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Editorial

All humanity in peril …..

As we publish this issue of the *Galle Medical Journal*, all humanity is facing a global pandemic of unprecedented magnitude: COVID-19 caused by the RNA virus, SARS-CoV-2. It is a major health threat which has affected all inhabitants of our planet transcending boundaries. The disease status worldwide is in a state of rapid and dynamic flux. According to Tedros Adhanom Ghebreyesus, the Director General of the World Health Organization (WHO), "It took 67 days from the first reported case to reach the first 100,000 cases, 11 days for the second 100,000 cases; just four days for the third 100,000 cases and a mere two days for the fourth hundred thousand." [i] Countries with well-developed health systems are fighting a formidable battle against COVID-19. The morbidity of the healthcare workers too is significant. The presentation varies from asymptomatic disease to a fatal pneumonia.

The COVID-19 pandemic calls for broad-based diagnosis with wide spread testing; expansion of care services with adequate facilities for respiratory support; research for effective medications and a vaccine. Numerous drug trials are in progress with antiviral agents and other agents. However, curative medication and vaccines need to be **fast-tracked**. Considering the current exigency, we wonder whether laid down guidance can be overridden?

The pandemic has given an impetus to new improvisations and inventions too; for *e.g.* the rapid manufacture of ventilators. Improvised continuous positive airway pressure (CPAP) devices have been used and are being devised to bridge the gap between the oxygen mask and full ventilation. [ii]

Public health services are globally active in tracing contacts and in the preventive measures. We in Sri Lanka too are currently in a state of lock down with strong advice on social distancing with curfews and suspension

of international arrivals. These measures call for a high level of social responsibility with behavioural adjustments.

Adversity of this pandemic transcends mere health-related aspects with effects on family, and broader social, behavioural, political and economic ramifications. Human behaviour has changed with social distancing, quarantine and isolation. Economies worldwide are in a state of recession with loss of jobs and reduced incomes. It is very likely that this will cause a high incidence of mental disorders due to a multitude of causes. It is certain that this pandemic will have a profound effect on the social behaviour of *Homo sapiens* into the future.

This issue of the *GMJ* features two leading articles looking at different aspects of the global pandemic of COVID-19. Gunasena focuses on features of this pathogen, transmission, period of infectivity, clinical manifestations, and minimization of adverse effects. We need to recognize the high level of infectivity of the virus before the disease manifests out clinically. Fernando traces events from its origin to the current situation. He calls for a **reality check**. He is of the view that values of power and growth have gone into oblivion and he calls for introspection and reflection on real values of life. This in turn is likely to cause a behavioural modification.

It needs to be emphasized that figures related COVID-19 given herein will be different by the time you read this issue as the disease incidence and mortality are rapidly changing. The national and global picture into the next few months is so very unpredictable at this juncture. We fervently hope that all humanity globally will escape the scourge of SARS-CoV-2 soon. Please stay safe.

Satish K Goonesinghe
Eisha I Waidyarathne
Editors in Chief / GMJ

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i   https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-g20-extraordinary-leaders-summit-on-covid-19---26-march-2020 [Accessed 30 March 2020]

ii   https://www.theguardian.com/world/2020/mar/30/f1-team-helps-build-new-uk-breathing-aid-for-covid-19-patients [Accessed 30 March 2020]

GALLE MEDICAL JOURNAL: INSTRUCTIONS TO AUTHORS

The Galle Medical Journal is published by the Galle Medical Association. The *journal* is published biannually, March and September and the submissions are accepted throughout the year. The aims of the journal are to foster co-operation among the medical fraternity and to be a forum to make literary contributions, share experiences encountered in medical practice, update their knowledge and have debates on topics related to all aspects of medicine. Also, we attempt to cater to the educational needs especially of the postgraduate trainees. The *Journal* publishes original articles, reviews, leading articles and case reports. When an article is submitted for publication, we expect that the work it reports has not been published, submitted simultaneously to another journal or accepted for publication elsewhere. All manuscripts will be reviewed anonymously before acceptance.

Manuscripts must be submitted with the text type written in 12-point Times New Roman font double spaced. Text and all illustrative material should be submitted in two hard copies and the electronic version in Microsoft Word document format. In order to avoid delay we require authors to comply with the following requirements. **All manuscripts should accompany a covering letter indicating the number of words in the manuscript, institution where ethical clearance was granted, conflict of interests and contact details of the corresponding author.**

Types of contributions:

Review articles and Leading articles: We encourage submission of review or leading articles which are less than 3000 words in length and address topics of current interest. They should be supported by no more than 20 references. Submissions may be subjected to external review before acceptance.

Original articles: Should normally be in the format of introduction, methods, results and discussion. Each manuscript must have a structured abstract of 200 words. The text should be limited to 3000 words and maximum of 5 tables/figures taken together with no more than 15 references. Lengthy manuscripts are likely to be returned for shortening. The discussion in particular should be clear, concise and should be limited to matters arising directly from the results. Avoid discursive speculation.

Case Reports: These should not exceed 750 words and 5 references; no abstract is required. Case report should be informative and devoid of irrelevant details. Case report should have a clear message or learning point and this should be highlighted adequately. Rarity of the case does not mean it is suitable for publication. Written consent of the patient should be submitted together with the case report, especially when photographs are used.

References:

These should conform to the Vancouver style. The reference in the text should be numbered consecutively in Arabic numerals in parentheses in the same line of the text in the order in which they appear. The first five authors should be listed and if there are more than five, then the first three should be listed followed by et al. Examples are given below:

1. Kumar A, Patton DJ, Friedrich MG. The emerging clinical role of cardiovascular magnetic resonance imaging. *Canadian Journal of Cardiology* 2010; **26**(6): 313-22.

2. Calenoff L, Rogers L. Esophageal complication of surgery and lifesaving procedures. In: Meyers M, Ghahremani G, eds. Iatrogenic Gastrointestinal Complications. New York: Springer, 1981: 23-63.

Units / Abbreviations:

Authors should follow the SI system of units (except for blood pressure which is expressed in mmHg). Authors should use abbreviations sparingly and they should be used consistently throughout the text.

Manuscripts that do not conform to these requirements will be returned for necessary modifications.

Manuscripts should be addressed to Chief Editors, Galle Medical Association, Teaching Hospital, Karapitiya and all soft copies should be sent to *gmathk@gmail.com*

Profile of a global contagion: SARS-CoV-2

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Introduction

In December 2019, number of cases of pneumonia of unknown aetiology was reported from Wuhan, Hubei Province, China to the World Health Organization (WHO). Clinical presentations were very much like that of viral pneumonia. In addition to the increase in number, cases were reported from other provinces in China. Thailand reported first laboratory confirmed imported case on 13th January 2020 followed by Japan and Republic of Korea (1).

Deep sequencing of lower respiratory tract samples collected from affected patients identified a coronavirus not detected before and was named as 2019 Novel coronavirus (2019-nCoV) (1). Further genetic studies indicated that this virus is genetically linked to the virus that caused severe acute respiratory syndrome (SARS) epidemic in 2002 - 2003 and International Committee on Taxonomy of Viruses (ICTV) named it as "Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2). WHO announced the disease caused by SARS-CoV-2 as "Coronavirus disease 2019 or COVID-19" (2).

Spread of the virus within China and importation of the virus to other countries led WHO to declare the outbreak as "Public health emergency of international importance" (3). With the establish--ment of outbreaks in many countries WHO declared COVID-19 as a Pandemic on 11th March 2020 (3).

Current global situation

COVID-19 pandemic has affected more than 190 countries with rapidly changing case load and number of deaths. WHO has reported (accessed on 28th March 2020) more than 570,000 cases with more than 26,000 deaths around the world (4).

China has reported 135 new cases with 3 new deaths during last 24 hours indicating the epidemic has been controlled. Of the European countries, highest number coming from is Italy with 86,498 cases and 9136 deaths. Spain, France and Germany are the other worst affected European countries. Even though, Germany has reported nearly 50,000 cases, number of deaths is only 325. Rapidly expanding epidemic has been reported from United States with 85,228 cases and 1243 deaths (4). Situation appears to be out of control with more countries reporting cases and countries already affected having rapidly increasing numbers and deaths.

Situation in Sri Lanka

Epidemiology Unit, Ministry of Health, Sri Lanka in its latest report released on 30th March 2020 at 7.00 p.m. declared that 122 COVID-19 patients (including three foreigners) has been laboratory confirmed. Of this, 14 patients have recovered with two reported deaths and 104 patients are under observation (5). COVID-19 exposure history published by the Epidemiology Unit of Sri Lanka provides interesting information. Transmission links has been identified to all most all of cases and it indicates the transmission is confined to family contacts and contacts of imported cases with no community transmission (6).

The Virus

The virus SARS-CoV-2 with the SARS-CoV and MERS-CoV are members of the genus Beta coronavirus of the family Coronaviridae. All three viruses are bat viruses and once humans are infected, human to human transmission can occur (7).

Transmission

Human to human transmission occurs through respiratory route. Transmission can occur in close personal contact (within 6 feet of a sick person) via droplets generated by coughing, sneezing or by direct contact with infected respiratory secretions on the mucous membrane of mouth, nose or eye. Transmission also occurs via indirect contact with contaminated surfaces or objects (7).

Clinical presentation

Incubation period of COVID-19 vary from 0 to 14 days on average 5-6 days (8). It is estimated that 80% of the infected patients have asymptomatic or mild disease and does not seek health care. Another 14% have severe illness and 6 % has critical illness and these two groups are in contact with health care system (9). Infectivity of asymptomatic patients and the importance of them in the transmission of the virus in the community remains uncertain.

Fever, sore throat and dry cough is considered the common symptoms of COVID-19. Breathlessness is commonly seen in critically ill patients. Sputum production, headache and diarrhea is seen less commonly. Leucopenia and evidence of renal impairment may also be there in a few (10). China has reported a 2.3% case fatality rate (CFR) for COVID-19 (11). However, WHO estimates lower infection fatality rate of 0.3 - 1% (8).

Preliminary data from USA showed that number of cases and the severity (as defined by hospitalisation and ICU admission) increases with age (12). A study from China also reported that 86.6% of COVID-19 cases were from 30 - 79 years age group (11).

Similarly, CFR increases with age and with co-existing serious health conditions. Report indicates 45% hospitalisation, 53% of ICU admissions and 80% of deaths occurred in $\geq$ 65 years age group (12).

Data from Epidemiology Unit of Sri Lanka showed that highest number of cases (33%) reported from age group 41 - 50 years and only 9% reported from less than 20 years age group. Interestingly it appears the elderly population has been relatively spared (61 – 70 years 6.6% and > 70 years 1.8%) (13).

Period of infectivity

From few virological studies performed, the period of infectivity has been estimated. They indicate that the patients are infectious 1 - 2 days before the onset of symptoms lasting for 10 days or more after the onset of symptoms (14). This reiterate the importance of isolation of the patient following onset of symptoms and the tracing and isolation of contacts who have been exposed to the patient during the incubation period. WHO identify the period of exposure as 2 days before to 14 days after onset of symptoms in defining the contacts (4).

Minimizing the adverse effect of the pandemic

WHO has identified strategic objectives in the context of ongoing COVID – 19 pandemic namely,
1) Interrupt human–human transmission,
2) Identify, isolate and care for patients early,
3) Identify and reduce transmission from animals,
4) Address crucial unknowns e.g. clinical severity, extent of transmission, treatment options etc.
5) Communicate critical risk and event information,
6) Minimize social and economic impact (15).

By implementation of quarantine, social distancing and isolation of infected patients China was able to control the COVID-19 epidemic by early March 2020 (16). Early government action and social distancing measures taken by the individuals helped to keep the situation in Singapore and Hong Kong under control.

An article on the influence of mitigation measures on the course of COVID-19 epidemic, the authors comment that in comparison to new strain of influenza A, COVID-19 epidemic slower in initial spread, has a more drown out course and the effect of seasonality is unknown (17).

Mandatory quarantine is implemented for the exposed contacts and for returnees from affected countries. Early identification, isolation and management of patients in health care institutions or at home is important. Social distancing is implemented by stopping mass gathering (both public and private), closure of educational institutions, workplaces, isolation of households, areas, towns where infected patients were detected and more extensive scale social distancing like

"lockdown." These measures will help to minimize the human – human transmission, bring the case load to a manageable level so that it will not overwhelm the health care system (17).

Recommendations of WHO on prevention and mitigation of this pandemic also addressed exposure of health care workers (HCW) to the patients by way of risk assessment and management in context of COVID-19 (18).

It is the responsibility of the government and the policy makers to decide and implement the strategies to control the COVID-19 epidemic and to minimize its social and economic impact. However, the success of these measures also depends on the voluntary implementation of these strategies by the individuals.

References

1. World Health Organization. Situation report 1 on 21st January 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

2. World Health Organization. Naming the coronavirus disease and the virus that causes it. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it.

3. World Health Organization. Rolling updates on coronavirus disease (COVID-19). https://www.who.int/emergencies/ diseases/novel-coronavirus-2019/events-as-they-happen.

4. World Health Organization. Situation report 68 on 28th March 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

5. National Epidemiological Report, Epidemiology Unit, Sri Lanka dated 30.03.2020. http://www.epid.gov.lk/web/index.php?lang=en

6. Epidemiology Unit. COVID-19 Exposure history updated on 27.03.2020. http://www.epid.gov.lk/web/

7. Centers for Disease Control and prevention (CDC), USA. How it spreads. https://www.cdc.gov/coronavirus/2019-ncov/prepare/transmission.html

8. World Health Organization. Situation report 30 on 19th February 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

9. European Centre for Disease Prevention and Control. Daily risk assessment on COVID-19. https://www.ecdc.europa.eu/en/current-risk-assessment-novel-coronavirus-situation.

10. Huang Chaolin, Wang Yeming, Li Xingwang *et al*. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China, *The Lancet* 2019; **395**: 10223: 497-. DOI: https://doi.org/10.1016/S0140-6736(20)30183-5.

11. Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China [Chinese]. Chinese Center for Disease Control and Prevention Weekly 2020; **41**:145-51.

12 Centers for Disease Control and prevention (CDC), USA. Severe outcomes among patients with coronavirus disease 2019 (COVID-19) United States, MMRW, February 12 – March 16, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e2.htm

13. Epidemiology Unit. Situation report 61 on 28.03.2020. http://www.epid.gov.lk/web/

14. Zou L, Ruan F, Huang M, *et al.* SARS-CoV-2 viral load in upper respiratory specimens of infected patients. *New England Journal of Medicine* 2020; published online Feb 19. DOI: 10.1056/NEJMc2001737.

15. World Health Organization. Situation report 07 on 27th January 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

16. World Health Organization. Situation report 44 on 4th March 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

17. Roy M Anderson, Hans Heesterbeek, Don Klinkenberg, T Déirdre Hollingsworth. How will country-based mitigation measures influence the course of COVID – 19 epidemic? *The Lancet* 2020 March, 395; **10228**: 931-934. DOI: https://doi.org/10.1016/S0140-6736(20)30567-5.

18. World Health Organization. Situation report 53 on 13th March 2020. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/

COVID-19 Pandemic; a call for a reality check

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The backdrop

A virus of the Beta coronavirus 2B lineage was first discovered in December 2019, in three bronchoalveolar lavage samples of a Chinese patient who was affected by pneumonia of unknown aetiology (1), in a hospital in Wuhan the capital of the Hubei Province in China. The doctors treated the patient and not much was thought of the virus at that time. Doctors, Li Wenliang and Ai Fen realized the dangers of the new virus. They wrote about it in social media. They were reprimanded and warned sternly by the authorities in China. On 8th January 2020, the Wuhan Public Security Bureau arrested eight doctors who had posted information about the illness on social media. An official at the Hubei Provincial Health Commission ordered laboratories, which had already determined that the novel virus was similar to SARS-CoV which caused severe acute respiratory syndrome in 2003; to stop testing samples and to destroy existing samples. On 13th January, the first coronavirus patient was reported in Thailand, the first known case outside China. On 20th January the first corona virus patient was reported in South Korea. A few days later patients were reported from Japan and USA. The warning signs of an epidemic were emerging but the Chinese authorities were still in a denial mode. Soon the Chinese authorities realized their mistake.

On 21st of January, China's top political commission in charge of law and order warned that "anyone who deliberately delays and hides the reporting of [virus] cases out of his or her own self-interest will be nailed on the pillar of shame for eternity" (2).

On 23rd January, Wuhan and three other cities are put on lockdown. As China celebrated the Lunar New Year holiday from 24th to 30th January, approximately 5 million people left Wuhan without being screened for the illness. Hundreds of millions of people travelled around the country. The spread of the virus was rapid and devastating from then on. The virus was given the official name SARS-CoV-2 and the disease was named as COVID-19 (corona virus disease-19). The WHO declared a worldwide pandemic on 11th of March 2020. The rest is history. At the last count more than 720,000 people have been affected worldwide resulting in 33,900 deaths (as of 30th March) especially in the older age groups and immune compromised patients. The high figures are partly due to human disregard for the rule of law and lack of civic consciousness. World over, people behaved in the most selfish manner disregarding requests and warnings, contributing to the pandemic. No one can predict what the final outcome will be. The tiny particle of SARS-CoV-2 has brought the world to a standstill and put many countries in lockdown mode.

The need of a reality check

The world and humanity today are considered to be very advanced. The emphasis is on growth, power and individuality. The buzz words are nanotechnology, robotics, genetic engineering, artificial intelligence and cyborgs. Undoubtedly these advances have made significant contributions to enhance human existence. The higher echelons of society are seeking divinity. The downside is that the human race has forgotten some fundamental moral values. Truth, honesty, civic consciousness, equity, humility, love, family values, unity and kindness are not given much thought in the fast-moving world of today.

In the face of this tiny particle called SARS-CoV-2, aforesaid current values of power and growth seem so insignificant. The basic instinct of survival is the need of the day. This emphasizes the frailty of the humans. In many countries people died in total isolation and their main cry was for kindness and the embrace of a loved one. Even the most powerful including leaders of countries and their families were affected by the virus. Power, growth and technology did not offer any protection. Despite all the technological advances experts cautiously predict that a vaccine against COVID-19 is at least 18 months away. The new frontiers of nano-technology, robotics, genetic engineering, artificial intelligence and cyborgs must be fully supported and advanced.

Whatever your religious beliefs are or even if you do not have one, it is time for everyone to stop and take a reality check and reexamine your life. The recent advances inebriated some people so much that they claimed that human beings could achieve immorality in the twenty first century (3).

The current epidemic calls on a reality check for such claims. This is the time to stop and think of real values in life. If humans can balance the advances and the real values that matter then the human existence will undoubtedly be enhanced and the world will become a much better place to live in. Perhaps the COVID-19 pandemic is a divine message for the world to take a reality check.

References

1. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19).

2. Bethany Allen-Ebrahimian: https://www.axios.com/timeline-the-early-days-of-chinas-coronavirus-outbreak-and-cover-up-ee65211a-afb6-4641-97b8-353718a5faab.html

3. Alexander Bolonkin Twenty-first century - The beginning of human immortality. October 2004 Kybernetes 33(9/10): 1535-1542. DOI: 10.1108/03684920410556115.

Skin closure with Pfannenstiel incision in lower segment caesarean section; comparison of wound outcome with interrupted vs. subcuticular techniques

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ABSTRACT

Introduction: Caesarean section is the most common surgical procedure performed in the world. A vast majority of the procedures are carried out with Pfannenstiel incision. Different techniques and materials are used to approximate the skin in caesarean section. Each method has its own advantages and disadvantages. The objective of the study was to compare surgical wound outcome and satisfaction of women who underwent Pfannenstiel incision closure with interrupted vs. subcuticular suturing in caesarean sections.

Methods: A prospective comparison was carried out in 400 age and body mass index matched women who underwent lower segment caesarean section for the first time. Standard lower segment caesarean section was performed with assigning interrupted and subcuticular wound closure for 200 women in each group, following matching for BMI and age. Two arms were compared for wound complications, postoperative pain and overall satisfaction of the outcome.

Results: There was no statistically significant difference between groups for baseline characteristics (age, BMI and category of caesarean sections). According to visual analogue scale 91% of women reported to have moderate to severe pain in interrupted group compared to 80% in subcuticular group (p<0.05). Wound complications were present in 8% of interrupted group vs 3% in subcuticular group (p<0.001). Sixty four percent of women were satisfied with subcuticular method vs. 28% with interrupted method (p<0.001).

Conclusions: Women who had subcuticular suturing method had less post-operative pain, better wound outcome and more satisfaction compared to interrupted suturing.

Keywords: *Caesarean section, Pfannenstiel incision, wound closure, wound outcomes*

Introduction

Caesarean section is one of the most common surgical procedures performed worldwide. It was first described and performed by Hermann Pfannenstiel in 1900 (1). This involves low transverse suprapubic incision with the dissection of rectus muscles from the overlying rectus sheath. This has become popular and currently is the incision of choice in most of the obstetric and gynaecological surgeries. Currently a vast majority of caesarean sections are being performed using this incision (2, 3).

Advantages of this skin incision over a vertical incision are; low rate of complications (infection, haematoma and gaping) and rapid healing with cosmetically better appearance. This results in closing dead space, supporting and strengthening wound until healing is completed and approximating

skin edges for the aesthetic results minimizing bleeding and risk of infection (4). Skin union can be observed by 48 hrs of the surgery and complete union take place by the seventh post-operative day. Surgical closure also serves functional and aesthetic purposes, for example, the elimination of dead space by approximating the subcutaneous tissues; careful epidermal alignment resulting in minimisation of scar formation; and avoidance of a depressed scar by precise eversion of skin edges (5).

There are several techniques to close the skin; interrupted mattress, subcuticular adhesive types and staplers. Each technique has its own advantages and disadvantages. The subcuticular technique involves running a stitch through subcuticular or epidermal tissue. This is an easy method of approximation of skin. Interrupted vertical mattress stitch involves piercing the skin at four points at the same level for a single stitch with a good amount of subcuticular tissue and fat. This closure allows blood and serosanguinous tissues to drain. However, this technique is time consuming (6).

Caesarean section has no universally agreed standards on operative techniques or materials to use. There is no conclusive evidence about how the skin should be closed after caesarean section. Questions regarding the best closure techniques and outcome are remaining unanswered. Post-operative wound related complications and scar related morbidity following caesarean section is important to women for the optimal obstetric care. There is no conclusive evidence to say whether any particular technique for closing abdominal wound in caesarean section is better than the other.

In the current context due to limitations of the evidence particularly of skin closure, obstetricians use different closing techniques to approximate the skin during caesarean section. The aim of the study was to compare wound outcome and maternal satisfaction in subcuticular and interrupted techniques for skin closure in caesarean section.

Methods

The study was carried out in selected 400 women who had caesarean delivery with Pfannenstiel incision for the first time in a single obstetrics unit. There were three age categories (<25 years, 26-35

years and >35 years) and four BMI categories (underweight, average, overweight and obese). It was make sure to allocate approximately similar number of mothers consecutively for each category while assigning woman for two methods of suturing to get 200 mothers in each group for the prospective assessment of the outcome. Interviewer administrated questionnaire was used for the data collection. The questionnaire consisted of three sections. Section one was related to demographic data, section two contained data on wound related complications and last section was on patient satisfaction. Data collection was done at postoperative day 1, day 3 and day 14. Women were advised to seek immediate medical advice if there were any wound related complications during follow up period.

Women with diabetes, multiple pregnancies and maternal medical problems were excluded from the study. All caesarean sections had been performed by trained middle grade medical officers under the supervision of the obstetrician without giving any preference to either of the techniques. Group1 consisted of women with subcuticular suturing for incision closure with absorbable material (No. 3.0 polyglecaprone and group 2 consisted of women with interrupted suture with non-absorbable material (No. 0 Nylon). Perioperative antibiotics had been given prior to the procedure in all cases. Routine skin cleaning was done with povidone iodine and ethyl alcohol. Skin incision was performed with Joel-Cohen incision. Rest of the caesarean section was done in the standard way. On the post-operative day 3, the two groups of women were asked to indicate the level of post-operative pain using a visual analogue scale. The dressing was open on the third day and wound was inspected for any complications. Uncomplicated patients were discharged on post-operative day 3 and women in group 2 were advised to have suture removal on day 7. After two weeks of the surgery, mothers were assessed for wound related complications and their overall satisfaction was assessed using 1 to 5 satisfaction score. Categorical variable of satisfaction was ranging from not satisfied to highly satisfied.

Ethical approval was obtained from Ethical Review Committee, Faculty of Medicine, University of Ruhuna. Informed written consent was obtained

from all participants. Data were stored in password protected database and were analysed for the statistical significance by chi-square test for qualitative data and t-test for quantitative data.

Results

Table 1 summarizes baseline characteristics of the study groups. There were 400 women recruited for the study with 200 in each group. Approximately two third of women belong to age category of 26-35 years in both study groups. Approximately 40% of women in both groups were within the normal range for BMI. More than 90% of women were Sinhala Buddhists. Half of the women in both groups had studied up to A/L. In both groups almost half of women underwent elective caesarean sections. There was no statistically significant difference in study groups with regards to baseline characteristics.

Table 2 summarizes outcome of different suture techniques. In both groups, a vast majority of women experienced moderate to severe pain and it was significant in women with interrupted suture technique compared to subcuticular technique (91.5% vs. 80.5%, (p<0.05). Overall wound complications were observed more in interrupted group than in the subcuticular group (8% vs. 3%, (p<0.001). There was a clinically significant difference in wound complications in interrupted group than in subcuticular group. There was a statistically significant difference of overall satisfaction with 64.5% of women in subcuticular group vs. 28% in interrupted group (p<0.001).

Table 1: Socio-Demographic characteristics of the participants (n=400)

Demographic Characteristics	Category	Subcuticular		Interrupted		p value
		Frequency (n=200)	Percentage (%)	Frequency (n=200)	Percentage (%)	
Age (years)	≤ 25	37	18.5	40	20	0.92
	26 - 35	138	69	135	67.5	
	> 35	25	12.5	25	12.5	
BMI	Under wt.	42	21	40	20	0.35
	Normal	84	42	88	44	
	Over wt.	39	19.5	31	15.5	
	Obese	35	17.5	41	20.5	
Race	Sinhalese	186	93	184	92	0.7
	Other	14	7	16	8	
Religion	Buddhist	185	92.5	184	92	0.85
	Other	15	7.5	16	8	
Educational level	≤ O/L	119	59.5	102	51	0.09
	≥ A/L	81	40.5	98	49	
Category of LSCS	Emergency	88	44	97	48.5	0.37
	Elective	112	56	103	51.5	

Table 2: Outcome of different suture techniques

Outcome variables	Categories	Subcuticular		Interrupted		p value
		Frequency (n=200)	Percentage (%)	Frequency (n=200)	Percentage (%)	
Pain (visual analogue scale)	< 5 (mild)	39	19.5	17	8.5	< 0.05
	> 5 (moderate to severe)	161	80.5	183	91.5	
Overall wound complications	Present	6	3	16	8	< 0.001
	Not present	194	97	184	92	
Different types of Wound complications	Seroma	3	1.5	4	2	-
	Hematoma	1	0.5	3	1.5	
	Gaping	4	2	9	4.5	
Overall Satisfaction	None	192	96	184	92	< 0.001
	Satisfied	129	64.5	56	28	
	Not satisfied	71	35.5	144	72	

Discussion

Current study showed that women who had subcuticular suturing technique had less post-operative pain, better wound outcome and more satisfaction compared to interrupted suture technique.

As caesarean section is the most common surgical procedure performed worldwide, incision related morbidity is of paramount importance for the overall improvement of maternity care. Out of other modalities of deliveries, caesarean section related pain is worse. Skin closure significantly contributes for the severity of pain. In this study, subcuticular group had less pain score than interrupted group. This may be due to involvement of more tissue bulk with tightening in the interrupted suturing technique.

Approximately 10% of women suffered from wound related morbidity, mostly due to approximation of the skin. Our study found that occurrence of wound complications in interrupted group more than in the subcuticular group. Choudhary A, *et al.* has reported that subcuticular absorbable material offered better skin approximation and healing than interrupted suture which needed re-suturing more often (7). Makeen, *et al.* in their systematic review of Cochrane database on techniques and material for closure of caesarean section found that non

absorbable staples were associated with increased risk of separation and resuturing than absorbable subcuticular suturing (6).

In randomized controlled trials performed by Brown JK, *et al.* they compared subcuticular absorbable suturing to skin adhesives. They had observed that there was no difference in cosmetic outcome in skin closure provided adhesive skin approximation for proper healing. Skin adhesives on the other hand are more expensive than suturing though it reduces operating time (8).

It was found that subcuticular suture is not only cost effective but also saves operating time when compared to interrupted mattress. A study done by Choudhary A, *et al.* in 2017 revealed that subcuticular absorbable suture is superior to interrupted mattress when wound outcome is considered. Time taken for skin closure was less and approximation was better without tension. Women were discharged earlier since there was no need for suture removal (7).

Guruswami, *et al.* in their systematic review in Cochrane database compared continuous vs. interrupted mattress for non obstetric surgeries found that superficial wound adhesions may be reduced by using subcutaneous continuous sutures. This observation is in agreement with our findings of

lesser incidence of wound gapping with subcuticular techniques (9).

This study also shows that women's satisfaction score was much higher in subcuticular group than interrupted group. This reflects overall less postoperative pain and minimal wound related morbidity in subcuticular group than interrupted group. Similar finding was reported by Aliya I, *et al.* in 2011(10).

Limitations

There are some limitations of this study. We have considered the BMI of these patients but not the other parameters such as skin thickness and variability of the thickness of abdominal fat layer which could have influenced the wound outcome more than the BMI. Further, the sections were performed by different medical officers under the supervision of an obstetrician rather than a single surgeon performing the technique in all patients.

References

1. Wylie BJ, Gilbert S, Landon MB, Spong CY, Rouse DJ, Leveno KJ, *et al*. A comparison of transverse and vertical skin incision for emergency cesarean delivery. *Obstet Gynecol.* 2010; **115**(6): 1134-40.

2. Figueroa D, Jauk VC, Szychowski JM, Garner R, Biggio JR, Andrews Wet al. Surgical staples compared with subcuticular suture for skin closure after cesarean delivery: a randomized controlled trial. *Obstet Gynecol,* 2013; **121**(1):33-8.

3. Altman AD, Allen VM, McNeil SA, Dempster J. Pfannenstiel incision closure: a review of current skin closure techniques. *J Obstet Gynecol Canada.* 2009; **31**(6): 514-20.

4. Walter JB, Israe lMS. Wound healing, Textbook of General Pathology, 6th ed. Ch.**9**: 124-5.

5. Vuolo, Julie Caroline. Assessment and management of surgical wounds in clinical practice. *Nursing Standard*, 2006; **20**(52): 46-52. *Gale Academic OneFile*, Accessed 16 Sept. 2019.

6. Mackeen AD, Berghella V, Larsen ML, Techniques and materials for skin closure in caesarean section. *Cochrane Database Syst Rev,* 2012; **11**: Cd003577.

7. Choudhary A, Bansal N, Chaudhari P. Closure of Pfannenstiel skin incisions in cesarean sections: comparison of wound outcomes with interrupted mattress vs. subcuticular suture. *Int J Reprod Contracept Obstet Gynecol,* 2017; **6**: 2964-8.

8. Brown JK, Campbell BT, Dronogowski RA, Alderman AK, Giger JD, Teitlbaum DH, *et al.* A prospective, randomized comparison of skin adhesive and subcuticular suture for closure of pediatric hernia incisions: cost and cosmetic considerations. *J Pediatr Surg,* 2009; **44**(7): 1418-22.

9. Guruswamy KS, Toon CD, Allen VB, Davidson BR. Continuous versus interrupted sutures for non-obstetric surgery. *Cochrane Database Syst Rev*, 2014 14 February Cd010365.

10. Aliya I, Amdreen E. Comparison of suture material and technique of closure of subcutaneous fat and skin in caesarean section. *N Am J Med Sci,* 2011 Feb; **3**(2): 85-88.

Evaluation of bipolar lengths of the kidneys in healthy Sri Lankan adults in view of assessing the need for nomograms

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ABSTRACT

Introduction: Renal sizes are of immense use to diagnose renal pathologies. As ethnic variations are known to influence renal sizes, we aimed to assess the ethnic variations in bipolar renal length (RL) and kidney to body height ratio (KBR) of a young adult Sri Lankan population.

Methods: Healthy adults were recruited, by excluding subjects with previous renal surgeries, renal diseases, or other chronic illnesses. Bilateral RLs were measured sonographically.

Results: The study sample consisted of 215 individuals (100 females) with an age range of 19-36 years (mean age=24 years). Mean right RL was 9.77±0.78cm; mean left RL was 10.16±0.83cm; mean KBR of the right kidney was 0.60±0.05mm/cm and left kidney was 0.63±0.05mm/cm. Right and left RLs and KBRs of males were 9.82±0.76cm; 10.3±0.78cm and 0.59±0.05mm/cm; 0.62±0.05mm/cm respectively and same parameters in females were 9.71±0.8cm; 10.0±0.9cm and 0.62±0.05mm/cm; 0.64±0.05mm/cm respectively. Irrespective of gender, left RL and KBR were higher than those of the right side (p<0.001). RLs were significantly different (p<0.05) compared to European and North American populations.

Conclusions: This preliminary study can be considered as the first step in establishing age and gender specific reference values for RL and KBR for a Sri Lankan population. Due to ethnic variations, accuracy of using renal nomograms from other populations as reference values raises serious concerns.

Keywords: *Bipolar length, healthy adults, kidney to body height ratio, ultrasonography*

Introduction

Kidneys are paired retroperitoneal organs serving an excretory function. Renal size alterations are frequently described in various renal pathologies, while the renal size is a decisive factor in obtaining a successful renal biopsy sample (1). For many more reasons, including diagnosis and management of renal pathologies, having an accurate understanding of normative renal sizes is essential. While bipolar renal length (RL) has been considered the traditional measurement in renal size assessment, kidney to body height ratio (KBR) has recently described as a more reliable parameter due to minimal gender and body height dependency (2,3).

Organ morphometry can be assessed during cadaveric / surgical dissections or using radiological images. Although cadaveric specimens resemble in vivo human organs with fair accuracy, a certain degree of tissue alterations during the preservation process could influence the organ size (4,5). Whereas, ultrasonography is of immense use in assessing organ morphometry due to its real-time imaging facility, non-invasiveness, free availability, safety and cost-effectiveness while having proven reliability in renal size measurements (1-3, 6).

Renal size is dependent on several factors such as age, gender, and height of the subject. Previously described ethnic variations in renal sizes are perhaps partially representative of variations in age, gender, or height of the subject (3,7,8). Since data regarding normal renal dimensions are scarce for the Sri Lankan population, normal reference values are obtained from Western populations. In Western countries, bipolar length below 9 cm is considered as the threshold to diagnose irreversible renal failure; however, this value appears to be within normal range for some Asian populations (8). Thus, the use of Western reference ranges may lead to a false-positive diagnosis of renal diseases (8). Hence, it is exigent to have benchmark renal parameters for the Sri Lankan population. This need is further underscored by the possibility for diagnostic and therapeutic decisions to be influenced by false-positive renal measurements. Therefore, in this study, we evaluated the normal RL and KBR of a selected healthy young adult Sri Lankan population to establish population-specific reference values and to describe geographical variations in such parameters.

Methods

A retrospective, cross-sectional review of patients, presenting to a health care centre in the Southern Province of Sri Lanka for medical checkups from March 2015 to March 2017, identified as the (n=215) study subjects. Ethical approval for the study was obtained from the Ethical Review Committee of Kotealawala Defense University of Sri Lanka (RP/2018/13). Age and sex-matched male and female study subjects were within 18 - 40 years of age. The subjects were excluded from the study if they were found to have serum creatinine values >1.5 mg/dL (done within last three months), diagnosis of chronic illness, acute illness at the time of investigation, past history of renal calcular disease or renal surgeries, recurrent urinary tract infections, history of childhood renal diseases; renal cysts, asymptomatic renal calculi, unilateral kidney or other congenital morphological renal anomalies, or discrepancy of >1.5 cm between right and left bipolar lengths. The eligible subjects were identified by analysing the clinical history through review of the available medical records.

Subjects' date of birth was used to calculate the age, and the personal height was measured using a stadiometer, in standing erect position without footwear, according to the standard protocols.

Ultrasonographic renal evaluation was performed by an experienced radiologist using the 3.5 MHz curvilinear probe of the high-end ultrasound scanner GE Volusion scanner (Seongnam, Gyeonggi, Korea; released to the market in 2016). All of them were fully hydrated and had a full bladder at the time of the investigation. The subjects were lying on left lateral recombinant position for the right kidney examination and vice versa for the left kidney examination. All the measurements were obtained during full inspiration while taking precautions to avoid freezing an oblique image of the kidney. Maximum pole to pole length of each kidney was measured in the frozen image to the nearest 0.1 mm (Figure 1). Each measurement was repeated thrice, and the average was taken for calculations.

Figure 1: Ultrasound image of kidney showing bipolar renal length measurement (white dotted line-bipolar length)

The kidney to body height ratio (KBR) was calculated for each kidney by the following: dividing the renal length in millimeters by the subject's body height expressed in centimeters (2).

Statistical analysis

Statistical analysis was performed using SPSS 20 IBM statistical software. Categorical variables were expressed as percentages, and continuous variables were expressed as means, standard deviations, ranges, percentiles and inter-quartile ranges.

The right and left renal lengths were compared using paired sample T-test, and gender variation of the measurements were compared using an independent sample T-test. P values less than 0.05 were considered as statistically significant.

Results

Out of all studied subjects (n=215), 46.5% (n=100) were females and 53.4% (n=115) were males; no significant age difference was observed among male and female study populations (T=0.376; p>0.05). Mean age and height (2 SD) of the study population was 24 (4.3) years and 162.0 (8.15) cm, respectively. The baseline characteristics of the study sample and the renal measurements are tabulated (Table 1). The left kidney was longer than the right kidney (p<0.001) with a mean difference of 0.39 mm between right and left kidneys. Left KBR was higher than right KBR (p<0.001) with a mean difference of 0.03 mm/cm.

Basic demographic data and renal sizes of male and female study populations are tabulated (Table 2). Male subjects were taller than female subjects (T=11.914; p<0.001). Similarly, the males had longer kidneys compared to females (p=0.01), while mean renal length difference of the right and the left kidney of male and female study population was 0.11 cm and 0.25 cm, respectively. By contrast, females had higher KBR values compared to males (p<0.001). Though a significant gender influence was shown on right KBR (T= 4.938; p<0.0001) and left KBR (T= 3.107; p<0.002), the gender influence was shown only on the left renal length (T=-2.56; p=0.011; versus right renal length: T=1.04; p=0.298).

Table 1: Baseline characteristics and renal measurements of the study sample

Parameters		Right kidney (n=215)	Left kidney (n=215)
RL (cm)	Mean (SD)	9.77 (0.78)	10.16 (0.83)**
	Range	8.1 - 12.34	7.8 - 12.36
	Median	9.8	10.2
	Inter quartile range	9.2 - 10.2	9.6 - 10.7
	10th-90th percentiles	8.8 - 10.8	9.0 - 11.4
KBR (mm/cm)	Mean (SD)	0.60 (0.05)	0.63 (0.05)**
	Range	0.47 - 0.75	0.46 - 0.78
	Median	0.60	0.63
	Inter quartile range	0.57 - 0.63	0.59 - 0.66
	10th-90th percentiles	0.54 - 0.67	0.56 - 0.70

RL- renal length; KBR- kidney to body height ratio; ** p<0.001

Table 2: Baseline characteristics & renal measurements of male and female study populations

	Male (n=115)	Female (n=100)
Age (years)	24 (4.5)	24 (4.06)
Height (cm)	166.79 (6.3)	156.49 (6.3)
R/K length (cm)	9.82 (0.76)*	9.71 (0.8)*
L/K length (cm)	10.30 (0.78)*	10.0 (0.9)*
R/K KBR (mm/cm)	0.59 (0.05)**	0.62 (0.05)**
L/K KBR (mm/cm)	0.62 (0.05)**	0.64 (0.05)**

R/K- right kidney, L/K- left kidney, KBR- kidney to body height ratio; results are expressed as mean (SD); * p<0.05; ** p<0.001

Discussion

While renal sizes are a surrogate indicator of renal function, they often are the cornerstones of diagnosing and monitoring renal pathologies. Among numerous non-invasive technologies that assess renal sizes, ultrasonography is widely used due to its free availability and cost effectiveness. Whilst the renal length (RL) or the bipolar length has been the most frequently measured parameter, there has been increasing interest in measuring kidney to body height ratio (KBR) for renal size assessment (2). Here we report normal values for both RL and KBR for young adult Sri Lankan population; both RL and KBR of the left side were found to be higher than those of the right side. We also report a gender variation in both RL and KBR with males having longer kidneys whilst the opposite was true for KBR.

In comparison to the RL that were reported for a Sri Lankan farming population from North Central Province, this study reports slightly longer right and left kidneys for both genders. However, the RL difference between two populations was not statistically significant (T=1.73; p=0.11; Figure 2) (9).

Reasons for this discrepancy in RL among Sri Lankan populations could be multi-factorial. First, Nadeeshani, *et al*. recruited subjects with a wide age range (<40 years to <60 years). Perhaps their mean RL would have been influenced by the age-dependent gradual decrease in renal mass, which is particularly obvious in the subjects older than 60 years (3,8). Secondly, the farmers from North Central Province might be suffering from sub-clinical chronic kidney disease of which the renal size reduction could be considered as an early feature (10).

The mean renal lengths of the studied Sri Lankan population were compared with renal lengths of other populations using independent sample T-test. Renal lengths of the Sri Lankans were compatible with those reported for Indian (T=1.53; p=0.13) and Malaysian (T=0.41; p=0.36) populations (7,8). By contrast, it was significantly smaller than Kuwaiti (T=3.73; p=0.03), Mexican (T=2.58; p=0.06), Croatian (T=0.539; p=0.014) and Iranian (T=4.72; p=0.02) populations (3,11-,13) (Fig. 2).
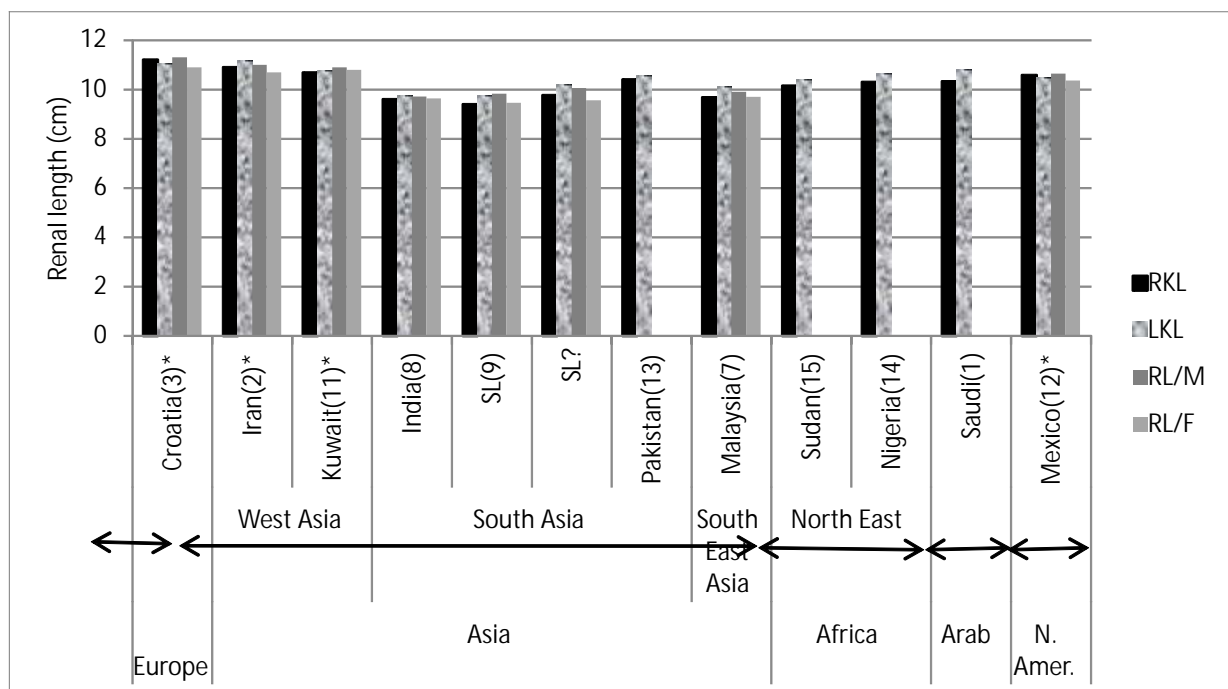

(RKL- right kidney length; LKL- left kidney length; RL/M- renal length in males; RL/F- renal length in females; SL?- current study; SL- Sri Lanka; N. Amer.- North America; *p<0.05); (1-3,7-9,11-15)

Figure 2: Comparison of bipolar lengths among different population

Except for Sudanese population, our cohort had significantly smaller kidneys compared to Pakistani (T=2.98; p=0.05), Saudi (T=1.95; p=0.09), Nigerian (T=1.97; p=0.09) and Sudanese (T=1.28; p=0.16) populations (1, 13 - 15). Collectively a clear national variation in the renal lengths is demonstrated. Moreover, perhaps a geographical influence is contributing to the observed ethnic variation in renal lengths in the following way: renal lengths of populations from Europe, Western Asia, and North America were significantly longer than those from South-Asian populations, whilst renal lengths of populations from Africa and the Middle-East were not significantly different from those reported for South-Asian and South-East-Asian populations (Figure 2) (1,3,7,8,11,12,15). Since the renal sizes of the Pakistani population has shown a minor deviation from the rest of South-Asian populations, factors such as genetic influence and nutritional pattern on the body composition might also influence on renal sizes (13).

Therefore, ethnic as well geographical influences on renal length need to be considered carefully; hence considering normative parameters from remote geographical regions as the reference values need to be reconsidered. Further, having an insight into renal sizes of different ethnicities would help develop medical technologies such as and angiogram catheters.

Though the difference was not significant, the KBR values of the Croatian (T=1.99; p=0.09) and Iranian (T=2.59; p=0.02) populations were found to be higher than the Sri Lankan values (Figure 3) (2,3). Taking into account that these populations have demonstrated a significant ethnic variation in renal length; KBR would likely serve as a better parameter due to minimum ethnic influence. However, considering the scarcity of KBR values specific to different populations, evidence is still insufficient to postulate conclusions on applications of KBR.
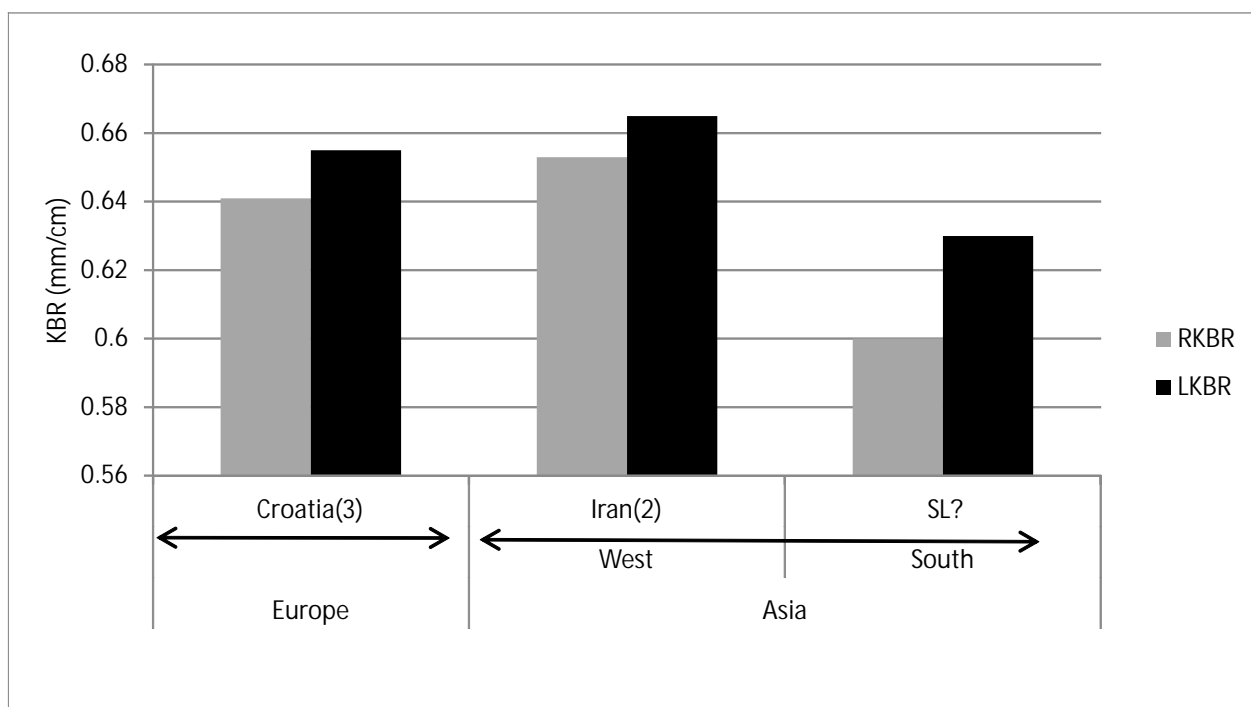
(RKBR- right kidney to body height ratio; LKBR- left kidney to body height ratio; KBR- kidney to body height ratio; SL? current study) (3,2)

Figure 3: Comparison of KBR among different populations

Though the left kidney is reported to be significantly longer than the right kidney (1,7,8,11,15,16), few studies have reported a reciprocal finding (3,12). This study is in agreement with several other studies that reported a significant KBR difference between right and left kidneys (2,3). Similarly, the left kidney reported to have a higher volume than the right kidney. It is known that the renal volume is influenced by the tissue mass in the kidney (16). Thus, there appears to be a discrepancy in renal tissue mass and the number of nephrons in either side.

The current study has shown a significant gender difference only for the left RL, while some other studies have reported a gender difference for both kidneys (2,3). Similarly, we have shown a significant gender difference for bilateral KBRs, contradicting the findings of several other studies those have reported lack of gender variability in KBR (2,3). Whether such difference in RL and KBR among populations has arisen due to ethnic influences or merely due to statistical artefacts needs to be considered in large population based studies.

A strength of this study is that bipolar lengths were assessed by a single experienced radiologist, thus inter-observer variability has been eliminated. Further, since the low inter and intra-observer variability in sonographic assessment of renal lengths has been demonstrated in multiple studies, the use of ultrasonography is fully justified to assess renal lengths (17). This study is limited by a relatively small sample size of a single geographical region, and it should be considered before generalization of study findings to the larger Sri Lankan population. Assessment of other linear or volumetric renal parameters along with RL and KBR would further improve the applications of nomograms. This study highlights the need for a renal size nomograms, specific for ethnic groups or geographical regions, which should be established with multi-centre studies, recruiting larger numbers of healthy adult subjects, representing different age groups, ethnicities, and geographical regions.

In conclusion, this preliminary study has provided normal renal lengths and kidney to body height ratios for a Sri Lankan young adult population, whilst underscoring the significance of developing renal nomograms for Sri Lankan population at larger. Further, considering the given gender and side differences in renal measurements, it is advisable to have gender as well as side specific renal nomograms.

This study should be considered as an initial step in developing such ultrasonic renal nomaograms for the Sri Lankan population.

References

1. Hammad LF. A sonographic study of kidney dimensions in Saudi's University Students. *Pakistan J Med Sci,* 2012; **28**: 395-399.

2. Hekmatnia A, Yaraghi M. Sonographic measurement of absolute and relative renal length in healthy Isfahani adults. *J Res Med Sci*, 2004; **2**: 1-4.

3. Mileti D, Fu kar Ž, Šusti A*, et al.* Sonographic measurement of absolute and relative renal length in adults. *J. Clin. Ultrasound,* 1998; **26**: 185-189.

4. Balta JY, Cronin M, Cryan JF, *et al.* The utility of cadaver-based approaches for the teaching of human anatomy: A survey of British and Irish anatomy teachers. *Anat Sci Educ,* 2017; **10**: 137-143.

5. Fraser KW. Effect of storage in formalin on organ weights of rabbits. *N. Z. J. Zool,* 1985; **12**: 169-174.

6. Emamian SA, Nielsen MB, Pedersen JF. Intra observer and inter observer variations in sonographic measurements of kidney size in adult volunteers. A comparison of linear measurements and volumetric estimates. *Acta Radiol,* 1995; **36**: 399-401.

7. Arooj A, Lam J, Wui YJ, *et al.* Comparison of renal size among different ethnicities. *Int J Biol Biomed Eng,* 2011; **5**: 221-229.

8. Muthusami P, Ananthakrishnan R, Santosh P. Need for a nomogram of renal sizes in the Indian population–findings from a single centre sonographic study. *IJMR*, 2014; **139**: 686-693.

9. Nadeeshani S, Dassanayake R, Kodithuwakku U. Ultrasonic Assessment of Kidney Length in a Sri Lankan Farming Population. *Anuradhapura Med J,* 2015; **9** (Supp 2): S07. Abstract.

10. Gunathilake SK, Samaratunga SS, Rubasinghe RT. Chronic kidney disease (CKD) in Sri Lanka – current research evidence justification: A review. *Sabaragamuwa Univ J, 2015*: **13**: 31-33.

11. El-Reshaid W, Abdul-Fattah H. Sonographic assessment of renal size in healthy adults. *Med Princ Pract,* 2014; **23**: 432-436.

12. Oyuela-Carrasco J, Rodríguez-Castellanos F, Kimura E, *et al.* Renal length measured by ultrasound in adult mexican population. *Nefrol publicacioǹ of la Soc Espanõla Nefrol* 2009; **29**: 30-34.

13. Buchholz NP, Abbas F, Biyabani SR, *et al.* Ultrasonographic renal size in individuals without known renal disease. *J Pak Med Assoc,* 2000; **50**: 12-16.

14. Okoye IJ, Agwu KK, Idigo FU. Normal sonographic renal length in adult southeast Nigerians. *Afr J Med Med Sci,* 2005; **34**: 129-131.

15. Abdoelrahman HA, Mansour AA, Gar-elnabi MEM, *et al.* Ultrasonographic renal length and parenchymal thickness in normal Sudanese population. *Int J Sci Res,* 2016; **5**: 623-635.

16. Emamian SA, Nielsen MB, Pedersen JF, *et al.* Kidney dimensions at sonography: correlation with age, sex, and habitus in 665 adult volunteers. *Am J Roentgenol,* 1993; **160**: 83-86.

17. Ablett MJ, Coulthard A, Lee RE, *et al.* How reliable are ultrasound measurements of renal length in adults? *Br J Radiol*, 1995; **68:** 814-1087.

Prevalence of low vision among adults in Galle District, Sri Lanka

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ABSTRACT

Introduction: The global initiative to prevent avoidable blindness in the world has taken several measures to accomplish their theme "Vision 2020 – Right to Sight". However, visual problems still remain among the least priority in preventive care. Visual impairment is common after 40 years of age. Thus, it is important to identify the problem of low vision in the community where majority can be easily identified and corrected with minimum cost. This study was aimed to determine the prevalence of low vision among adults aged 40 - 60 years in Galle District, Sri Lanka.

Methods: A Community based cross sectional study conducted in Galle District among adults aged 40 - 60 years. Multistage cluster-sampling method was adapted to select subjects from both urban and rural areas in the district. An interviewer administered questionnaire was administered to collect their demographic and social information followed by checking the visual acuity (VA), using the Snellen chart in the standard manner.

Results: A sample of 708 people recruited and the majority (30.8%, n=218) were in the 40-44 years age group with a mean age of 49.0 (SD 6.2) years. There were 52.3% (n=370) females in the study sample with a male, female ratio of 1 : 1.09. Of the study sample, 88.9% (n=630) were from the rural sector. The prevalence of low vision and blindness for the uncorrected VA was 37.1% (n=263) (CI 95% 33.5 - 40.7) and 0.6% (n=4) (CI 95% 0.56 - 0.65) respectively. Thus the total with visual impairment in the study sample was 37.7% (n=267). When considering the presenting VA, the prevalence of low vision and blindness was 28.1% (n=199) (95% CI: 24.8 - 31.4) and 0.4% (n=03) (95% CI: 0.37 - 0.43) respectively. The total visual impairment of the study sample was 28.5% (n=202). Among all people with visual impairment, 24.3% (65/267) have already corrected their defects.

Conclusions and Recommendations: The prevalence of uncorrected low vision among adults aged 40 - 60 years in Galle district was approximately thirty seven percent. Majority of people with visual impairment have not corrected their defects. Therefore, the policy makers and the health planners have to look into this problem to address the correctable proportion with low vision in this population.

Keywords: *Adults, low vision, Sri Lanka*

Introduction

"Vision 2020 – Right to sight" is the theme of global initiative to prevent avoidable blindness in the world. Sight is a gift given by nature to everybody healthy when they are born but can lose it due to many reasons. According to previous studies, many causes of blindness are avoidable or correctable by recognizing the problem at the correct time and providing simple interventions and modifying relevant risk factors.

The first global estimation of visual impairment done in 1975 indicates that 28 million people were

blind. The estimates done in 1996 reveal that there were 45 million people who were blind and another 135 million with low vision. Among those who were blind, 60% were due to refractive errors and cataract. When these data are projected to the 2020 world population, it has been estimated that this will be doubled in 2020. Out of all treatable eye diseases and treatable causes of blindness, it has been estimated that 75% of all blindness in the world could have been prevented .

Sri Lanka is lacking data regarding the magnitude of visual problems in the community except for a few individual studies conducted on this. The census population and housing survey conducted by the Department of Census and Statistics, Sri Lanka have looked into disabilities in seeing as self-reported by participants. It reports that 41.0 per 10,000 population in Sri Lanka have some sort of disability either due to total blindness, blindness in one eye or due to weak vision. Out of the total male population, 46.6 per 10,000 and out of the total female population 48.7 per 10,000 are having difficulty in seeing. Galle District Department of Census and Statistics reports that 47.7 per 10,000 population in Galle district have difficulty in seeing. The prevalence of blindness in Sri Lanka was nearly 0.5% according to the survey conducted by Eye Care Sri Lanka in 20 districts. They have found that 66% of total blindness was due to cataract .

First national Steering Committee for the Prevention and Control of Blindness in Sri Lanka was established in year 2001 following the launching of "Vision 2020 – Right to Sight" global programme. The national eye care plan was laid down in 2004 in line with vision 2020 priorities .

In Sri Lanka the data on low vision has not being reported and therefore not published in the Annual Health Bulletin. Some patients with these problems are managed at out-patient clinics and at private sector. These data are usually not recorded. It is important to identify the problem of low vision in the community, out of which refractive errors that can be corrected easily and cheaply. Knowing the magnitude of the problem will support the health planners and managers to launch their activities at grass root level to address the needy people in the community in order to achieve the goals of vision 2020. Therefore, this study was designed to determine the prevalence of low vision among adults aged 40 - 60 years in the Galle district.

Methods

A community based cross sectional study was conducted in Galle District of Southern Province, Sri Lanka to determine the prevalence of low vision among adults aged 40 - 60 years in 2011. Galle District has a population of 990,487 belonging to a mixed ethnicity in a land area of 1617 km^2. Majority (87%), of the population reside in rural areas with urban to rural ratio of 1 : 8. Thirty four percent of population belongs to the age category of 40 - 60 years .

The sample size was calculated using formula [n = $Z^2_{1-\alpha/2}$ $P(1-P)/d^2$] for the descriptive study. According to previous studies done in the Galle district, the prevalence of low vision was 28.8%. Therefore, a prevalence of 30% was used as the anticipated population proportion of low vision in this study. Z score of 1.96 corresponding to an alpha error of 5%, P value of 0.3 and absolute precision (d) of 0.05 considered.

Since cluster-sampling method was adapted the calculated sample size (n=323) was multiplied by the design effect to overcome effects of clustering. This is usually estimated using the results of previous studies of similar design and subjects. Due to the unavailability of previous information about the degree of homogeneity the design effect was taken as two. Further, to compensate for dropout rate another 10% was added to the sample . Accordingly, the total sample size was 711. Since data was collected from 36 equal clusters (20 study subjects from each cluster) the recapitulated final sample size was 720.

Adults between 40 - 60 years who have been residing in the Galle district for a continuous period of three months or more from the date of data collection were included into the study from the selected households. If a single house had more than one family, all families were included into the study and all eligible individuals in a single household were included. Any person who was found to be bed bound among those who fulfilled criteria given under the inclusion criteria was excluded as it was difficult to measure the visual acuity (VA) in them.

To ensure the proportional representation of the urban and rural subjects in the sample, selection of 36 clusters was done at the level of Grama Niladari (GN) divisions located in both areas proportionate to the urban / rural population proportion in the Galle district. In the field, the starting point for recruitment of eligible subjects from a cluster was done by going to the office of the GN in the particular cluster and selecting the direction randomly. All households on either side of the road in that direction was screened for eligible individuals until the required sample size of 20 people were selected.

The principal investigator and six pre-intern medical officers as data collectors and the area GN comprised the field team. The data collectors were trained at the Community Ophthalmology Centre, Faculty of Medicine, University of Ruhuna by a Community Ophthalmologist to refresh their knowledge on VA checking, basic eye examination and on identification of cataract using torch light. Community Ophthalmologist rechecked fifty percent of the study subjects in the field to assess the reliability of field examination and diagnosis. Difficult cases were referred to the Community Ophthalmology Centre for specialist opinion and people with cataract were referred to the Teaching Hospital Karapitiya for necessary treatment.

After obtaining the informed consent an interviewer administered questionnaire was administered. Then the visual acuity was measured using the Snellen chart in the standard manner. Presenting VA was assessed using a standard Snellen chart of numbers (non-illuminating type) at 6 meters. For those who are illiterate tumbling E type of Snellen chart was used. Whenever possible the VA was assessed in good light, outdoors in a seated position. Each eye was tested while the opposite eye was covered. Person was asked to read from top line first and then the next line below. Once a person has started a line, he or she should finish by guessing at all 5 letters on that line. Once at least three letters are missed on a line and all letters on that line have been attempted, then the person has completed that VA measure.

The study participants were grouped into four categories namely normal vision, mild visual defect, low vision and blind, according to their VA level in the better eye (Figure 1), and the VA was measured with and without correction. Following definitions used by World Health Organization were used in this study.
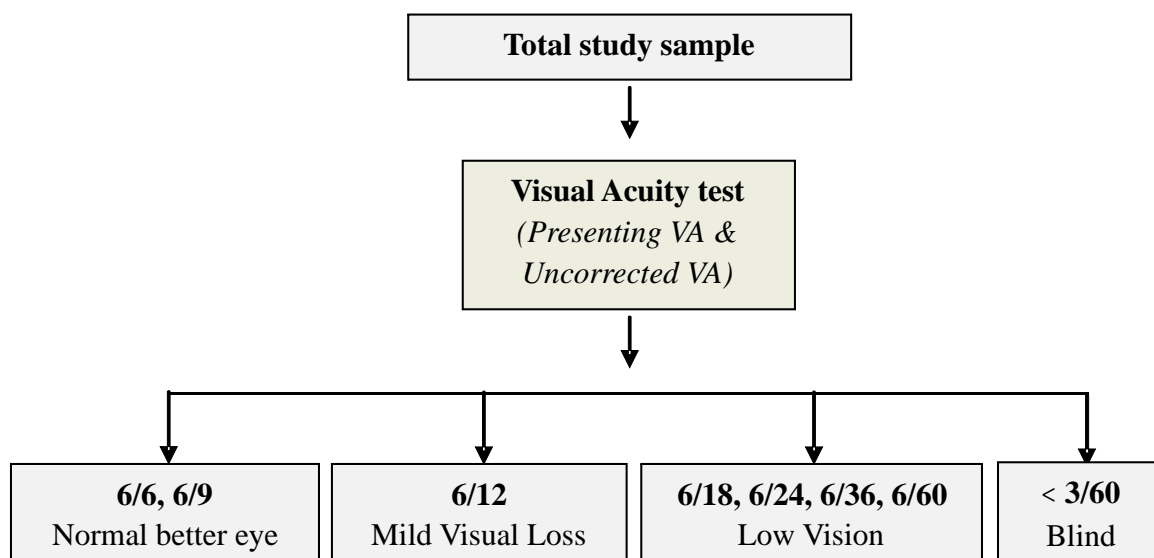

Figure 1: An outline of analysis of the study

Normal vision

Normal vision has been defined as VA of more than 6/9 in better eye (i.e. 6/6 or 6/9 in the better eye).

Low vision

Low vision has been defined as VA less than 6/18 and equal to or better than 3/60 in the better eye.

Visual impairment

Visual impairment has been defined as VA of less than 6/18 in the better eye spanning the low vision and blindness categories as defined above.

Mild visual impairment

The VA 6/12 in better eye was defined as mild visual impairment.

Blindness

Blindness has been defined as VA of less than 3/60 in the better eye or inability to count fingers at a distance of 3 meters in the better eye with or without available means of correction (with spectacles when available).

Uncorrected VA

VA measured without correction (presenting VA on those who are not wearing spectacles and VA without spectacles in those who were wearing spectacles or contact lenses).

Presenting VA

VA measured with spectacles in those who are wearing spectacles or contact lenses (may not be the best corrected VA) and VA without spectacles in those who are not wearing spectacles or contact lenses.

Statistical analysis was done using Epi Info (TM) 3.4.3 database and statistics software for public health professionals from the Centers for Disease Control and Prevention and the SPSS 15.0 software.

Ethical approval was obtained from the Ethics Review Committee, Faculty of Medicine, Galle.

Permission was obtained from the relevant administrative and health authorities. Informed consent obtained from all participants and were given the option to withdraw from the study at any time. The obtained data was handled as grouped data preserving the confidentiality.

Results

The study sample enrolled was 708 persons aged 40 - 60 years, which is within the sample size calculated with non-responders. All subjects gave their consent to participate in the study and the non-response rate was nil.

The distribution of basic demographic characteri--stics of the respondents is presented in Table 1. When comparing the study sample with Galle District census and population statistics, a significant deference in the distribution were found between age groups (p<0.01) and ethnicity (p<0.01) of the study sample and Galle District population. This may be due to extraction of district statistics from 2001 demographic survey on population and housing, after which age group of cohorts may have been shifted. Also, the difference in ethnicity may be due to clustering of religious and other ethnic groups in the normal geographical distribution.

Of the 708 individuals who participated, 338 were males. Majority belonged to the age group 0f 40 - 44 years and 88.4% (n=626) of the sample were married.

Among study participants 40.4% (n=286) had a monthly household income between > Rs. 5,000 to 10,000 rupees while 12.7% (n=90) had a monthly income > Rs. 20,000. Mean monthly income was Rs. 13,516.95 (SD 8729.33) while the range was 2,500 – 75,000 rupees.

The social class of study subjects was calculated according to the social class categorization given by Barker and Hall. According to this 33.3% (n=236) were in Social Class III, 25.9% (n=183) in Social Class V, 22.7% (n=161) in Social Class IV and approximately 17.0% (n=123) in Social Class II. Among males 71.4% (n=241) and among females 64.0% (n=237) had an education level equal to or greater than General Certificate Examination-Ordinary Level [GCE (O/L)].

Table 1: Distribution of demographic and socio-economic characteristics

Characteristics	Study		Adult Group Population in the District*	
	No.	**%**	**No.**	**%**
Age in years				
40 – 44	218	30.8	64,868	29.8
45 – 49	163	23.0	57,076	26.2
50 – 54	152	21.5	53,033	24.4
‡ 55	175	24.7	42,725	19.6
Total	**708**	**100.0**	**217,702**	**100.0**
Mean age±SD = 49.0±6.2 years, Median = 48 in years, Min/Max = 40/60 years				
Sex				
Male	338	47.7	103,094	47.4
Female	370	52.3	114,608	52.6
Total	**708**	**100.0**	217,702	100.0
Area of residence/ Sector				
Urban	78	11.1	25,130	11.7
Rural	630	88.9	188,504	88.2
Total	**708**	**100.0**	**213,634****	**100.0**
Ethnicity				
Sinhalese	689	97.3	206,991	95.2
Tamil	3	0.4	3,942	1.8
Moor and other	16	2.3	6,571	3.0
Total	**708**	**100.0**	**217,504**	**100.0**
Religion				
Buddhist	686	96.9	206,240	94.8
Hindu	3	0.4	2,954	1.4
Islam	16	2.3	6,697	3.0
Roman Catholic/ Christian & other	3	0.4	1,811	0.8
Total	**708**	**100.0**	**217,702**	**100.0**

NS = Not significant

*Dept. of Census & statistics (Census of population & housing) 2001- Galle district

** Excluding the estate population

Visual acuity in the study sample

Out of the total study sample of 708 people, 12.1% (n=86) were using spectacles or contact lenses at the time of enrollment.

The distribution of uncorrected VA and the presenting VA of the study subjects are shown in tables 2 and 3 respectively. The prevalence of low vision and blindness of the above two groups are shown in the table 4. The prevalence of low vision in the uncorrected and presenting subjects was 37.1% and 28.1% respectively. The percentage of subjects with visual impairment was 28.5% (202/708) at the presentation and 37.7% (267/708) when uncorrected indicating that only 24.3% (65/267) people with visual impairment had already corrected their defects at the time of the study.

Table 2: Distribution of uncorrected visual acuity

Uncorrected Visual acuity	Right eye		Left eye		Both eyes		Better eye	
	No.	%	No.	%	No.	%	No.	%
6/6, 6/9	355	50.1	363	51.3	333	68.9	384	55.6
6/12	49	6.9	44	6.2	19	3.9	57	8.6
6/18	73	10.3	81	11.4	32	6.6	85	10.6
6/24	90	12.7	92	13.0	39	8.1	88	11.9
6/36	64	9.0	55	7.8	17	3.5	45	6.4
6/60	67	9.5	63	8.9	39	8.1	45	6.4
≤ 3/60	10	1.4	10	1.4	4	0.8	4	0.6
Total	**708**	**100.0**	**708**	**100.0**	**483**[*]	**100.0**[**]	**708**	**100.0**

[*]*Subjects with different VA in both eyes (225) were not included.*

[**]*Percentages may not sum to 100% due to rounding error.*

Table 3: Distribution of presenting (corrected) visual acuity

Presenting Visual acuity	Right eye		Left eye		Both eyes		Better eye	
	No.	%	No.	%	No.	%	No.	%
6/6 , 6/9	415	58.6	415	58.6	386	74.5	443	62.6
6/12	49	6.9	56	7.9	24	4.6	63	8.9
6/18	69	9.7	71	10.0	29	5.6	70	9.9
6/24	76	10.7	73	10.3	37	7.1	66	9.3
6/36	44	6.2	36	5.1	11	2.1	29	4.1
6/60	46	6.5	48	6.8	28	5.4	34	4.8
≤ 3/60	9	1.3	9	1.3	3	0.6	3	0.4
Total	**708**	**100.0**	**708**	**100.0**	**518**[*]	**100.0**[**]	**708**	**100.0**

[*] *Subjects with different VA in both eyes (190) were not included.*

[**] *Percentages may not sum to 100% due to rounding error.*

Table 4: Prevalence of categories of vision according to uncorrected VA and presenting VA

	Uncorrected Visual Acuity			Presenting Visual Acuity		
	No.	%	CI	No.	%	CI
Mild visual defect	57	8.1	7.52 – 8.71*	63	8.9	8.3 – 9.6*
Low vision	263	37.1	33.5 – 40.7	199	28.1	24.8 – 31.4
Blind	4	0.6	0.56 – 0.65*	3	0.4	0.37, 0.43*
Normal	384	54.2		443	62.6	
Total	**708**	**100.0**		**708**	**100.0**	

* confidence interval for exact probability test was used

Discussion

The magnitude of the problem of low vision has not been studied properly until the vision 2020 global initiative in 1999. The under estimation of actual situation may be due to the different definitions used in interpreting results (12). The best corrected VA in better eye as in the International Statistical Classification of Diseases (ICD) has been used to define visual impairment, low vision and blindness in many of the studies which sparse the actual number with disease (13). Therefore, the real magnitude of the visual impairment should be more than the above in reality.

This study was conducted in the age group of 40 - 60 years because visual impairment is more prevalent in this age group. The effect on occupation, household activities and on the productivity of the country is high in this age group. Other population based studies done in the world have also targeted the age group above 40 years (14). The distribution of age, sex, ethnicity and the place of residence (urban : rural) were closely represented in the study sample and the Galle district target population ensuring the accurate representativeness of the sample.

Visual acuity is the measure of resolving power of the eye, i.e. the ability to distinguish details and the shape of objects. It is the primary measure of visual function in both research and clinical settings. In this study Snellen chart was used to check VA as it is commonly used in community based studies due to wide availability and familiar to data collectors. When classifying persons with visual loss, the definitions and cut offs of VA used by the different researchers were diverse. In this study VA was measured with and without correction and classified according to the Figure 1.

In the study population 55.6% of people were normal in their better eye without correction. When considering the presenting VA, 62.6% were normal in their better eye. Only 24.3% of people in the community with visual impairment have corrected their defects by the means of spectacles or contact lenses by the time of the study. Among the rest majority could improve their vision with an intervention. But some defects could not be totally corrected and they may remain as people with uncorrectable visual impairment.

The prevalence of low vision without correction (by spectacles or contact lenses) was 37.1% in this study. A previous study done in Sri Lanka in a population above 20 years of age, revealed prevalence of low vision as 16.6%. This difference may be due to age group variation since low vision is more common after 40 years of age (5).

In this study, when considering the presenting VA, the prevalence of low vision was 28.1%. But "The Kandy eye study" done in the central part of Sri Lanka found that the prevalence of uncorrected visual impairment among inhabitants equal to or more than 40 years of age was very low (5.9%) (16).

The prevalence of blindness without correction in this study was 0.6% which is comparable to findings of a previous study in Sri Lanka (0.5%) (5) and to that reported in Singapore (0.5%) (15). In the world population, 0.85% were blind ($\leq$ 3/60) with the best corrected vision (17). The study conducted in Kandy, Sri Lanka found that the prevalence of blindness in population of above 40 years of age was 1.1% (95% CI 0.002-0.020) (16), while in the present study it was 0.4% when considering the presenting VA.

Conclusions

The prevalence rate of uncorrected low vision among adults aged 40 - 60 years in Galle district was approximately thirty seven percent. Only a quarter of of people in the community with visual impairment have corrected their defects. Among the rest majority could improve their vision with an intervention.

Recommendations

Similar studies are recommended in other parts of the country to study the magnitude of the problem and to utilize this data in planning and implementation of eye care services in the country. Detection and correction of visual defects should be done at grass root level via low vision clinics conducted at MOH level. Also people should be motivated to attend services by increasing awareness of gravity of the problem.

Limitations

The study was carried out in Galle district, Southern Province of Sri Lanka where the findings may not be generalised to the country. The study was restricted to people who speak and understand Sinhala.

Authors declare no conflicts of interests.

References

1. World Health Organization. World health Organization. Monitoring committee for the elimination of avoidable blindness, Vision 2020 – The right to sight: the global initiative for the elimination of blindness, Report of the first meeting. Geneva. 2006.

2. Frick KD, Foster A. The Magnitude and Cost of Global Blindness: An Increasing Problem That Can Be Alleviated. *Am J Ophthalmol,* 2003; **135**(4): 471-6.

3. Department of Census and Statistics. Information on disabled persons; Census population and housing – 2001, Sri Lanka. 2001.

4. Department of Census and Statistics. Census population and housing 2001 – Population and Housing Data, Galle District. 2001.

5. Wimalasundara S. Fighting for Sight through Community Eye Care in Southern Sri Lanka. In Oration of fifth academic sessions, University of Ruhuna; 2008.

6. Ministry of Health. National programme for prevention and control of avoidable blindness in Sri Lanka – five-year plan. Ministry of Health, 2007-12. 2007.

7. Lemeshow S, Hosmer Jr DW, Klar J and, Lwanga SK. Adequacy of Sample Size in Health Studies. 1st ed. John Wiley & Sons England; 1991.

8. Wimalasundara S, Kumari RAC. A preliminary epidemiology survey of eye diseases in adult rural population of Southern Sri Lanka. *J Coll Ophthalmol Sri Lanka,* 2002; **8**: 22-4.

9. World Health Organization. Global Initiative for the Elimination of Avoidable Blindness, 2006 - 2011 action plan. Geneva. 2007.

10. World Health Organization. Consultation on development of standards for characterization of vision loss and visual functioning. Prevention of Blindness and deafness. Geneva. 2003.

11. Barker DJP, Hall AJ. Practical epidemiology. 4th ed. Churchill Livingstone, London; 1991.

12. Dandona L, Dandona R, What is the global burden of visual Impairment. *BMC Med,* 2006; **4**: 4-6.

13. Krishnaiah S, Srinivas M, Khanna RC, Rao GN. Prevalence and risk factors for refractive errors in the South Indian Adult population: Andhra Pradesh Eye Disease Study. *Clin Ophthalmol,* 2009; **3**: 17-27.

14. Gupta A, Casson RJ, Newland HS, Muecke J, Landers J, Selva D, Aung T. Prevalence of refractive error in rural Myanmar: the Meiktila Eye Study. *Ophthalmology,* 2008; **115**(1): 26-32.

15. Saw SM, Foster PJ, Gazzard G. Causes of blindness, low vision, and questionnaire-assessed poor visual function in Singaporean Chinese adults: the Tanjong Pagar Survey. *Ophthalmology,* 2004; **111**: 1161-8.

16. Edussuriya K, Sennanayake S, Senaratne T, Marshall D, Sullivan T, Selva D, Casson RJ. The prevalence and causes of visual impairment in central Sri Lanka the Kandy Eye study. *Ophthalmology,* 2009; **116**(1): 52-6.

17. West S, Sommer A. Prevention of blindness and Priorities for the future. *Bull World Health Organ,* 2001; **79**: 244-8.

Unpreventable maternal death despite the advances in antenatal care

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Introduction

The annual incidence of aortic dissection (AoD) during pregnancy is about 0.4 cases per 100,000 persons (1). Although it is a rare entity, aortic dissection in pregnancy may result in adverse maternal and fetal outcomes. Half of the aortic dissections occur in the third trimester of pregnancy and in the postpartum period due to the hyperdynaemic state and the hormonal effect on the vasculature (2, 3). Atherosclerosis, hypertension, genetic disorders of connective tissue such as Marfan's syndrome, genetic conditions such as Turner's syndrome, valvular abnormalities of the heart such as bicuspid aortic valve and vascular conditions like preeclampsia and cocaine abuse are some of the risk factors for AoD (4). The pregnancy alone with no underlying preexisting risk factors is a risk factor for AoD (5). The hyperdynamic changes in pregnancy and the increased oestrogen level which suppresses the synthesis of collagen and elastin may have weakened the vascular wall thereby playing an important role in the development of AoD during pregnancy (5).

Although it is difficult to diagnose the AoD, the measurement of diameter of the root of the aorta is a diagnostic criterion to identify the risk of acute AoD. The aortic root diameter more than 45 mm in pregnancy has a high risk for AoD (6).

Case presentation

A 28-year-old, 38-week primi was referred to a tertiary care hospital following sudden onset of burning epigastric pain which developed while returning from the routine visit to the cardiologist.

She was admitted to the hospital around 30 minutes after developing symptoms. She was treated for gastritis in the ward and a few hours later, she developed shortness of breath, tight chest pain and tachycardia. Emergency Lower Segment Caesarian Section (LSCS) was done and a live, non-asphyxiated baby was delivered. Soon after the extubation, she developed a sudden cardiac arrest and despite the intensive resuscitation measures, which include transfusion of six units of blood, she succumbed to injuries.

She was diagnosed with mild aortic regurgitation (AR) and trivial mitral regurgitation (MR) before pregnancy and was referred to the cardiologist during the first trimester and was confirmed with having a low cardiac risk. She was seen by the cardiologist during all three trimesters and was concluded to have low cardiac risk. During the last visit to the cardiologist which was approximately 30 minutes before admission to the hospital, she had undergone a 2D ECHO that has also revealed a low cardiac risk. She was not a known hypertensive and there was no history of connective tissue disorders.

The autopsy revealed 2750 ml of blood in the combined chest cavity and 750 ml of blood in the abdominal cavity. There was a collection of blood which was infiltrated into the mediastinal tissues surrounding the aorta. The collection of blood was present in the subintima of the aorta starting from the root of the aorta extending up to the ostia of the renal arteries in the abdominal aorta (Figure 1). The exact place of the dissection was unable to be determined at the autopsy. The abdominal cavity was normal except the postpartum appearance of the sectioned uterus. There was no bicuspid aortic valve.

Several sections obtained from different sites of the aorta for histology revealed degeneration of tunica media and through and through micro-tears with leakage of blood into the surrounding tissues of the aorta (Figure 2). The cause of death was concluded as haemorrhagic shock following acute aortic dissection in a pregnant woman.

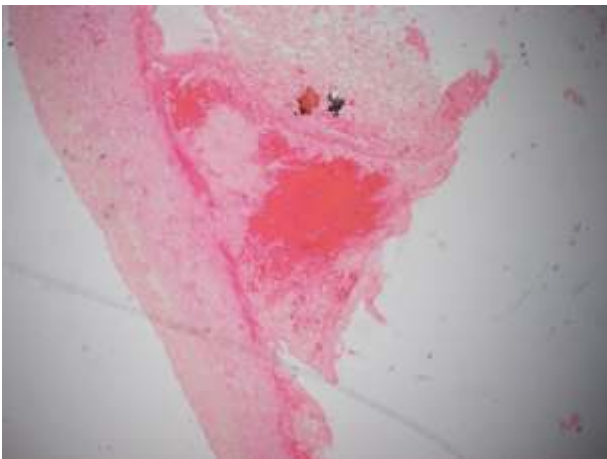**Figure 1:** The eviscerated organs with the opened aorta. Note absence of tears on the intima.

Figure 2: Micrograph of the aorta showing leakage of blood into its wall.

Discussion

This patient was diagnosed with AR and trivial MR which are not considered as risk factors for the aortic dissection. Among the valvular heart diseases, bicuspid aortic valve, which is a congenital anomaly of the aortic valve, is considered as a risk factor for

acute AoD (7). This indicates that the deceased did not have a known preexisting risk factor for the acute AoD other than being pregnant. The hyperdynamic changes in pregnancy such as increased heart rate, stroke volume, cardiac output, and left ventricular dimensions may have affected on the forces on the aortic valve (6) and this may be exacerbated by increased outflow resistance in the distal aorta due to compression by the gravid uterus (5). The hormonal changes during pregnancy suppress the synthesis of collagen and elastin weakening the elastic fibers of the aortic vessel wall (8). Therefore these alterations during pregnancy may have caused the aortic dissection in the deceased.

The common symptoms at the onset of the AoD are, chest pain accounting for 12% and the back pain accounting for 55% (9). Sudden onset of dyspnea, nausea and vomiting has been reported in a death due to AoD (10). Our patient had burning epigastric pain more suggestive of gastritis. The determination of having a low cardiac risk by the cardiologist a few hours before and the atypical clinical symptoms may have contributed to delay in suspecting AoD.

The evaluation by a cardiologist a few hours before death revealing a low cardiac risk was based on the measurements of the root of the aorta, which measured less than 40mm. For it to be high risk of AoD, the aortic root diameter should be more than 45mm in pregnancy. However, thirty minutes later she developed symptoms and was admitted to the hospital. On suspicion of AoD, an emergency LSCS was performed. Pregnancy itself is a risk factor for the development of AoD, which can lead to sudden unexpected death. This case report highlights the fact that one cannot rely totally on investigation findings. Further, lack of reference values for aortic root diameter among Sri Lankans may have contributed to failure in early diagnosis. However, the increased risk of AoD during pregnancy should be kept in mind in patients with symptoms even without preexisting risk factors.

References

1. Thalmann M, Sodeck GH, Domanovits H, Gassberger M, Loewe C, *et al*. Acute type A aortic dissection and pregnancy: a popular based study. *Eur. J Cardiothorac Surg,* 2011; **39**(6): 159-63.

2   Ozdemir B. Aortic Dissection in Pregnancy. *Turkish Clinics J Int Med Sci,* 2005; **1**(50): 54-8.

3.   Collins D. Aethiology and management of acute cardiac tamponade. *Crit Care Resusc,* 2004; **6**: 54-8.

4.   Nasiell J, Lindqvist PG. Aortic dissection in pregnancy: the incidence of a life threatening disease. *Eur J Obstet Gynecol Reprod Biol* 2010; **149**: 120-21.

5.   Shi-MinYuan. Aortic Dissection During Pregnancy: A Difficult Clinical Scenario: Review. *Clini. Cardiol,* 2013; **36**(10): 576-84.

6.   Immer FF, Bansi AG, Immer Bansi AS, *et al.* Aortic dissection in pregnancy : analysis of risk factors and outcome. *Ann Thorac Surg.* 2003: **76**:309-314.

7.   Nishadi AA, R Herath, G R C Silva, R Mohomead, P Wijesinghe, S Padumadasa et al. A fatal case of dissecting aortic root aneurysm due to undiagnosed Marfan syndrome in the puerperium. *Sri Lanka Journal of Obstetrics and Gynaecology,* 2012; **34**(2): 55-7.

8.   Ohlson L. Effects of the pregnant uterus on the abdominal aorta and its branches. *Acta. Radiol Diagn.* (Stockh) 1978: **19**: 369-76.

9.   Fuster V, Andrews P. Medical treatment of the aorta. *L. CardiolClin,* 1999; **17**(4): 697-715.

10. Kinney-Ham, H. Bryant Nguyen, Robert Steele, Elizebeth L Walters. Acute Aortic Dissection in Third Trimester Pregnancy without Risk Factors. *West J Emerg Med*, 2011 Nov; **12**(4): 571-74.

Sympathetic crashing acute pulmonary oedema (SCAPE), dealing with the worst heart failure

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Introduction

Sympathetic crashing acute pulmonary oedema (SCAPE) is the most severe form of the spectrum of acute heart failure syndrome (AHFS), characterised by excessive sympathetic activation which results in very high blood pressure and redistribution of extracellular fluid causing severe pulmonary oedema, respiratory failure and death (1). This particular subset of patients present with acute onset and rapid progression of symptoms soon develops into a life-threatening condition within minutes to hours. Diagnosis of SCAPE is purely clinical and if effectively managed, the outcome is usually good (2).

This case report documents an acutely deteriorating patient with SCAPE preceding unstable angina who was successfully treated with high dose nitroglycerin and non-invasive positive pressure ventilation (NIPPV) obviating the need for tracheal intubation and intensive care unit (ICU) admission.

Case presentation

We present a 66-year-old male, with history of unstable angina, who presented to the emergency treatment unit (ETU), Teaching Hospital Karapitiya with shortness of breath, which progressed rapidly over 2 hours. It was associated with chest tightness, sweating and a few episodes of vomiting. His last recorded blood pressure at the clinic was 130/80 mmHg.

On admission to the ETU, he was restless, agitated and profusely diaphoretic. He was severely dyspnoeic with a respiratory rate of 44/min and he had a feeling of suffocation. Auscultation revealed bilateral coarse crepitations up to the level of clavicles and his oxygen saturation (SPO_2) was 82% with high flow oxygen. He had a pulse rate of 130 beats per minute and his blood pressure recorded was 230/110 mmHg.

Arterial blood gas showed pH – 7.2, PaO_2 – 45 mmHg (with FiO_2 – 0.8 - 0.9), PCO_2 – 46 mmHg, HCO_3 – 18 mmol/L, serum lactate – 6 mmol/L, indicating a mixed acidosis with type 2 respiratory failure. Bedside ultrasound scan further suggested the diagnosis of pulmonary oedema (presence of > B lines on one intercostal space in bilateral lung fields – B profile).

Intravenous nitroglycerin and NIPPV were commenced immediately. A loading dose of intravenous nitroglycerin 400 mics/min was given over two minutes and followed by 100 mics/min infusion. Manual blood pressure was checked in every 2 minutes to adjust the rate of infusion. After 10 minutes of treatment, a blood pressure of 150/80 mmHg was reached and the infusion was slowly tailed off. Oral (NG) captopril 25 mg was given. Patient's respiratory distress, oxygen saturation, restlessness and conscious level were dramatically improved within 10 minutes of treatment. Later he was treated for unstable angina and admitted to the acute side of a medical ward.

Discussion

In SCAPE, as opposed to other AHF syndromes, the main aim is to achieve a rapid afterload reduction to block the vicious cycle resulted from the sympathetic surge, and thereby, to improve cardiac output and diastolic dysfunction. Therefore, initiation of nitroglycerin with a high dose (with vasodilator effect) is advised as opposed to gradual up-titration (3). Commonly practiced protocol is a loading dose of 200 - 500 mics/min for 2 minutes followed by an infusion of 100 mics/min with rapid titration till systolic blood pressure reaches 140 mmHg (or previous normal value) and clinical improvement (4).

We did not start loop diuretics during early management in the ETU. There were principally two reasons for it. In this category of patients, due to increased afterload, the renal perfusion is compromised and therefore, the amount of drug reaching the kidneys is decreased resulting in late diuretic action (5). Further, its venodilatory effect is not proven in the literature among this group of patients. Therefore, it was withheld till improvement in afterload and renal perfusion was achieved by other medications. Secondly, frusemide administration within 90 minutes of onset has shown to increase the mortality in acute decompensated heart failure (5). It is thought to be due to initial activation of renin-angiotensin-aldosterone system (RAAS) which causes an increase in afterload and worsening of the primary pathology (5).

Conclusions and recommendations

In SCAPE, early and effective treatment is proven to reduce the incidence of tracheal intubation, ICU admission and mortality. High dose nitroglycerin and NIPPV remains the mainstay of early management. Early administration of diuretics, although commonly used, is not supported by good scientific evidence.

References

1. Rimoldi SF, Yuzefpolskaya M, Allemann Y, Messerli F. Flash pulmonary oedema. *Prog Cardiovasc Dis,* 2009 Nov-Dec; **52**(3): 249-59.

2. Naman Agrawal, Akshay Kumar, Praveen Aggarwal, Nayer Jamshed. Sympathetic crashing acute pulmonary oedema. *Indian J Crit Care Med,* 2016 Dec; **20**(12): 719-23.

3. Levy P, Compton S, Welch R, Delgado G, Jennett A. Treatment of severe decompensated heart failure with high-dose intravenous nitroglycerin: a feasibility and outcome analysis. *Ann Emerg Med,* 2007 Aug; **50**(2): 144-52.

4. Weingart S. Emcrit Podcast 1, Sympathetic Crashing Acute Pulmonary Edema.

5. Felker GM, O'Connor CM, Braunwald E. Loop diuretics in acute decompensated heart failure: necessary? Evil? A necessary evil?. *Circ Heart Fail,* 2009 Jan; **2**(1): 56-62.