified Duke Criteria requires two separate blood cultures positive for typical pathogens. or community-acquired enterococci in the absence of a primary focus. If other culprit pathogens are suspected, blood cultures must remain persistently positive as defined by either two positive cultures drawn more than 12 hours apart or positive results of all three or the majority of 4 or more separate cultures (with first and last samples drawn one hour apart) (6).

Our patient did not fulfil this major criterion because only two out of three blood cultures were positive for *E. coli* . The second major criterion involves sonographic evidence of endocardial involvement. An echocardiogram must demonstrate a vacillating intracardiac mass fixed to a valve, supporting structure, or implanted material. Initial evaluation with a transthoracic echocardiogram (TTE) is common; a more sensitive and specific transesophageal echocardiogram (TEE) is required only if TTE is negative, and suspicion of infective endocarditis remains high (7). Our patient was found to have

vegetation on TTE.

Of the five minor criteria our patient fulfilled three: fever of more than 38 degrees Celsius, evidence of glomerulonephritis, and a positive blood culture not fulfilling the major criterion (7). Hence the diagnosis of IE was made based on one major and three minor Modified Duke Criteria.

E. coli is a rare cause of infective endocarditis with few reported cases in the literature (3,8–10). Most were elderly females, with concurrent urinary tract infections which suggested the urinary tract is the portal of entry for the organism (8,9,11). In general a favourable outcome is seen after long-term conventional antibiotic therapy (8). A few required prosthetic tissue valve replacements due to complications such as congestive cardiac failure and valvular defects (9,12). Some had concurrent spondylodiscitis and bilateral endophthalmitis, purulent spondylitis , and associated septic abortion (3, 10, 13).

Conclusion

E. coli can rarely cause infective endocarditis. It commonly follows a urinary tract infection. However, the outcome is favourable with adequate antibiotic therapy.

Article Information

Acknowledgment: We thank the patient who gave consent for this case presented in this paper.

Conflict of Interest: No conflict of interest

Funding: This study was self-funded by the investigators. No external organization or institution was involved in this study.

Ethical Approval: Not applicable

Consent: Written informed consent was obtained from the patient for publishing this case report.

References

1 .Holland TL, Baddour LM, Bayer AS, et al. Infective endocarditis. Nat Rev Dis Primers [Internet]. 2016 Sep 1 [cited 2022 Mar 25];2:16059. Available from: /pmc/articles/PMC5240923/

2. Barnett R. Infective endocarditis. Lancet [Internet]. 2016 Sep 17 [cited 2022 Mar 25];388(10050):1148. Available from: https://pubmed.ncbi.nlm.nih.gov/27672723/

3. Lauridsen TK, Arpi M, Fritz-Hansen T, et al. Infectious endocarditis caused by Escherichia coli. Scand J Infect Dis [Internet]. 2011 Jul [cited 2022 Mar 25];43(6–7):545–6. Available from: https://pubmed.ncbi.nlm.nih.gov/21309637/

4. Klein M, Wang A. Infective Endocarditis. J Intensive Care Med [Internet]. 2016 Mar 1 [cited 2022 Mar 25];31(3):151–63. Available from: https://pubmed.ncbi.nlm.nih.gov/25320158/

5. Infectious Endocarditis - StatPearls - NCBI Bookshelf [Internet]. [cited 2022 Mar 25]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK557641/

6. Li JS, Sexton DJ, Mick N, et al. Proposed modifications to the Duke criteria for the diagnosis of infective endocarditis. Clin Infect Dis [Internet]. 2000 [cited 2022 Mar 28];30(4):633–8. Available from: https://pubmed.ncbi.nlm.nih.gov/10770721/

7. Baddour LM, Wilson WR, Bayer AS, et al. Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications: A Scientific Statement for Healthcare Professionals From the American Heart Association. Circulation [Internet]. 2015 Oct 13 [cited 2022 Mar 28];132(15):1435–86. Available from: https://pubmed.ncbi.nlm.nih.gov/26373316/

8. Benaissa E, Yasssine BL, Chadli M, et al. Infective endocarditis caused by Escherichia coli of a native mitral valve. IDCases. 2021 Jan 1;24:e01119.

9. Rangarajan D, Ramakrishnan S, Patro KC, et al. Native valve Escherichia coli endocarditis following urosepsis. Indian Journal of Nephrology [Internet]. 2013 [cited 2022 Mar 28];23(3):232. Available from: /pmc/articles/PMC3692155/

10. Akuzawa N, Kurabayashi M. Native valve endocarditis due to Escherichia coli infection: A case report and review of the literature. BMC Cardiovascular Disorders [Internet]. 2018 Oct 19 [cited 2022 Mar 28];18(1):1–9. Available from: https://bmccardiovascdisord.biomedcentral.com/articles/10.1186/s12872-018-0929-7

11. Micol R, Lortholary O, Jaureguy F, et al. Escherichia coli native valve endocarditis. Clinical Microbiology and Infection [Internet]. 2006 May 1 [cited 2022 Mar 28];12(5):401–3. Available from: http://www.clinicalmicrobiologyandinfection.com/article/S1198743X14620012/fulltext

12. Kanwal A, Allugubelli N, Kaplan J, et al. E. coli endocarditis of the tricuspid valve. https://doi.org/101080/2000966620191684424 [Internet]. 2019 Nov 2 [cited 2022 Mar 28];9(6):495–8. Available from: https://www.tandfonline.com/doi/abs/10.1080/20009666.2019.1684424

13. Anjum Z, Tariq Z. Escherichia coli-associated Infective Endocarditis in a Patient with Septic Abortion: A Rare Culprit in a Unique Presentation. Cureus [Internet]. 2019 Sep 12 [cited 2022 Mar 28];11(9). Available from: https://www.cureus.com/articles/22999-escherichia-coli-associated-infective-endocarditis-in-a-patient-with-septic-abortion-a-rare-culprit-in-a-unique-presentation

14. Villamil-Cajoto I, van den Eynde A, Rodriguez-Framil M, et al. Escherichia coli pacemaker-related endocarditis. Clinical Microbiology and Infection [Internet]. 2006 Dec 1 [cited 2022 Mar 28];12(12):1241. Available from: http://www.clinicalmicrobiologyandinfection.com/article/S1198743X14628810/fulltext

Severe Metformin poisoning; Experience at a tertiary care hospital in Sri Lanka: a case series

Sirisena PWMSS[1], Hettiarachchi NM[1] , Manilgama SR[2], Thenuwara TWPK[1]

[1]Toxicology Unit, Teaching Hospital Peradeniya
[2]North Colombo Teaching Hospital Ragama.

Abstract

Metformin is the first line medication used for the treatment of type 2 diabetes mellitus worldwide. It has been considered a cost effective and safe drug for decades. Though, lactic acidosis is a recognized adverse effect of metformin, it is sparsely seen with therapeutic doses. However, it occurs frequently in patients with metformin overdose and in the presence of renal insufficiency. Metformin associated lactic acidosis (MALA) carries a mortality rate of almost 50%. Early initiation of renal replacement therapy has shown to reduce morbidity and mortality in these patients. Metformin overdose is relatively uncommon and only few cases of severe metformin overdose are reported in the literature. Here, we discuss five cases of MALA due to severe metformin poisoning. Four of them were successfully treated with early use of renal replacement therapy.

Correspondence to:

NM Hettiarachchi
Consultant Physician,
Department of Toxicology,
Teaching Hospital Peradeniya,
Sri Lanka

Tel No: 077 372 5179

E-mail:
nmhettiarachchi@gmail.com

Key words: metformin poisoning, metformin associated lactic acidosis, metformin toxicity, MALA

Introduction

Metformin is a biguanide, used in the management of diabetes mellitus. It reduces plasma glucose by several mechanisms: reducing gluconeogenesis, reducing glycogenolysis, increasing peripheral uptake of glucose, enhancing intestinal glucose consumption and decreasing fatty acid oxidation (1, 2, 3. 4, 5). Metformin is available only in oral form and it reaches its peak plasma concentration within 2 hours of ingestion. The drug is excreted via kidneys unmodified. In acute metformin overdose, the toxic effects occur due to accumulation of metformin as a result of the saturation of clearance mechanisms of the kidney. (1,6)

The toxic dose of metformin is yet to be established and it is found that the metformin levels do not correlate well with clinical presentations. However, evidence indicates that higher levels are associated with dire complications such as severe lactic acidosis, cardiovascular compromise, and renal insufficiency. Other clinical presentations include nausea, vomiting, abdominal pain, myalgia and altered mental status. Hypoglycaemia and less commonly hyperglycaemia have also been reported in patients with acute metformin overdose. (7,8,9,10)

MALA is a well-recognized, potentially fatal, rare adverse effect that is reported in acute overdose (11,12,13). MALA has also been described in patients with acute on chronic metformin toxicity, end stage renal disease and in patients with acute renal failure on chronic metformin therapy (13,14). Its incidence varies from 3 to 10 per 100 000 patients (11,14,15,16). Metformin increases lactic

acid production by reducing hepatic gluconeogenesis. In addition, it suppresses the lactate metabolism in the liver, inhibits mitochondrial respiration and also exerts a negative inotropic action on the heart, all of which lead to lactatemia (17,18,19). Development of acidemia may take 6 to 24 hours and severe acidemia can lead to altered mental status, coma, hypotension, and respiratory insufficiency and it is often associated with acute kidney injury (20,21).

Here we discuss five patients who presented with severe Metformin poisoning who were managed in a tertiary care hospital in Sri Lanka.

Case 1

A 16-year-old, previously well, schoolgirl, was transferred from the local hospital to the Toxicology Unit, Teaching Hospital Peradeniya for management of metformin overdose. She had self-ingested a month's supply of her grandmother's medication (about 120 of 500 mg tablets) with suicidal intent. Decontamination with gastric lavage and activated charcoal was done at the local hospital. On admission, i.e.,6 hours after drug ingestion, she was asymptomatic except for mild epigastric discomfort, and she was haemodynamically stable. However, her initial arterial blood gas showed severe metabolic acidosis with a pH value of 7.08, pCO2 of 20 mmHg, pO2 of 158 mmHg, HCO3 of 5.9 mmol/L, base excess of -22 mmol/L and a lactate value of 13 mmol/L. Plasma glucose remained high between 200-300 mg/dL in the first twenty-four hours. The patient was admitted to the toxicology high dependency unit (HDU) for close monitoring. She was started on a sodium bicarbonate 100 mmol /hour infusion together with symptomatic treatment until hemodialysis (HD) took place. At the 12th hour of ingestion of metformin, haemodialysis with bicarbonate containing dialysate was initiated. However, she could not tolerate HD due to haemodynamic instability despite adequate fluids and vasopressors. HD had to be discontinued and continuous renal replacement therapy (CRRT) remained the only option. As there was a delay setting up CRRT due to limited availability, she was maintained on a sodium bicarbonate infusion and inotropes. Patient remained conscious and systolic blood pressure was maintained at 100 mmHg with a noradrenalin 0.5 mcg/kg/hour infusion. Around the 14th hour into ingestion, the patient's haemodynamic condition started to deteriorate further. She became drowsy due to further drop of blood pressure and the second vasopressor had to be started. Her metabolic acidosis worsened with a pH of 6.8, HCO3 of 3 mmol/L and base excess of -30 mmol/L. Lactate levels were persistently more than 15mmol/L. Patient was electively intubated. CRRT was only started at the 20th hour of metformin ingestion when she was barely maintaining a mean arterial pressure (MAP) of 65 mmHg with maximum doses of noradrenaline, adrenalin, dobutamine and vasopressin. After 72 hours of CRRT, her haemodynamic parameters improved transiently together with biochemical and blood gas parameters. However, she developed features of sepsis with disseminated intravascular coagulation (DIC), acute kidney injury and liver failure. At the same time, it was noted that her pupils were unequal, raising the possibility of intracranial haemorrhage. CT brain could not be performed as the patient was not haemodynamically stable to be mobilised. Despite supportive treatment, the patient succumbed to death on day 8 of metformin overdose due to multiorgan failure.

Case 2

A 70-year-old man was admitted to hospital with an altered level of consciousness. He had vomited twice on the way to the hospital and had no other symptoms. His past medical history was uneventful. He was not on any long term medication or narcotics. On admission he was maintaining his airway and respiratory system examination was normal. His pulse rate was 100 beats per minute and blood pressure was 80/50 mmHg. His Glasgow Coma Scale (GCS) was 12/15 with normal reactive pupils. There were no focal neurological signs or other evidence to suggest a convulsion or head injury. His random plasma glucose was 138 mg/dL and the temperature was

normal. Initial fluid bolus was followed by normal saline and noradrenaline infusions. His initial venous blood gas showed metabolic acidosis with a pH of 7.18, HCO3 of 9.7 mmol/L, and base excess of -18 mmol/L. Lactate level was more than 15mmol/L. The patient developed repeated episodes of hypoglycaemia, worsening metabolic acidosis and the lactate levels remained more than 15 mmol/L. Serum electrolytes including sodium, potassium, calcium and magnesium concentrations, sepsis screening and other toxin screens were normal. Computer tomography of the brain was normal. Hence the possibility of metformin overdose was suspected, and hemodialysis with bicarbonate containing dialysate was commenced. The patient improved after 4 hours of HD and his conscious level, hemodynamic parameters and the lactic acidosis further improved after a few more sessions. Once fully conscious, the patient admitted to having ingested a handful of Metformin tablets with suicidal intent. During the hospital stay, he developed acute kidney injury needing regular hemodialysis. After a hospital stay of 18 days with hemodialysis every other day, the patient made a complete recovery and was discharged on a nephrology and psychiatry follow up plan.

Case 3

A 17-year-old schoolgirl presented after 12 hours following self-ingestion of 40 tablets of 500mg metformin. She complained of vomiting and generalised abdominal pain on admission. Her past medical history was unremarkable. She was haemodynamically stable and her GCS was 15/15. Her random plasma glucose was 200 mg/dL. However, her initial venous blood gas showed severe metabolic acidosis with a pH of 7.17, HCO3 of 7.3 mmol/L, base excess of -19 mmol/L and a lactate level greater than 15 mmol/L. She was commenced on a 100 mmol per hour sodium bicarbonate infusion till urgent hemodialysis with bicarbonate containing dialysate was arranged. Her lactic acidosis rapidly improved after the first dialysis and no further dialysis was needed. She was discharged on the 5th day of hospital stay without any complications.

Case 4

A 17-year-old girl was transferred to the toxicology unit, TH Peradeniya, after ingestion of 50 tablets of 500mg Metformin 24 hours back. She had vomited several times and had complained of dizziness and difficulty in breathing at the local hospital. On admission to our hospital, she was hypotensive, tachycardic and had a GCS of 10/15. She was started on a noradrenaline infusion after fluid resuscitation. Arterial blood gas revealed severe lactic acidosis with a pH of 6.8, HCO3 of 3.2 mmol/L, base excess of -22 mmol/L and lactate greater than 15 mmol/L. She was started on a sodium bicarbonate infusion and admitted to the intensive care unit (ICU) for CRRT. After 48 hours of CRRT her blood gas was normalised. Patient was discharged on day 10 of admission after complete recovery with a follow up plan at a psychiatry clinic.

Case 5

An 18-year-old girl admitted to the toxicology unit, TH Peradeniya after 3 hours following ingestion of 100 tablets of 500 mg Metformin. She was conscious and haemodynamically stable. Gastrointestinal decontamination with gastric lavage and activated charcoal was carried out to reduce absorption of metformin and she was monitored in the HDU. Initial arterial blood gas showed a pH of 7.32, HCO3 of 12mmol/L and base excess of -16 mmol/L with lactate of 10 mmol/L. She was started on high dose insulin euglycemic therapy (HIET) with soluble insulin 0.5U/kg infusion and dextrose infusion titrated to maintain sugar levels in the range of 140-180mg/dL. Serum potassium was monitored 2 hourly and corrected accordingly. Blood gas repeated after 3 hours showed worsening metabolic acidosis with a pH of 7.17 and HCO3 of 8 mmol/L. Hence it was decided to arrange hemodialysis. In the interim a sodium bicarbonate infusion was commenced. While waiting for dialysis, the patient gradually became restless and confused. Her blood pressure crashed requiring two inotropes for maintenance. The patient was

transferred to ICU and CRRT was initiated after 9 hours following the ingestion of metformin. HIET was continued in addition to other supportive treatments. After 24 hours of CRRT, the patient showed improvement in lactic acidosis and haemodynamic parameters. Intubation was not required for this patient. After 3 days of CRRT and HIET, she was deescalated from ICU care to ward care. HD sessions were continued till she recovered from acute kidney injury. The patient was discharged 11 days following admission.

Discussion

Overdose with metformin is rare and its clinical presentations are highly nonspecific. Without a clear history of overdose, clinicians should have a high index of suspicion to diagnose the condition. Toxicity can cause severe consequences including death, mainly due to metformin associated lactic acidosis (MALA). Hence, Metformin ingestion should always be considered in the differential diagnoses of any patient with metabolic acidosis and high lactate level. (22,23).

In this case series, we discussed 4 females (aged 16-18 years) and a male (70 years) who presented with a massive Metformin overdose. The minimum number of tablets taken was 40 while maximum was 120. The duration from ingestion to hospital admission varied between 3-24 hours. Two were hypotensive on admission while another two developed hypotension later. Their arterial blood gases showed pH varying from 6.8-7.32, bicarbonate varying between 3-12 mmol/L with severe high anion gap metabolic acidosis. All patients had evidence of severe lactic acidosis (10-15 mmol/L) regardless of the time duration from ingestion of metformin to admission (Table 1). Except the male patient who had repeated hypoglycemia, others had normal or high blood sugar levels.

There is no specific antidote for metformin toxicity. The mainstay of treatment is supportive care to maintain the fluid status, acid base balance, electrolytes, and cardiovascular stability together with enhanced elimination of the toxin (24,25). All five patients were managed with maximum supportive care. Fluid resuscitation and infusion of inotropes/vasopressors were used to maintain the circulation.

Activated charcoal should be considered in patients who present soon after ingestion, provided that there are no contraindications (10, 26). Two patients received GI decontamination. Sodium bicarbonate may be considered in severely acidotic patients who are not responding to supportive measures, as acidosis can impair cardiovascular function and increase mortality. However, the benefits of bicarbonate in metformin toxicity is unclear (10, 11, 24, 27). It may be reasonable to initiate bicarbonate as a buffer until hemodialysis is initiated. All 5 patients were started on intravenous fluid resuscitation and vasopressors according to clinical parameters. All the patients were started on sodium bicarbonate bolus doses and continuous infusions initially due to severe acidosis. However, it was evident that sodium bicarbonate infusion has only a minimal or no benefit, because the clinical condition of all the patients deteriorated despite this treatment eventually needing hemodialysis. But it may delay the clinical deterioration of the patient by controlling the acidosis till hemodialysis is available. Hence in low-income countries like Sri Lanka, where hemodialysis facilities are not readily available, sodium bicarbonate infusion may be used as an initial bridging therapy.

Metformin can effectively be dialysed owing to its properties such as high-water solubility, minimal protein binding and small molecular weight. Hence it has been used successfully in patients with MALA due to chronic overdose or acute overdose. Some general recommendations for initiating dialysis are: 1) lactate concentration greater than 20 mmol/L 2) pH less than or equal to 7.0 3) presence of shock 4) decreased level of consciousness and 5) failure to respond to standard supportive care (22, 18, 28). Main aims would be to correct the acid base disturbance and to remove metformin from the body. The treatment could be performed with conventional hemodialysis (HD) or continuous renal replacement therapy (CRRT) and the latter is more

Table 1 - Summary of cases

Age (years)	Gender	No. of Tablets ingested	Time from ingestion to admission	Premorbid condition	symptoms	On admission BP	On admission GCS	ABG*				Gastric decontamination	Therapy	Progression & Outcome
								pH	HCO_3	BE	Lactate			
16	F	120	6 H	NAD	Mild epigastric pain	Stable	15	6.8	3	-30	>15	Yes	HD** CRRT**	An episode of hyperglycaemia Intubated Inotropes AKI/ALI MOF →died
70	M	A handful	unknown	NAD	Drowsiness Vomiting	Low BP	12	7.18	9.7	-12	>15	No	HD	Recurrent hypoglycaemic episodes AKI D18 discharged
17	F	40	12 H	NAD	Abdominal pain Vomiting	Stable	15	7.17	7.3	-19	>15	No	HD	D5 discharged
17	F	50	24 H	NAD	Vomiting Difficulty in breathing	Low BP	10	6.8	3.2	-22	>15	No	CRRT	D10 Discharged
18	F	100	3 H	NAD	Asymptomatic	Stable	15	7.32	12	-16	10	Yes	HIET HD CRRT	AKI D11 discharged

F- Female, **M**- Male, **H**- hours, **BE**- Base excess, **BP**- Blood Pressure, **HD**- Haemodialysis, **CRRT**- Continuous Renal Replacement Therapy, **HIET**- High dose insulin euglycaemic therapy, **AKI**- Acute kidney injury, **ALI**- Acute lung injury, **MOF**- Multi organ failure, **ABG**- Arterial blood gas, **NAD**- Nothing abnormal detected
*ABG values corresponding to the most critical stage of the patient are included
**From the time of admission, there was a 12 H delay in arranging HD while CRRT took place 20 H later

suitable for haemodynamically unstable patients (24, 25, 29). Use of bicarbonate dialysate may increase metformin clearance (22, 17, 27). In intentional acute poisoning, early dialysis is likely to be more beneficial as it will prevent the drug being redistributed into the tissues. This is because metformin has a large volume of distribution, and also it has been suggested that prolonged dialysis may be needed to see a beneficial effect (30, 31, 32). All five patients with severe metformin poisoning needed hemodialysis and showed clinical response only following the procedure. Hence, early initiation of hemodialysis in severe metformin poisoning is likely to aid in reducing the morbidity and mortality of these patients.

High dose insulin dextrose therapy or hyperinsulinemic euglycemic therapy which is a standard treatment of beta blocker and calcium channel blocker toxicity, has been shown to be effective in metformin toxicity as well. This therapy includes providing a high dose of insulin together with dextrose in order to prevent hypoglycaemia. Insulin facilitates glucose utilisation, sustains glycolysis, attenuates lipolysis and enhances lactate utilisation in the myocardium as an energy source. High dose insulin also increases cardiac output without increasing myocardial oxygen demand. A few clinical studies have shown a significant mortality benefit in patients who were treated with insulin dextrose when compared to those that were not (24, 33, 34). We initiated insulin dextrose infusion on admission on one of the patients with severe metformin poisoning. However, the patient continued to deteriorate despite the insulin dextrose therapy and bicarbonate infusions, needing hemodialysis.

Few case studies report that methylene blue may be beneficial in metformin toxicity as methylene blue could help to bypass the electron transport impediment at mitochondrial level seen in these patients (3, 35, 36). In addition, it has shown to be effective in reducing the metformin induced vasodilatory effects and improving haemodynamics. Evidence for its use and an appropriate regime is still inadequate, however it may be used as an option for treatment in patients with severe acidosis and distributive shock who are poorly responding to vasoactive agents (35). We did not use this treatment method in our patients due to lack of evidence on its use.

Conclusion

Metformin toxicity is a serious clinical condition associated with severe lactic acidosis and significant mortality. Recommendations for effective therapies are limited. The mainstay of treatment includes gastrointestinal decontamination, supportive care with fluids and vasopressors and early initiation of hemodialysis. Further clinical studies using a larger number of patients will be beneficial to improve the clinical management of these patients.

References

1 .Kopec KT, Kowalski MJ. Metformin-Associated Lactic Acidosis (MALA): Case Files of the Einstein Medical Center Medical Toxicology Fellowship. J Med Toxicol [Internet]. 2013 Mar 1 [cited 2021 Jun 5];9(1):61–6. Available from: https://link.springer.com/article/10.1007/s13181-012-0278-3

2. Renda F, Mura P, Finco G, Ferrazin F, Pani L, Landoni G, et al. Metformin-associated lactic acidosis requiring hospitalization. A national 10 year survey and a systematic literature review [Internet]. Available from: www.agenziafarmaco.it

3. Coleman JJ, Tavoosi S, Zarzaur BL, Brewer BL, Rozycki GS, Feliciano D V. Arterial injuries associated with blunt fractures in the lower extremity. In: American Surgeon. Southeastern Surgical Congress; 2016. p. 820–4.

4. Foretz M, Guigas B, Bertrand L, Pollak M, Viollet B. Metformin: From mechanisms of action to therapies. Vol. 20, Cell Metabolism. Cell Press; 2014. p. 953–66.

5. Blough B, Moreland A, Mora A. Metformin-Induced Lactic Acidosis with Emphasis on the Anion Gap. Baylor Univ Med Cent Proc [Internet]. 2015 Jan [cited 2021 Jun 12];28(1):31–3. Available from: /pmc/articles/PMC4264704/

6. Wills BK, Bryant SM, Buckley P, Seo B. Can acute overdose of metformin lead to lactic acidosis? Am J Emerg Med. 2010 Oct 1;28(8):857–61.

7. Wang GS, Hoyte C. Review of Biguanide (Metformin) Toxicity [Internet]. Vol. 34, Journal of Intensive Care Medicine. SAGE Publications Inc.; 2019 [cited 2021 Jun 5]. p. 863–76. Available from:

https://journals.sagepub.com/doi/abs/10.1177/0885066618793385

8. Perrone J, Phillips C, Gaieski D. Occult metformin toxicity in three patients with profound lactic acidosis. J Emerg Med. 2011 Mar 1;40(3):271–5.

9. Umeda T, Minami T, Bartolomei K, Summerhill E. Metformin-Associated Lactic Acidosis: A Case Report. Drug Saf - Case Reports [Internet]. 2018 Dec 9 [cited 2021 Jun 5];5(1):1–4. Available from: https://doi.org/10.1007/s40800-018-0076-1

10. Leonaviciute D, Madsen B, Schmedes A, Buus NH, Rasmussen BS. Severe Metformin Poisoning Successfully Treated with Simultaneous Venovenous Hemofiltration and Prolonged Intermittent Hemodialysis. Case Reports Crit Care. 2018;2018:1–4.

11. Chung A, Ho Yin C. A case of fatal metformin overdose. Hong Kong Journal of Emergency Medicine.

12. Asif S, Bennett J, Marakkath B. Metformin-associated Lactic Acidosis: An Unexpected Scenario. Cureus [Internet]. 2019 Apr 6 [cited 2021 Jun 12];11(4). Available from: /pmc/articles/PMC6559700/

13. Goonoo MS, Morris R, Raithatha A, Creagh F. Metformin-associated lactic acidosis: Reinforcing learning points. BMJ Case Rep. 2020 Sep 2;13(9).

14. Al-Abdwani R. Metformin-induced lactic acidosis reported in the youngest pediatric patient with impaired renal function. Oman Med J [Internet]. 2020 Jul 1 [cited 2021 Jun 10];35(4):514–7. Available from: /pmc/articles/PMC7477526/

15. Stevens A, Hamel JF, Toure A, Hadjadj S, Boels D. Metformin overdose: A serious iatrogenic complication—Western France Poison Control Centre Data Analysis. Basic Clin Pharmacol Toxicol [Internet]. 2019 Nov 1 [cited 2021 Jun 12];125(5):466–73. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/bcpt.13273

16. Inzucchi SE, Lipska KJ, Mayo H, Bailey CJ, McGuire DK. Metformin in patientswith type 2 diabetes and kidney disease a systematic review [Internet]. Vol. 312, JAMA - Journal of the American Medical Association. American Medical Association; 2014 [cited 2021 Jun 12]. p. 2668–75. Available from: /pmc/articles/PMC4427053/

17. Kinoshita H, Yanai M, Ariyoshi K, Ando M, Tamura R. A patient with metformin-associated lactic acidosis successfully treated with continuous renal replacement therapy: A case report. J Med Case Rep [Internet]. 2019 Dec 17 [cited 2021 Jun 5];13(1):1–4. Available from: https://link.springer.com/articles/10.1186/s13256-019-2311-5

18. Metformin poisoning - UpToDate [Internet]. [cited 2021 Jun 13]. Available from: https://www.uptodate.com/contents/metformin-poisoning#H13

19. Andrzejewski S, Gravel S-P, Pollak M, St-Pierre J. Metformin directly acts on mitochondria to alter cellular bioenergetics. Cancer Metab. 2014;2(1):12.

20. Bellefroid C, Goffin P, Guntz J, Deville M. Metformin-Induced Lactic Acidosis: A Question of Time. Case Reports Crit Care. 2020 Oct 21;2020:1–4.

21. MALA: Metformin-Associated Lactic Acidosis · California Poison Control System (CPCS) [Internet]. [cited 2021 Jun 12]. Available from: https://calpoison.org/news/mala-metformin-associated-lactic-acidosis

22. Nguyen HL, Concepcion L. Metformin intoxication requiring dialysis. Hemodial Int [Internet]. 2011 Oct [cited 2021 Jun 11];15(SUPPL. 1). Available from: https://pubmed.ncbi.nlm.nih.gov/22093605/

23. Chowdhury W, Lodhi MU, Syed IA, Ahmed U, Miller M, Rahim M. Metformin-Induced Lactic Acidosis: A Case Study. 2018;

24. Wang GS, Hoyte C. Review of Biguanide (Metformin) Toxicity [Internet]. Vol. 34, Journal of Intensive Care Medicine. SAGE Publications Inc.; 2019 [cited 2021 Jun 11]. p. 863–76. Available from: https://journals.sagepub.com/doi/abs/10.1177/0885066618793385

25. Sidlak AM, Abesamis MG, Shulman JA, Marino RT. Feasibility of Intermittent Hemodialysis in Metformin Toxicity With Shock. J Emerg Med. 2020 May 1;58(5):749–55.

26. Lášticová M, Víšek J, Zima O, Šmahelová A, Blaha V. Metformin-associated lactic acidosis. Vnitr Lek [Internet]. 2020 Sep 16 [cited 2021 Jun 5];66(7):438–42. Available from: https://www.bmj.com/content/339/bmj.b3660

27. Heaney D, Majid A, Junor B. Bicarbonate haemodialysis as a treatment of metformin overdose. Nephrol Dial Transplant. 1997 May;12(5):1046–7.

28. Deepak V, Neel S, Lohana AC, Tanase A. Metformin-associated Lactic Acidosis Successfully Treated with Continuous Renal Replacement Therapy. Cureus [Internet]. 2019 Aug 6 [cited 2021 Jun 10];11(8). Available from: https://pubmed.ncbi.nlm.nih.gov/31598437/

29. Keller G, Cour M, Hernu R, Illinger J, Robert D, Argaud L. Management of metformin-associated lactic acidosis by continuous renal replacement therapy. PLoS One [Internet]. 2011 [cited 2021 Jun 13];6(8):e23200. Available from: www.plosone.org

30. N Peters NJDBACLNPBSG. Metformin-associated lactic acidosis in an intensive care unit. Crit Care. 2008;12:R149.

31. Soni P, Ponnusamy V, Sharma S, Sinha A, Seneviratne C, Kupfer Y. A Case of Severe Lactic Acidosis Due to Metformin Toxicity. In: American Thoracic Society International Conference Meetings Abstracts American Thoracic Society International Conference Meetings Abstracts. American Thoracic Society; 2019. p. A4849–A4849.

32. Regolisti G, Antoniotti R, Fani F, Greco P, Fiaccadori E. Treatment of Metformin Intoxication Complicated by Lactic Acidosis and Acute Kidney Injury: The Role of Prolonged Intermittent Hemodialysis. Am J Kidney Dis. 2017 Aug 1;70(2):290–6.

33. Misbin RI. Phenformin-associated lactic acidosis: pathogenesis and treatment. Ann Intern Med [Internet]. 1977 [cited 2021 Jun 13];87(5):591–5. Available from: https://pubmed.ncbi.nlm.nih.gov/921092/

34. Young T, Cevallos J, Napier J, Martin-Lazaro J. Metformin poisoning treated with high dose insulin dextrose therapy: a case series. Acta medica Litu [Internet]. 2019 May 7 [cited 2021 Jun 13];26(1):72–8. Available from: /pmc/articles/PMC6586385/

35. Plumb B, Parker A, Wong P. Feeling blue with metformin-associated lactic acidosis. BMJ Case Rep [Internet]. 2013 [cited 2021 Jun 13];2013. Available from: https://pubmed.ncbi.nlm.nih.gov/23456165/

36. Graham RE, Cartner M, Winearls J. A severe case of vasoplegic shock following metformin overdose successfully treated with methylene blue as a last line therapy. BMJ Case Rep. 2015 Jul 6;2015.

ajim.slcim@gmail.com

Key to Picture Quiz

(1) Answer B – Dermatomyositis

Nail fold telangiectasia and ragged cuticles are seen in systemic sclerosis and dermatomyositis. This patient has muscle weakness along with the above changes and the diagnosis is therefore suggestive of Dermatomyositis.

(2) Answer B – Chronic actinic dermatitis

Chronic actinic dermatitis causing leonine face
Chronic actinic dermatitis predominantly affects men over the age of 50 years. It is characterised by severely itchy, red, inflamed, and thickened dry skin. It gets worse with exposure to sunlight.

(3) Answer D – Chromoblastomycosis

Solitary verrucous plaque due to Chromoblastomycosis

The diagnosis of Chromoblastomycosis than Fish tank granuloma is suggested by black and red dots. These black and red dots represent trans-epidermal elimination of fungal elements and inflammatory cells along with haemorrhage. Treatment of choice is itraconazole +/- flucytosine and Cryotherapy

(4) Answer D – Livedo racemosa

It often affects the trunk and buttocks as well as legs. The net-like violaceous pattern is composed of irregular, broken macules with an annular pattern. Livedo racemosa is differentiated from the more common livedo reticularis by its shape and pattern in addition to its persistence on warming.

(5) Answer A – Herpes simplex incognito

Though herpes simplex is common on the lips it could also be seen in other areas of the face. The characteristic appearance of the vesicles is changed due to steroid application.

The Official Journal of
Sri Lanka College of Internal Medicine