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## CONTENTS

- |   |       |
|---|-------|
| 1. Editorial<br>The human tissue act and its relevance to forensic practice in Sri Lanka<br><i>Induwara Gooneratne</i>  | 1-3   |
| 2. Drug resistant tachycardia and fever in a neonate: A case of systemic candidiasis<br><i>Gunethilake K.M.T.B., Parthipan S., Vidanapathirana M., Beneragama D.H.</i>  | 4-7   |
| 3. Introduction of "a disability certificate" for Sri Lankan civil compensation cases<br><i>Senanayake S.M.H.M.K.</i>   | 8-12  |
| 4. A preliminary study of domestic violence in a rural community in Central Province, Sri Lanka<br><i>Vadysinghe A.N., Rathnayake R.M.I.S.D., Premaratne B.G., Wickramasinghe W.M.M.H.P.</i>  | 13-18 |
| 5. Use of development data to estimate colonization time of the myiasis-causing fly, <i>chrysomya bezziana</i> (diptera: calliphoridae) collected from human wounds.<br><i>Bambaradeniya Y.T.B., Karunarathne W.A.I.P., Goonerathne I., Kotakadeniya R.B., Tomberlin J.K.</i> | 19-26 |
| 6. Safety of the rear seat passenger: The importance of a new legislation<br><i>Sivasubramaniam M., Sarathchandra Kodikara, Jayasooriya R.P., Chandrakirithi A.</i>   | 27-29 |
| 7. Novel device to measure body length at autopsy<br><i>Fernando D.M.G., Gunatilake P.G.L.</i>  | 30-33 |
| 8. Instructions to Authors  | 34-35 |



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# EDITORIAL

## THE HUMAN TISSUE ACT AND ITS RELEVANCE TO FORENSIC PRACTICE IN SRI LANKA

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Forensic practitioners essentially deal with the dead and assist legal fraternity in unravelling purported mysteries surrounding deaths. In doing so, they perform autopsies, collect and store human tissues for analysis, manipulate human tissues for scientific scrutiny and later dispose of these collected tissues. The authority for post-mortem examination and allied pertinent investigations is vested on the practitioner through either a court order or the Inquirer's order. The authority in issuing such an order by the inquirer or court in Sri Lanka is derived through the criminal procedure code Act. However, the legal framework does not specify logistics or manner in which the forensic practitioners should collect, store or analyse samples and then dispose of them. In routine practice it is customary that the consent from the next of kin of the deceased is also taken for post mortem examination and for collection of tissues even in the presence of a court or inquirer's order.

In this line of discussion, a few important issues stem up. On what authority forensic practitioners retain specimens - for example bones or histological slides prepared after having arrived at a medical cause of death? Should they be discarded when the cause of death is arrived at or at least when the court case is over, if there is one? Is there a necessity for retention of specimens of cases now, when there are facilities for digital photographs? All practitioners including myself at times tend to retain specimens with the justification that we will either use them for teaching purposes, research purposes or to perhaps substantiate our opinions further in court, perhaps assuming that the court or jury may want to see the specimens later!. However, the original order of court was for and the consent from the relatives were taken merely to arrive at a cause of death which assist in deciding on the manner of death. Then, is the action of keeping these specimens for teaching purposes without a further court order and an extended consent

from relatives is ultra vires, unethical or is amounting to a punishable offense? In the absence of a specific legal framework addressing such issues which are part and parcel of forensic practice, this paper attempts to explore the Transplantation of Human Tissue act in Sri Lanka (no 48 of 1987) and see if it has helpful answers to the above mentioned research questions.

As the act itself introduces, the primary object of this particular enactment is to cover organ donation for transplant purposes within the territory of Sri Lanka. Despite this being the main purpose of the act, it is evident that this law also deals with organ donations for research and teaching purpose. The act clearly indicates a person above the age of twenty one is eligible to make a decision in regard to donating his entire body or its parts for medical or dental research, therapeutic/transplant purposes or for the use of medical or dental education. The article 2 of the act stipulates that;

'Any person above the age of twenty-one years, may consent to the donation, to take effect upon his death, of his body or any part thereof or any to be used for the advancement of medical and dental education, for the purposes of research, for the advancement of medical science or therapy or for use on any living person'

This means that any competent adult individual is entitled to decide if he wishes to donate his entire body or body parts to the above specified purposes before his death. The law is very clear about how such approval or consent be given by any adult who is above twenty one years. It is desirable that the prospective donor gives his consent voluntarily after having understood as to what may happen to his body or his body parts after they are being donated.



The tendering of consent by the adult should preferably be in writing which should be attested by two competent witnesses. What is meant by being competent is that these individuals are required to be rational adults with a sound mind above twenty one years and that they witness that the consent was provided before them voluntarily with no pressure or force what so ever at the donor. The concern I raise here is that at most times, the consent is obtained by the donor but regrettably fail to get two witnesses to validate the consent. In the absence of such two witnesses before them, validating his consent can make it invalid. Further, it is always desirable to allow two witnesses the donor knows personally rather than those known to the practitioner or the institute to avoid any conflict of interest. Both the witnesses and the donor must be present at the same time witnessing the donor's signature after having carefully reviewed the meaning and extent to which the consent is provided. Of course, the donor can revoke his consent at anytime.

In the absence of a prior consent by the deceased, the act further allows the next of kin or immediate relatives to give consent for donation of entire body or parts for medical or dental research, therapy/transplant or medical or dental education. In this regard too, the consent by the relatives should be voluntary without undue influence and that their written consent should have been witnessed by two competent witnesses being present at the time of giving consent. It is pertinent that the donor or the relatives of the donor who provides consent understands what happens to the body after it is being donated: whether it is being taken for education, therapy or research and the nature and extent of such research therapy and education. It is important that the relative who provides consent is aware that the deceased has had no prior directive against such donations or that there was no revoke of a previous consent given by the donor for such donation. In the event of a child both the parents or in the absence of parents the legal guardian/s may approve donating body parts of the deceased child where applicable.

According to the legal framework of Sri Lanka, the donees can only include a medical practitioner, a dental practitioner, a government hospital or institution prescribed in the consent

form. It is desirable that the donor is aware where his body parts are donated to and to what purpose. In the event a person dies and the relatives are aware that there was such a directive as to donate his body or body parts to a specified purposes, the relatives then may authorise removal of such body or body part. However, if the relatives believes that such a directive has been revoked by the deceased or that the relatives has other compelling evidence to believe any unethical or criminal activity then the relatives may object to such removal.

The act seems to provide provisions to remove unclaimed bodies in hospitals or other respective institutions. Accordingly when a body has not been claimed after seven days of declaration of death, the prescribed officer of such institution can authorise such unclaimed bodies for any post mortem examination or for anatomical research.

The body or body parts should not be used for any other purpose other than what the donor has agreed specifically. The act, under section thirteen specifically prohibits such malpractices and prohibits anyone using the body or body parts for any purposes other than what was agreed. It seems that the practitioners attempt to generally cover all research or educational purposes by providing general terms in the consent forms in a futile attempt to safe guard themselves from an imminent ethical or legal litigation. It is always desirable that we specifically inform the donor what we intend to do with his body or body parts and their nature and extent. There have been concerns raised against using donated bodies in medical exhibitions at faculties of medicine or dentistry as according to the prevailing regulations it is not specified as a function of such body or parts display which require further analysis and discussion.

In regard to collecting specimens and body parts for forensic purposes, it is done as part of the post mortem examination in view of ascertaining a cause of death or identifying medical evidence supporting circumstance of death. Despite this being conducted through a court order or a inquirer's order, it is always desirable to obtain the informed consent of the next of kin. Further, in storing samples or using these specimens for purposes other than for what it was taken for, the practitioner has to

obtain written consent giving reasons as to why they are taken and what they will be used for. For example, if the samples are taken in view of establishing a cause of death and the samples and the histology slides are used later for educational purposes, then informed consent for such has to be obtained from the relatives if the victim already did not have a directive in this regard. Further, as this was a legal referral

the approval of the inquirer to sudden death or magistrate is needed (in addition to, from the relatives) if the specimens are used for any purpose other than what they were originally collected for. Not adhering to these good practices will not only be unethical but also be both ultra verus and form an offense punishable under the law.

# DRUG RESISTANT TACHYCARDIA AND FEVER IN A NEONATE: A CASE OF SYSTEMIC CANDIDIASIS

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## ABSTRACT

### Introduction

Invasive fungal infection is a known cause of morbidity and mortality in the neonates especially in immunocompromised children. Demonstration of organisms by culture remains the gold standard for mycological diagnosis.

### Case report

A neonate delivered at 34 weeks of gestation with a birth weight of 1800g was admitted to a premature baby unit with breathing difficulty on day 05 after delivery. On examination, the child was febrile and had tachyarrhythmia. Blood culture showed a mixed growth of organisms and the echocardiogram was suggestive of a cardiac tumor. The condition of the neonate deteriorated in spite of treatment with antibiotics and supportive therapy and the child died 20 days after admission. At autopsy, a large vegetation was found on the tricuspid valve.

### Conclusion

Fungal endocarditis should have been considered as a possible cause especially in the presence of large vegetations in the right side of the heart in neonates. The presence of fungal abscesses in the kidneys supported the systemic nature of the infection. Tachyarrhythmias may have been due to the involvement of the conduction system of the heart as vegetations were found in the area of AV node.

**Key words:** *Candida albicans, systemic candidiasis, fungal endocarditis*

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## INTRODUCTION

Invasive fungal infection is a known cause of neonatal morbidity and mortality especially in the immunocompromised<sup>1</sup>. Early diagnosis and rapid initiation of effective treatment is a prerequisite for successful management. Culture remains the gold standard for mycological diagnosis<sup>2,3</sup>. However, as fungal cultures are not done routinely, the diagnosis can be delayed which can result in grave consequences.

Predisposing conditions for systemic fungal infection include prematurity, patients in the intensive care units, patients with implants, severe burns, children with congenital or acquired immunodeficiency, neutropenic patients, following hematopoietic stem cell transplantation or solid organ transplantation, and patients on immunosuppressive treatment. *Candida*, *aspergillus* and *cryptococcus* are among the common fungi that cause systemic fungal infection.

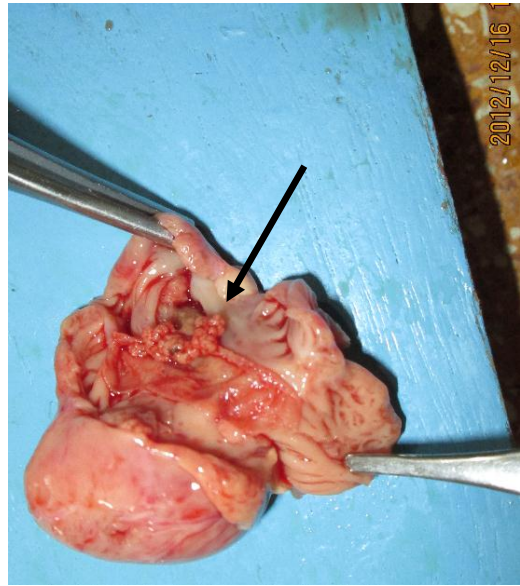
## CASE REPORT

A neonate delivered at 34 weeks of gestation with a birth weight of 1800g, was admitted with breathing difficulty on day 05 after delivery. The child developed fever spikes and tachyarrhythmia around the 8<sup>th</sup> day following admission which was unresponsive to the standard drugs. Blood culture showed mixed growth of bacteria and the echocardiogram suggested a cardiac tumor.

The child died on the 20 the day following admission. At autopsy, there was a cannula in-situ with a grossly distended abdomen (Figure 1) and a large, friable vegetation on the tricuspid valve (Figure 2).

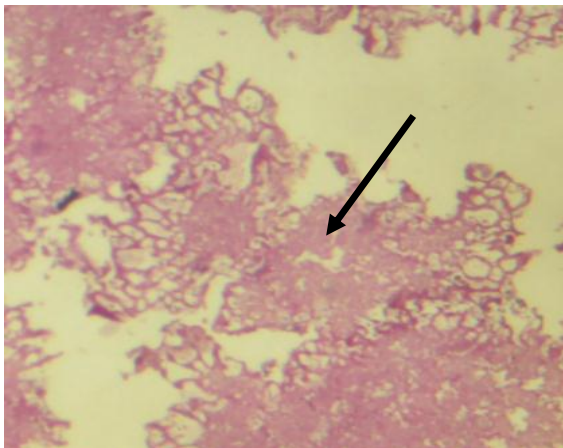


**Figure 1: Cannula and distended abdomen**

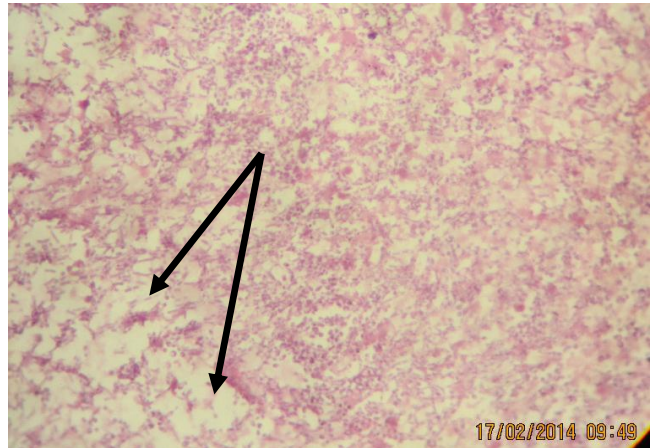


**Figure 2: A large, friable vegetation on the tricuspid valve (arrow)**

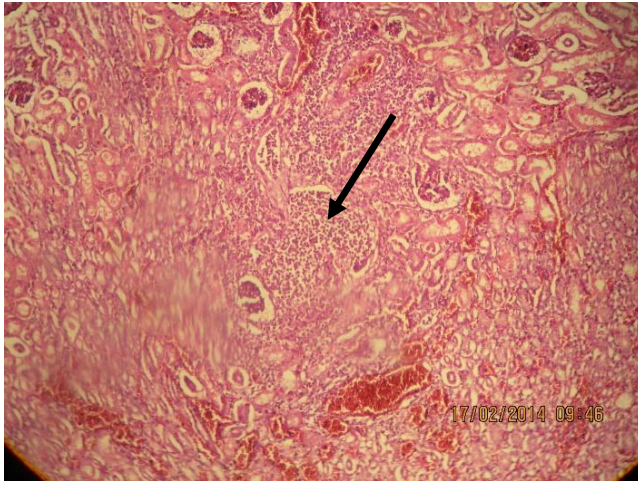
Histopathology of the vegetation showed hyphae and yeast forms (Figures 3, 4). Histopathology of the kidneys showed fungal micro-abscesses (Figure 5).



**Figure 3: Candida organisms in the vegetation (H&E X 100)**



**Figure 4: Candida hyphae and yeast forms in the vegetation (arrow) (H&E X 100)**



**Figure 5: *Candida micro abscess in kidney*  
(H&E X 100)**

## DISCUSSION

Candidiasis is defined as an infection or disease caused by a fungus of the genus *Candida*<sup>4</sup>. Systemic candidiasis is the most frequently encountered severe invasive opportunistic fungal infection. Major organs involved include the lungs, spleen, kidneys, liver, heart and the brain<sup>5</sup>. In the last few decades, the incidence of systemic candidiasis has increased resulting in an increased mortality rate<sup>4</sup>. Most of the cases are fatal due to the delay in diagnosis and initiation of effective therapy and are diagnosed only at postmortem examination<sup>6</sup>.

A diagnosis of invasive fungal infection requires a high index of suspicion<sup>7</sup>. The risk factors in this case included prematurity, low birth weight and insertion of an IV cannula. High fever for more than two weeks which was not responding to broad spectrum antibiotics was also supportive of a non-bacterial infection. Prematurity has been associated with a significant mortality and morbidity in patients with systemic candidiasis<sup>8</sup>.

False negative blood culture may be due to difficulty in interpretation by contamination with body commensals<sup>4</sup>. Special culture media are necessary for the best recovery of fungi<sup>7</sup>. Detection of candida antigen and antibodies by PCR and serology were found

to be more sensitive in the diagnosis of systemic candidiasis than blood culture<sup>4</sup>.

At autopsy, ante-mortem specimens must be sent for histopathology and fungal culture for a definitive diagnosis<sup>7</sup>. If the specimens have not been sent for fungal culture, serology or PCR, histological examination supplemented by special histochemical stains such as PAS or methanamine silver stain can be helpful in the diagnosis of fungal infection.

The histology of sections from the large friable infective vegetation on the tricuspid valve confirmed a fungal vegetation with right sided fungal endocarditis. This large vegetation was misinterpreted as a cardiac tumour on echocardiogram examination which resulted in further delay in treatment. Tricuspid vegetations can emboli in to lungs. The lungs showed areas of hemorrhagic necrosis. Multiple fungal micro abscesses were seen in the kidneys containing slender filaments and yeast forms at the center surrounded by necrosis and polymorphs with fungal balls obstructing the pelvicalyceal system. Involvement of kidneys confirmed the systemic nature of the infection which may have been largely contributory to the fatal outcome in this case.<sup>6</sup> Involvement of the conduction system of the heart by the vegetations which were found in the area of AV node may have resulted in the tachyarrhythmias.

In conclusion, a fungal aetiology must be considered in premature neonates with fever for over two weeks unresponsive to broad spectrum antibiotics. Early diagnosis by culture, serology or PCR and initiation of treatment will result in a significant reduction of mortality and morbidity especially in the presence of vegetations involving the tricuspid valve or the right side of the heart.



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## INTRODUCTION OF “A DISABILITY CERTIFICATE” FOR SRI LANKAN CIVIL COMPENSATION CASES

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### ABSTRACT

In Sri Lanka, obtaining medical evidence for civil compensation cases is difficult and expensive for the plaintiff because of compulsory transfer of government medical officers in every four years. Therefore, Judicial Medical Officers (JMO) are frequently summoned by Judges and prosecutors because a JMO has examined the patient and is trained to give evidence in courts. The respondent party usually opposes stating that JMO had only medico-legally examined the patient, hence, is not an expert to describe the ordinary outcome of the patient. However, lot of compensation cases had been concluded by granting compensations from medical evidence of JMO who prepared evidence with re-examination of the patient and consulting clinicians. Introduction of a detailed medical certificate which could be named “disability certificate for compensation purposes” for all civil compensation cases to help courts is a timely necessity in Sri Lanka. The certificate should include the history of the incident, initial examination, diagnosis, summary of the management, condition at the time of discharge, summary of clinic follow-up, all disabilities (temporary partial, temporary total, permanent total and permanent partial) with relevant durations, outcome of each disability, effect of each disability on his earnings and personal life. This certificate is to be signed by the clinician/s and JMO, issued when requested by the patient before filling the compensation court case and if necessary before the trial date. JMO is to give oral evidence first, based on this report and if required, clinician is to be summoned only to address unsolved issues, so to minimize unnecessary harassments to large number of patients managed by the clinician.

Respondent party will also have the opportunity to request a new examination and a new certificate by different medical experts. This certificate will educate judiciary, prosecution and defense. It will expedite the civil compensation procedure, minimize the burden on clinicians, prepare medical personals to give oral evidence and minimize the expenses for the victim.

**Key Words:** *Disability certificate, civil compensation*

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### INTRODUCTION

A civil compensation case in the District Court is the final pathway available for a victim of any damage due to criminal act or civil act to obtain monetary compensation for his loss. This action belongs to the civil law and the plaintiff has to bear the expenditure for the case which includes charges for lawyers and medical witnesses. Unfortunately, in Sri Lanka obtaining medical evidence for civil compensation cases in district courts is difficult and expensive for the plaintiff because of compulsory transfer of government medical officers in every four years. Therefore, Judicial Medical Officers (JMO) are frequently summoned by Judges and prosecutors because a JMO had examined the patient and is trained to give oral evidence in courts. The respondent party usually objects evidence of JMO stating that JMO had only medico-legally examined the patient and, hence, is not an expert to describe the

outcome of the patient's clinical conditions. However, several compensation cases had been concluded by granting compensations with medical evidence from JMO who gets prepared with re-examination of the patient, discussions with the clinician and literature survey before the court trial. In a compensation trial, period of hospitalization, period of rehabilitation, residual permanent disabilities and effects on those disabilities on the professional life are discussed in length to decide the amount of compensation. Though is no residual permanent disability due to full recovery, victim will be awarded a compensation relevant for the period he/she was under treatments.

In some developed countries, clinical forensic medicine curriculum has a major module under the title of "Workers compensation examination and assessments"<sup>1</sup>. Sri Lanka also needs more attention about medical evidence in civil compensation cases such as a module in the postgraduate curriculums, detailed medical reports of disability and formulating "disability scales".

In developed countries varying scales are used to assess the progression of the illness which includes subjective assessments of the patient and objective assessments of the clinician. All the professional associations of clinical medical specialists will have the duty to formulate disability scales for all common disabilities. There should be a common agreement among the medical professionals about the degree of a particular disability and the effect on the activities of the patient. Effects of different disabilities on patient's profession, day to day activities and leisure activities need to be identified during the period of treatment to evaluate the recovery. Present situation and future developments of the medical evidence in compensation cases are discussed in this article.

### **Present situation of medical evidence in compensation cases at civil courts of Sri Lanka**

Civil compensation cases are filled by victims of road traffic accidents, assaults, injured

during the occupation, etc. Medical evidence is vital for the judgment of the compensation. Clinician who treated the patient is bound to give written and oral evidence for civil courts on a payment by prosecution or responding party. Civil courts have the power to issue warrants for the medical officers who do not comply. However, in Sri Lanka, government medical officers are transferred out of the working station in every four years. When the compensation case is heard, clinician usually had been transferred to a distant hospital. Victim has to pay significant amount of payment to obtain medical evidence which includes the clinician's travelling expenses and his professional charges. A financially challenged victim can file a case with the help of legal aid commission (government institution for free legal advices) so that medical evidence is given free by JMO. Judiciary and ministry of health are expected to formulate rules about reasonable charges for medical evidence. Clinicians are not pleased to appear in courts as they cannot treat their patients during that particular day. Hence, Judges do not usually issue warrants for clinicians due to the extensive service they provide to their patients. When clinician is not available, prosecution and judges prefer to obtain medical evidence from the judicial medical officer (JMO). It is reasonable as the JMO had seen the patient and is well trained to give evidence in the courts. Lack of medical certificates and medical evidence about disabilities is a worldwide problem, therefore, majority of victims accept modified solutions proposed by insurance companies<sup>2</sup>.

Defense or responding party usually objects evidence given by the JMO on the basis that JMO had only performed a medico-legal examination, JMO had not treated the patient and JMO does not know about the outcome of the patient. When a summon is received from the civil court, JMO will re-examine the patient, will collect all medical documents including bed head ticket and clinic notes, study medical literature and discuss with the relevant clinician/s about the patient's condition as preparation.

**JMO's or clinician's duty in a civil compensation trial at present includes:-**

1. To present the original medical documents of the hospital (bed head ticket, investigation reports and clinic notes) with certified photocopies.
2. Briefly explain the bed head ticket including the clinical history, examination findings, investigation results, diagnosis and management.
3. If medico-legal examination had been performed, JMO will present the medico-legal report including history, injuries and compatibility of those two.
4. Explaining the clinic follow up with clinic notes.
5. Explain the natural history of medical conditions.
6. Explain the usual outcome of the illnesses with the treatments.
7. Explain the temporary and permanent disabilities of each injury with the time period.
8. Any modifying factors of outcome such as default treatments, concurrent illnesses, negligence of the patient.
9. Explain possible future management.
10. Explain necessary life modifications.

Above mentioned facts can be explained to courts by any medical person representing the head of the institution, who will prepare with the patient's conditions. However, in some cases, clinician is essential to explain about the outcome of the particular patient. Examples for such issues are; Why there was no improvement with the best available treatments in this patient? What will be the long term outcome of this disability in this particular patient? Was the patient given best possible treatments available in the hospital? Why that particular treatment was not given?

JMO will explain medical conditions and outcomes in general according to the medical literature but clinician who treated will explain the individual conditions of the particular patient according to the patient's condition and according to his experience. But such individualized explanation is needed infrequently.

Currently when the clinician or JMO who examined the patient are not available, court orders the nearby clinician or JMO to produce a new report after examining the patient and explaining previous medical documents such as bed head ticket and clinic documents to the court. Court may even appoint a medical board<sup>3</sup>. Court trial is heard few years later and the medical evidence is expressed according to the medical documents. Therefore, medical evidence of the JMO and clinician are not much different on facts observed in the patient and explanation of medical theories. However, opinion of the JMO will be the general opinion about any patient suffering from a similar condition while opinion of the treated clinician will be the specific and more focused about one particular patient. In most of the compensation cases, facts and knowledge of the medical conditions are sufficient for the judges to deliver the judgments. Absence of clinician's oral evidence will not make a significant difference in the judgments in most of the cases.

**Required developments in medical evidence**

To minimize the burden on clinicians and large number of patients under the care of such clinicians, Sri Lankan authorities need to introduce of a complete medical report for civil compensation purposes.

This certificate can be named as "Disability Certificate for Compensation Purposes (DCCP)".

**DCCP needs to contain:-**

1. history of the incident
2. findings of initial examination with injury description
3. diagnosis
4. compatibility of the history and injuries
5. summary of the medical management
6. clinical condition at the time of discharge
7. summary of clinic follow-up
8. all temporary and permanent disabilities
9. outcome of each disability



10. effect of each disability on his professional life and personal life
11. progression of each disability
12. possible future managements
13. necessary life modifications
14. available better treatment options inside and outside country for further management

### **When this DCCP is issued?**

All the patients who plan to file a civil compensation case are informed to get registered for civil compensation certificate program in JMO's office in the hospital. A file for each patient is maintained by the JMO which includes the history, injury description, certified photocopy of the bed head ticket, copy of clinic notes, periodical joint examination reports of JMO and clinician, all types of disabilities (permanent total, permanent partial, temporary total, temporary partial), all the disabilities with the affected time period and progression. First the certificate will be issued on request of the patient before the case is filed. Based on this report, the prosecutor for the victim can learn the real physical and mental condition of the client and can request a reasonable amount of compensation relevant for the disability. There will be no need to have medical consultation with the clinician prior to file the case. Second report will be issued only if requested, just before the trial, to show the progression of the disabilities. When defense or judge wants a separate certificate, court can order a new certificate from a separate group of clinician/s and JMO about the present condition and the future progression of disabilities. Practically it is easier to request a detailed medical certificate than finding a defense medical witness. In all above situations, JMO will prepare the certificate after discussing with the clinician/s and it will be signed by the JMO and all involved clinicians.

### **Advantages of DCCP are:-**

1. During the initial treatment period, patients inform about their future ambition for legal actions. Therefore,

doctors can collect all necessary medical evidence and medical reports for the court case such as investigations and referrals. Forensic medicine specialist can handle the case instead of non-specialists (assistant judicial medical officers) to improve the quality of medical evidence in the trial<sup>4</sup>. Usually bed head tickets are destroyed after five years in government hospitals. However, bed head tickets which are marked as "medico-legal case" can be persevered up to 25 years because of involvement with judicial actions. Doctors can anticipate possible legal issues and be prepared for them.

2. Before the trial, prosecution and responding parties can obtain necessary knowledge about the condition of the victim from this report. Therefore, prior consultation with clinician is not necessary to file the case.
3. When prosecution and defense agree, case can be settled without oral evidence from medical witnesses because a detailed medical report is available with the amount of disability and future progression.
4. Prosecution, defense and judiciary have the opportunity to study the case and be prepared, based on the facts and opinion of the certificate.
5. If judiciary or defense needs second medical opinion about the victim's latest condition, a new certificate from another group of medical specialists can be requested. When opinions of second report and first report are equal, there will be no need to summon medical witnesses.
6. When taking the oral medical evidence, time duration in the witness box will be minimum and procedure is easy because of the medical report (written evidence).
7. This certificate can be used by insurance companies, government departments and administrators of private factories also to grant compensations. Therefore,

professional secrecy should be maintained strictly<sup>5</sup>.

8. A government fee will be decided for this certificate as well as for oral medical evidence. It will reduce the expenditure of the victim.
9. Because a detailed medical report with signatures of relevant clinician/s is available, JMO will give oral evidence first, based on this report and if required only the clinician will be summoned to answer difficult and specific issues of the case to minimize unnecessary harassments to large number of patients managed by the clinician.
10. Medical witness will attend the court with better preparation because JMO and clinician plan to provide best scientific evidence to court from the beginning.

### **How to develop the DCCP?**

Ministry of health should arrange discussions with all relevant professional organizations and stake holders to formulate the structure of the certificate (DCCP), prepare a guideline and educate legal professionals and judiciary. Afterwards, academic bodies of medical specialists can formulate "Disability Evaluation Assessment Scales" for different conditions they manage<sup>6</sup> or one common disability scale for entire body for any form of damage. Such scales will be followed to monitor the recovery of the patient during the treatment period. Records of periodically completed scales can be presented to courts to explain the patients recover states accurately.

### **CONCLUSION**

All involved clinicians and JMO will prepare a disability certificate for compensation purposes containing all necessary information for compensation court cases including history, injuries, management, all forms of disabilities with outcome and the effect on victim's earning capacity and personal life. In civil compensation trials, first JMO can give oral evidence based on the certificate, and if

necessary only clinician/s can give oral evidence to address unsolved issues. This certificate will educate judiciary, prosecution and defense from the beginning of the case. It will expedite the civil compensation procedure, minimize the burden on clinicians, prepare medical personals to give oral evidence and minimize the expenses of the victim.

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# **A PRELIMINARY STUDY OF DOMESTIC VIOLENCE IN A RURAL COMMUNITY IN CENTRAL PROVINCE, SRI LANKA**

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## **ABSTRACT**

### **Introduction**

Domestic violence (DV) is a health, legal, economic, educational, and importantly a human rights issue. A fair question arises whether DV is given enough attention in the local context. It should be appreciated with the risk factors contributing to it in the society and effect it has on the society as a whole.

### **Objectives**

Identify the demographic factors, awareness and understanding on domestic violence.

### **Methods**

The study was conducted as a randomized cohort study, using a self-administered questionnaire, and analysis was done using the SPSS 22.0.

### **Results**

98 participated. Majority were females. 88% were employed and 80% had completed GCE O/L. Sixty four percent stated they had faced some form of DV. 75.6%, 50%, 56% respectively agreed that sexual, verbal & psychological abuses are included in DV. Only 32% agreed that economical harm is included. 47.6% believed physical injuries are essential to file a law suit. 42.1% was not aware that the ex-spouse /partner can be a perpetrator and 37.5% stated only the spouse can be the perpetrator. 93.3% was aware that there are specific laws with regard to DV.

Alcoholism was identified as a major cause for DV by 74% and they believed that the perpetrators are usually aggressive people

(53.8%), and DV is an expected normal phenomenon in family (34.2%).

### **Conclusion and recommendation**

Sixty four percent had faced some form of DV, 68% was unaware that economical harm is included and 47.6% believed physical injuries are essential to file a law suit, indicating below average Knowledge of DV and related law. Thus further studies and awareness programmes are recommended.

**Key Words:** Domestic violence, rural community

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## **INTRODUCTION**

Domestic Violence (DV) is defined as “any incident of threatening behavior or abuse (psychological, physical, sexual, financial or emotional) between adults who are, or have been intimate partners or family members, regardless of gender or sexuality<sup>1</sup>. The Prevention of Domestic Violence Act 2005 Sri Lanka, which is gender neutral, defines domestic violence, inclusive of emotional violence, in a broad manner and includes violence between two members of the family including children and the elderly<sup>2</sup>. DV has long been a topic which discussed behind closed doors, with the Sri Lankan cultural background and the common belief of taking

care of their own family matters by themselves, which left the victims with stoic endurance as the only socially attractive solution<sup>3</sup>.

There is a common misconception in the society that only women and children succumb to domestic violence and that the perpetrator is always a male<sup>4</sup>. However, violence against women has reached epidemic proportions in many societies<sup>5</sup>. Only a few individuals appreciate the broadness and complexity of domestic violence.

It is not a topic which can be considered in isolation, but instead should be appreciated with the risk factors contributing to it in the society and effect it has on the society as a whole. Multiple risk factors in varying capacities contribute towards the persistence of domestic violence seen in many societies. There can be characteristics of the victims and perpetrators that lead to acts of DV and the effects of such acts can remain long term, thus, understanding the nature of this problem is important in preventive aspects. Due to the very nature of matters arising related to DV, the problems cannot be directly observed<sup>6</sup> and many reasons such as taboos, fear and feelings of guilt and shame can account for not coming forward<sup>7</sup>.

During an extensive literature search, we identified a significant scarcity of recent research with regard to DV in the local context. None of the studies had been conducted in a rural setting. Furthermore, most of the previous studies were found to be outdated.

We conducted a preliminary study to explore the socio-demographic factors, personal experience of facing domestic violence, in order to have an insight regarding the prevalence within the selected group, awareness and risk factors regarding domestic violence and the awareness of the law such as what components are included in domestic violence act, options in acting against DV etc in a rural community.

## **OBJECTIVES**

Identification of the,

1. Demographic factors with regard to DV
2. Awareness and general understanding regarding domestic violence.

## **MATERIAL AND METHODS**

The study population was a group of individuals from a rural community of Galagedara from the central province of Sri Lanka. Convenient sample collection method was used in sample collection method.

A self-administrative questionnaire, which was pre tested and validated for this study was given to a selected random group of participants. They were informed that participation was purely voluntary in nature and that the data would be confidential and used for research purposes only. Ethical clearance was obtained from the ethical review committee, faculty of medicine, university of Peradeniya. People who were illiterate and refused to participate in the study were excluded. The data thus obtained was analyzed using SPSS version 22.0.

## **RESULTS**

There were 98 participants included in this study. Two were excluded from the study due to the incompleteness of the submitted questionnaires.

### **1. Socio demographic factors**

When considering the socio-demographic factors of the study population, the vast majority of the participants were found to be female 92. Of the study group, majority was married (92%) but none of them were divorced or co-habiting with their partners. The Mean age of the sample was 48 yrs. Eighty eight percent were employed and eighty percent had completed the General Certificate Examination – Ordinary Level.



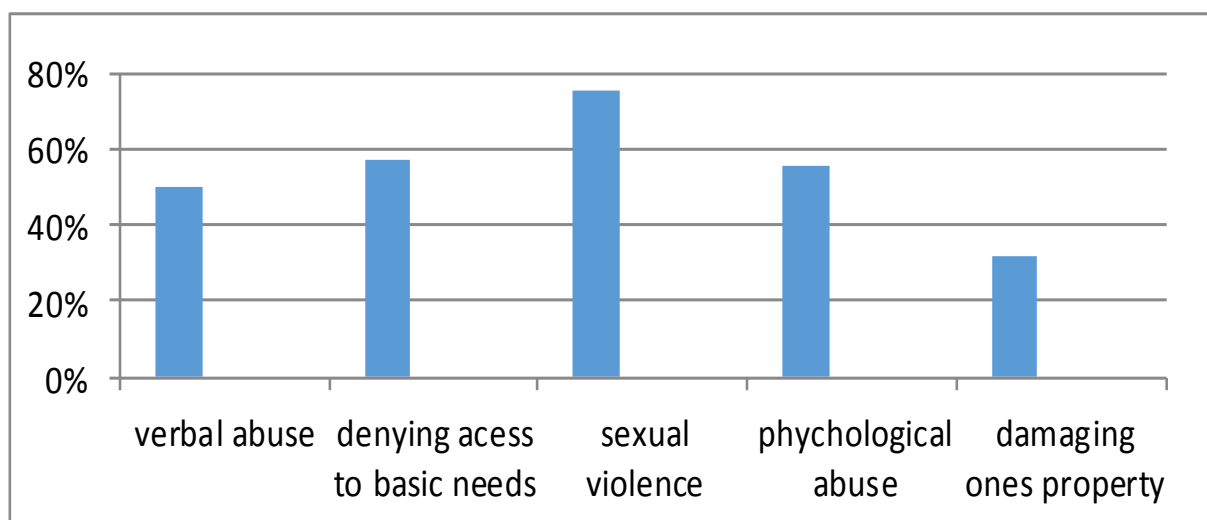
## 2. Awareness and understanding regarding DV

From the participants, 64% have faced some form of domestic violence, while 32% denied any such problems. However 4% was unaware whether they had faced DV or not. In this study, 75.6% 50% , 57%, 56% respectively agreed that sexual violence, verbal abuse, denying access to basic necessities, psychological abuse are included in domestic violence while only 32% agreed that damaging property is included. Knowledge regarding the components of domestic violence is shown in Figure 1.

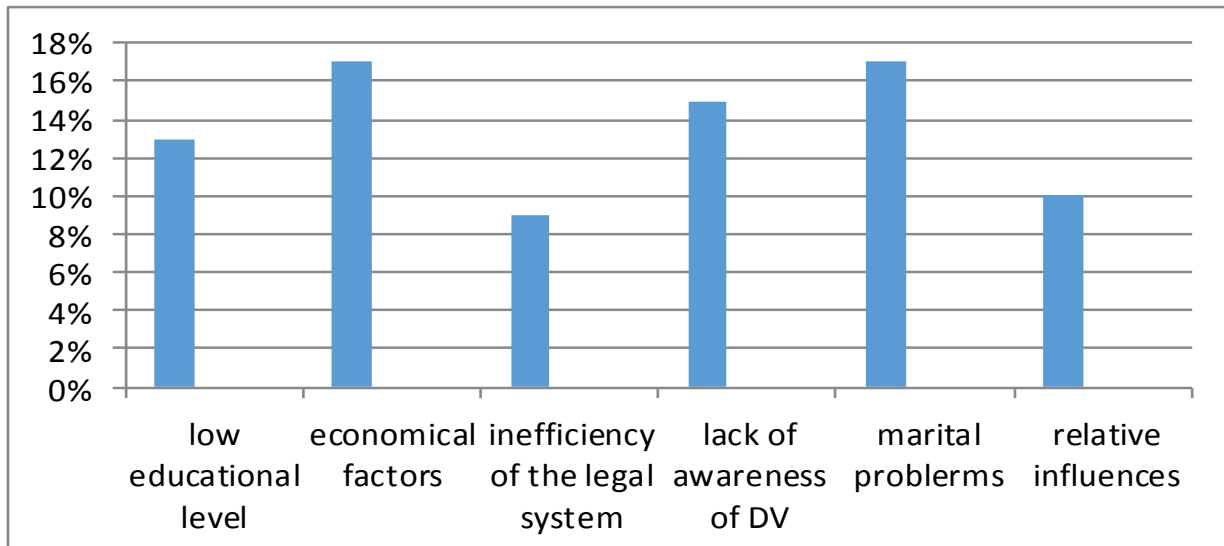
Physical injuries were identified an essential component in domestic violence by sixty nine percent of the population. Furthermore, 47.6% believed physical injuries are essential to file a law suit.

With regard to perpetrators of domestic violence; 42.1% were not aware that the ex-spouse or a co-habiting partner can be a perpetrator<sup>2</sup> and 37.5% stated only the spouse can be the perpetrator. Fifty nine percent stated that the only legal measure is to complain to police, in a case of DV, while 35% was unaware that a protection order could be taken thorough a magistrate court, without a police complaint. However, 93.3% was aware that there are specific laws with regard to DV.

Alcoholism was identified as a major cause for DV by 74% and they believed that the perpetrators are usually aggressive people (53.8%). DV was also an expected normal phenomenon in the family in 34.2% of cases. The commonest mode of acquiring knowledge was newspapers (37%). Poverty, marital problems, and lack of awareness of DV were identified in descending frequency, as the common risk factors for DV by the study group. Figure 2 elaborates the frequencies of risk factors as identified by the study group.



*Figure 1: Knowledge regarding components of the domestic violence*



*Figure 2: Risk factors for domestic violence.*

## DISCUSSION

In Sri Lanka, domestic violence Act no 34 of 2005 is intended to prevent and to provide necessary legal measures on such instances. According to that, domestic violence is defined as “All offences contained in Chapter XVI of the Penal Code 2, Extortion-Section 372 of the Penal Code, Criminal Intimidation-Section 483 of the Penal Code 4, attempt to commit any of the above offences and any emotional abuse”. It also states that “any person co-habiting in a same property could be perpetrators, not necessarily a legal relationship is required to exist between intimate partners”<sup>2</sup>. The offenses set out in chapter XVI of the penal code are “offences affecting the human body, i.e. offences affecting life, causing hurt, wrongful restraint and confinement, criminal force and assault, kidnapping, abduction and slavery, rape and incest and publication of matters relating to certain offences and any emotional abuse, (either of which is) committed or caused by a relevant person within the environment of the home or outside and arising out of the personal relationship between the aggrieved person and the relevant person”<sup>8</sup>.

Majority of the study population in this study was females. The disparity of the sex of the participants might be due to the prevalent social myth, stating that only women are victims of domestic violence.

Even though this was a sample of individuals from a rural community of Sri Lanka, literacy and employment rate was above average in this population. Therefore, it gives a better overview of the awareness and experience regarding DV.

This study shows a significant prevalence of DV (64%) among the rural population, showing it to be an essential issue on which further evaluation must be conducted on. Prevalence of domestic violence in Sri Lanka, ranges from 27% (Perera, 1990), 32% (Samarasinghe, 1991) and 40% (Jayatilleke et al., 2010) to as high as 60% (Deraniyagala, 1992)<sup>9,10</sup>. A community survey in western province in Sri Lanka concluded that the lifetime prevalence of physical violence(34%), controlling behavior (30%), and emotional abuse (19%) was high and the prevalence of sexual violence was low (5%)<sup>11</sup>. However, our study did not specifically explore the form of DV, and yet figured to be a significant issue.

Unsurprisingly, most of the group (75.6%) selected sexual violence as a key component of domestic violence. This level of awareness might be attributed to the broad media coverage on sexual violence and its prevention by the authorities. Interestingly, only 32% reported the damage to one's

property / economical harm being a part of domestic violence. This highlights the lack of a comprehensive programme for improvement of awareness on DV.

Nearly half of the study group believed physical injuries are essential to file a law suit. Thus, bringing to light the majority opinion that DV is mainly of a physical nature, and to present any legal action, there must be documentable physical injuries. This downplays the psychological aspect of DV and the role of psychological traumatization. However, it is noteworthy that proving psychological damage of a victim may need expert support, and might be a collective conclusion.

Lack of knowledge regarding the perpetrators highlights the common misconception and false opinion rampant in the society regarding DV occur only between spouses. This fact may contribute to under reporting of the DV, since women may be socially embarrassed to file a complaint against a co-habiting partner who is not legally married. In fact, violence against those women may be intense, both physically and psychologically, where they are ill-treated in the social background of our country.

Majority Stating that the only legal measure is to complain to police, in a case of DV, shows lack of any dissemination of knowledge or awareness on the legal aspect of DV, rights of the victims and the steps to be taken against perpetrators. It is clearly stated in the law that a protection order could be obtained directly from Magistrate Court with the help of a lawyer. Lack of help seeking behavior were due to embarrassment, concerns of family reputation and fear of more violence and some women have accepted violence as normal behavior<sup>6</sup>, where in this study 34% agreed similarly. This situation indeed is a downfall of all the reinforcements that are carried to empower victims of DV, since many people will stay behind assuming DV must be tolerated than act upon.

It is worthwhile to look into the risk factors of DV a point where authorities can implement programmes in prevention. An Indian study highlights the fact that economical dependency may be the reason why most women remain silent<sup>12</sup>, where in our study poverty was pointed out as a risk factor for DV. Apart from that Alcoholism, relationship problems, lack of awareness regarding DV were the risk factors identified by the study group. This is in consistence with existing literature of risk factors in the local context<sup>6</sup>.

Characteristic of the perpetrators of the DV was identified as the 'usually aggressive' people by the study group, which may be not true in most circumstances, where some of the perpetrators tend to be emotionally/relationship dependant while only some are antisocial and primarily hostile towards women<sup>13</sup>. Perpetrator training programmes could an effective method in preventing DV and also survivors of the DV should be taken care at the community level since they are prone to social, psychological and economical instabilities<sup>14</sup>.

DV is an unpleasant experience one can encounter in their life, which may create a huge impact on the victims that will hinder their normal perspectives of family and marriage. The need for extensive and long term programming to address DV is urgent from policy level to community level in the local context.

## **CONCLUSION AND RECOMMENDATION**

Majority of the study population were females, employed and with secondary education. A majority had faced some form of DV, with many agreeing to physical abuse being the key component of DV. Majority were of the opinion that spousal abuse was the primary component of DV. Regarding the legal proceedings and laws on DV, the majority stated that the police should be the first contact in a complaint against DV, where some were unaware of alternative methods of obtaining protection against DV. Alcoholism and aggressiveness were noted as common

traits in the perpetrators. Commonest mode of acquiring knowledge was from newspapers. Poverty, marital problems, and lack of awareness of DV were identified as the common risk factors for DV by the study group.

We recommend the use of this study as a baseline in the identification of the socio-demographic factors and level of awareness and experience of DV in the community. This preliminary result can be the first step in other studies with a substantial study population in the thorough analysis of the various risk factors and preventive factors regarding DV. Furthermore, the proper dissemination of knowledge and awareness building should be directed to the rural communities of Sri Lanka, with the aim of significantly reducing the level of domestic violence prevalent in the community.

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# **USE OF DEVELOPMENT DATA TO ESTIMATE COLONIZATION TIME OF THE MYIASIS-CAUSING FLY, *chrysomya bezziana* (DIPTERA: CALLIPHORIDAE) COLLECTED FROM HUMAN WOUNDS**

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## **ABSTRACT**

Forensic entomological techniques are highly accepted for forensic investigations all over the world, especially to estimate the time of colonization (TOC) as related to the postmortem interval (PMI) of human or other vertebrate remains as well as with cases of neglect or abuse. Here, the accumulated degree days (ADD) method was used to calculate the TOC as related to three cases of myiasis associated with individuals admitted to the teaching hospital, Peradeniya during 2016. *Chrysomya bezziana* was recorded as the responsible species for all three cases. *Chrysomya bezziana* is an obligatory myiasis-causing fly species commonly infesting human and farm animals mainly in tropical and subtropical countries. According to the present study, time of colonization of wounds by *C. bezziana* in these three cases ranged from two to six days. Accordingly, the present paper highlights the lack of information to apply such forensic entomology investigations and the future steps to be taken to improve this field in Sri Lanka. In the future, forensic medical and judiciary authorities in the country can incorporate this technique to pursue legal cases on verification of the malpractices of caregivers of wound patients in the professional and personal

environment, based on the time scale calculated from above method.

**Key words:** Forensic entomology, time of colonization, accumulated degree day, myiasis, *Chrysomya bezziana*

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## **INTRODUCTION**

Forensic entomology is the application of arthropod-related material as evidence in criminal investigations<sup>1</sup>. Entomological evidence can be used to resolve three major questions. Such material can be used to determine when, how and where a particular crime scene was committed<sup>2</sup>.

Flies (Diptera) are the most common group of insects used as evidence in forensic investigations<sup>3</sup>. In some cases, immature flies are present in wounds of living vertebrates. These events are referred to as myiasis<sup>4</sup>. Myiasis is considered the world's fourth most common travel-associated skin disease after cutaneous larva migrans, pyoderma and pruritic arthropod-reactive dermatitis<sup>5</sup>. Even though myiasis has been

reported globally, such events most commonly occur in tropical and subtropical countries<sup>5</sup>. Typically myiasis associated larvae feed on the host's living or dead tissue, liquid body substance, or on ingested foods<sup>6</sup>. Based on the host-larval relationship, myiasis is classified into three major groups, 1) obligatory, 2) facultative, and 3) accidental<sup>7</sup>. Larvae causing obligatory myiasis infest live tissues where as facultative larvae consume dead tissue. Accidental myiasis occurs when chance ingestion of fly eggs or larvae that survive in the gastro intestinal tract<sup>6</sup>. Emphasizing the infestation location, myiasis can be cutaneous, oral, nasal or gastrointestinal. Cutaneous myiasis is the most commonly encountered clinical form of the disorder and further can be classified into three groups: (1) furuncular, (2) creeping (migratory), and (3) wound (traumatic)<sup>8</sup>.

Diptera is one of the largest insect orders, with approximately 150,000 species in 150 families, and 10,000 genera<sup>9</sup>. Several fly species cause myiasis in humans. Examples include, but are not limited to, the primary screwworm *Cochliomyia hominivorax* Coquerel (Diptera: Calliphoridae) in the New World, *Chrysomya bezziana* Villeneuve (Diptera: Calliphoridae), *Chrysomya megacephala* Fabricius (Diptera: Calliphoridae), *Wohlfahrtia magnifica* Schiner (Diptera: Sarcophagidae) in the Old World<sup>10</sup>. *Chrysomya bezziana* is an obligate parasite, which causes myiasis in a wide range of vertebrates including livestock, domestic pets, and humans<sup>7</sup>. This species occurs throughout much of tropical and subtropical Africa, the Indian subcontinent and Southeast Asia from southern China to New Guinea<sup>11</sup>.

Accumulated Degree Days/Hours (ADD/ADH) are used to calculate TOC of decomposing remains by insects<sup>12</sup>. Poikilothermic creatures, such as insects, need a certain amount of energy to develop from one point of their life cycle to another. This growth is proportionate to the energy

amount provided by surrounding thermal conditions. Therefore theoretically, the development of a fly from egg to adult can be predicted based on the temperature conditions experienced. Lower and upper-temperature thresholds also bind insect development. Immature insects exposed to temperatures outside of this range experience retarded growth or death<sup>13</sup>. Based on data generated through development studies of these insects, entomologists can estimate the TOC of human or animals by these insects. The present paper discusses the application of ADD/ADH to estimate TOC of myiasis-causing larvae using already available development data set for the myiasis-causing fly species.

## METHODOLOGY

Three patients (Table 01) diagnosed with cutaneous myiasis were admitted to the surgery ward, teaching hospital, Peradeniya from February to April 2016. Larval samples were collected from each patient on the day of their admission. The larvae were removed from the wounds of each patient and transferred into separate vials (7ml bijou bottles) containing 3ml saline as a means to keep them alive. Larvae were brought to the Entomology laboratory, the University of Peradeniya for assessment. Two to three larvae were preserved in 70% ethanol and the remaining were placed on a 50g of piece of fish inside a petri dish, which was then stored in an uncontaminated insect-rearing jar (1L) containing saw dust at a depth of 1.25cm and stored under laboratory conditions. This material served as pupation site for the post-feeding larvae under room conditions. The mouth of the jar was covered with cloth mesh to prevent adult flies from escaping and jars were placed on a shelf under ambient temperature. Emerged flies were killed using ethyl acetate and curated using standard entomological techniques<sup>14</sup>. Preserved larvae and emergent adults were identified using identification keys<sup>15</sup>.

Stage of development was recorded for each larva preserved from each case. ADD values for each identified life stage were calculated using the following equation<sup>16</sup>:

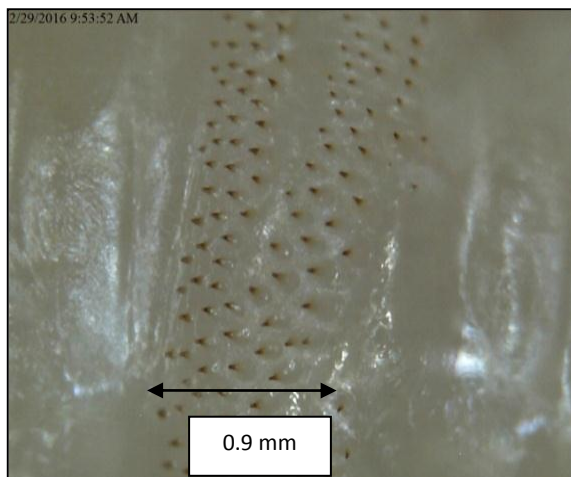
*ADD (Accumulated Degree Days) = Time is taken to attain each life stage (days) X (surrounding temperature\* – lower threshold temperature of the species)*  
(\*This can be environment/ experimental temperature or human body temperature)

To estimate the colonization time for each sample, initially, ADD values were calculated for development data obtained from a previously published laboratory study (Spradbery, 2002)<sup>17</sup>. For this study, the larval development temperature was considered 37°C as they were collected from human wounds. The lower threshold temperature for the fly species was considered 10°C<sup>16</sup>. These calculated ADD values for each development stage corresponded to the standard energy amount needed to attain each stage respectively.

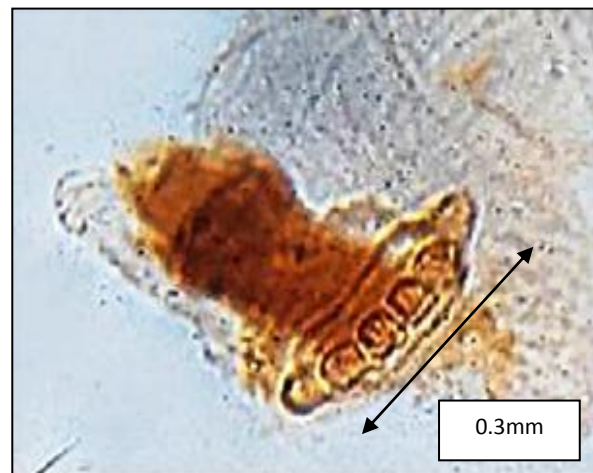
## RESULTS

### Species Identification

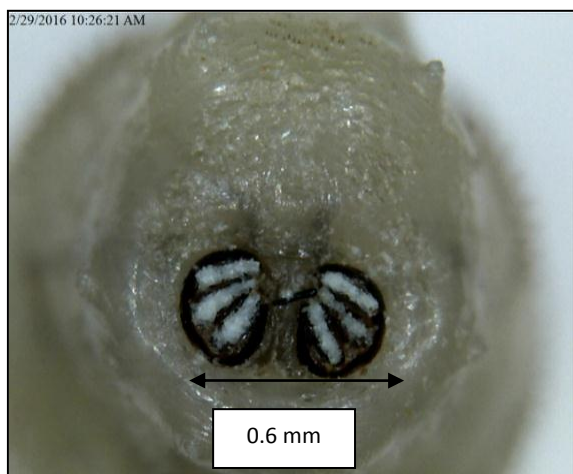
Larval samples were collected from three patients admitted to the Peradeniya Teaching Hospital during a period of three months in 2016. Larvae in all samples were identified as *C.bazziana*. *C.bazziana* larvae are easily distinguished from related species by the presence of several prominent characters such as pinkish coloration of the body, heavy bands of dark, robust, thornlike spines (Fig. 01), 4-6 lightly sclerotized (pale brown) papillae or branches in anterior spiracles (Fig. 02), heavily sclerotized incomplete peritreme in dark brown to blackish posterior spiracle and with 3 slit-like spiracular openings at approximately 45° to the horizontal plane<sup>15</sup> (Fig. 03). The adult flies of *C. bezziana* were identified using characters such as metallic blue, bluish purple or blue/green body color with predominantly orange colored heads and burgundy-coloured eyes<sup>15</sup> (Fig. 04).



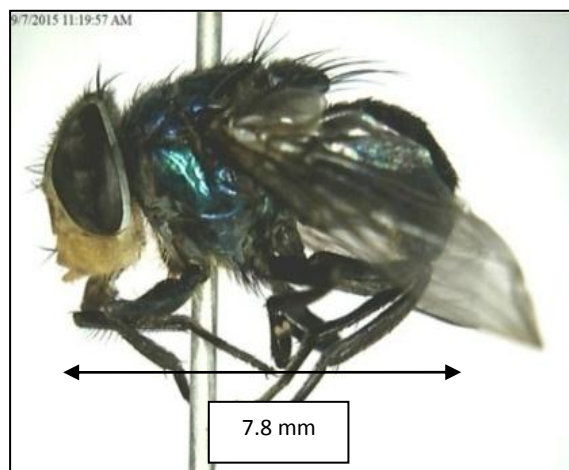
**Figure 1:** Heavy bands of dark, robust, thorn-like spines



**Figure 2:** Six lightly sclerotized (pale brown) papillae or branches in anterior spiracles



**Figure 3:** *Heavily sclerotized incomplete peritreme in dark brown to blackish posterior spiracle and with 3 slit-like spiracular openings*



**Figure 4:** *Blue/green body color of adult C. bezziana fly*

## CASE DETAILS

### *Case No. – 01*

Four live larvae were collected from a 76-year-old male diabetic patient on 29/02/2016 at 09.00 h at the Teaching Hospital, Peradeniya. Clinical examination revealed the presence of the larvae infesting a wound in the right heel of the patient. In the laboratory, two larvae from the total were preserved and the remaining two were reared to get the adults. The larvae were 3<sup>rd</sup> instar at the time of collection (Table 01).

### *Case No. – 02*

Two live larvae were collected from a 30-year-old male patient on 18/03/2016 at 12.00 h at the Teaching Hospital, Peradeniya. According to the clinical examination, both legs of the patient had severe wounds with the right heel infested with larvae.

Patient sensed a burning type irritation from the wound five days prior to admission to the hospital. One larva was preserved while the others were reared to the adult stage. The preserved larva was in the 2<sup>nd</sup> instar stage (Table 01).

### *Case No. – 03*

Two live larvae were collected from a 65-year-old female diabetic patient on 19/04/2016 at 13.00 h at the Teaching Hospital, Peradeniya. A larval infested wound was located under the 2<sup>nd</sup> left toe. The wound was first noticed by the patient three weeks prior to being admitted to the hospital. Collected larvae were in the 3<sup>rd</sup> instar stage (Table 01).

<i>Table 1: Background information of patients from which larvae were- collected.</i>					
Case No.	Sex	Age	Wound location	Life stage of the fly collected	Number of larvae collected
01	M	76	Right heel	3 <sup>rd</sup> instar	4
02	M	30	Right heel	2 <sup>nd</sup> instar	2
03	F	65	2 <sup>nd</sup> toe, left foot	3 <sup>rd</sup> instar	2



### Estimation of Colonization Time

<i>Table 2: ADD values for the experimental development time of C. bezzianacalculatedusingdevelopment data given by Spradbery JP, 2001</i>					
Life Stage	Threshold Minimum	Developing Temperature	Development Time (h) (day= h/24)	Exp.DD	ADD
	10 °C	28 °C			
<i>Egg</i>			20 h(0.83 days)	14.9	14.9
<i>1<sup>st</sup> Instar</i>			24 h (1day)	18	32.9
<i>2<sup>nd</sup> Instar</i>			24 h (1day)	18	50.9
<i>3<sup>rd</sup> Instar</i>			120 h (5days)	90	140.9
<i>Pupa</i>			168h(7days)	126	266.9
<b>Total ADD</b>					<b>266.9</b>

The lower threshold temperature for the fly species was considered 10°C<sup>16</sup>. This is because in many calliphorid related studies this temperature was the standard lower threshold temperature of larval growth.

<i>Table 3: Calculation of Degree Day (DH) and Accumulated Degree Day (ADD) for case study 01 with lower threshold minimum of 10<sup>0</sup>C</i>				
Date prior to infestation	Mean body Temperature	DD	ADD	
28/02/2016	37	27	27	
27/02/2016	37	27	54	
26/02/2016	37	27	81	
25/02/2016	37	27	108	
24/02/2016	37	27	135	
<b>*23/02/2016</b>	<b>37</b>	<b>27</b>	<b>162</b>	
22/02/2016	37	27	189	
21/02/2016	37	27	216	

\*- Day attains the 3<sup>rd</sup> instar larvae

According to the above calculation, in case study 01, eggs have been laid 6 days prior to removal of larvae (23/02/2016). In case 02, eggs have been laid two days prior to removal of larvae (16/03/2016). And, in case 03, eggs have been laid 6 days prior to removal (13/04/2016).

## DISCUSSION

Although this is not the first investigation to document *C. bazziana* infesting human hosts in Sri Lanka, it is the first to utilize entomological techniques to estimate the TOC of humans by this species. An extensive study carried out by Kumarasinghe et al<sup>18</sup>, in Colombo and Kaluthara district over 18 months, which was initiated in 1997, recorded 16 myiasis cases with 14 involving *C. bazziana*. Prior to the current study, other three *C. bazziana* infestations were only known from two incidents of nasal myiasis<sup>19</sup> and one of cutaneous myiasis<sup>20</sup>.

Risk factors leading to myiasis include poor personal hygienic practices, improper wound management and less concerning of good environmental hygiene<sup>19</sup>. The three patients in this study were from rural areas associated with low socioeconomic development.

Consequently, patients do not have proper access to health care professionals. The lack of resources possibly explains the poor wound care observed which could have led to ulceration and prolonged exposure to myiasis-causing flies. In this study, the infestation site associated with each patient was the foot. Kumarasinghe et al<sup>18</sup> recorded 15 of 16 cases involving foot myiasis. They observed that this commonly occurred due to non-wearing of shoes by patients who came to hospitals from rural areas of the country.

In this study, an attempt was made to calculate the TOC by *C. bezziana* using ADD. Historically, this method is used to

calculate the TOC associated with the PMI<sup>12</sup>. In Forensic entomology, two basic methods have been used to calculate the PMI namely temperature related methods and stage of succession<sup>12</sup>. ADD/ADH method and isomegalen/isomorphen diagram method are categorized under the temperature related methods which are the major techniques of calculating the TOC. The use of temperature-related methods is based on the hypothesized linear relationship between the temperature and development of flies<sup>12</sup>. ADD/ADH method was used here to identify the TOC of wounds by larvae, as it is the standard and most sophisticated technique used in many forensic cases to estimate the development rate of flies over a period of time<sup>21</sup>.

In this study, several assumptions were made. Typically with calculating ADD, ambient temperatures are used as the function of the rate of development. But in these cases, human body temperature was employed due to the host body serving as the primary source of heat for larval development. However, the impact of ambient temperature in conjunction with body-associated heat on the development of these insects is not known.

A second issue that there was no data published on the development of *C. bazziana* at this temperature. Therefore, the calculation was done using the available temperature (28 °C) given by Spradbery<sup>17</sup>. As the rate of larval development very with varying temperatures, this may have affected the calculated ADD. Development studies done for blowflies (Diptera: Calliphoridae) show that the development times within species vary for a variety of species<sup>22, 23</sup>.

A third assumption was the data from Spradbery<sup>17</sup> would be appropriate for application in the current study. The variation could be the result of a number of factors, such as experimental design, environment, and genetic variation. Tarone

and Foran<sup>22</sup> determined that environment conditions greatly influenced the development of the blow fly *Lucilia sericata* Meigen (Diptera: Calliphoridae). Their findings demonstrate the need for multiple development data sets for each species of blowfly across geographic regions, as well as for a standardization of laboratory-rearing techniques<sup>24</sup>.

As this study establishes the method of recording development stages of forensically significant flies in Sri Lanka, in the future, forensic medical and judiciary authorities in the country can incorporate this technique to pursue legal cases on verification of the malpractices of caregivers of wound patients in the professional and personal environment, based on the time scale calculated from above method. The present study highlights the importance of identifying the forensically important fly species found in Sri Lanka and recording their development data in order to build up the field of forensic entomology in the country.

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## SAFETY OF THE REAR SEAT PASSENGER: THE IMPORTANCE OF A NEW LEGISLATION

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### ABSTRACT

The enforcement of law for the front seat occupants to wear seat belts and timely deployment of air bags during crashes has unquestionably reduced front seat occupant morbidity and fatality. However, law does not impose any regulation for the rear seat passengers to wear seat belts in Sri Lanka. As a result an increased incidence of rear seat passenger fatality in high speed crashes is observed in forensic practice. This communication presents four unrestrained rear seat passenger fatalities, in two similar crashes. Imposing of regulations in Sri Lanka to wear seatbelts for rear passengers is strongly recommended as it minimizes fatalities/injuries, not only in rear seat passengers but in all the occupants of a vehicle.

**Key words:** *Rear seat passenger, road safety*

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### INTRODUCTION

The enforcement of law<sup>1</sup> for the front seat occupants to wear seat belts and timely deployment of air bags during crashes has unquestionably reduced front seat occupant morbidity and fatality. However, law does not impose any regulation for the rear seat passengers to wear seat belts in Sri Lanka<sup>1</sup>. Rear seat passengers make use of this legal silence and tend, not to wear seat belts. However, an increased incidence of rear seat

passenger fatality in high speed crashes is observed in forensic practice even in supposedly “safe modern car”, when the same vehicles’ front seat passengers escape injury<sup>2</sup>. Restraint of rear seat passenger with seat belt is considered an effective means of reducing injuries to the rear seat passenger as well as reduction of injuries to front seat occupants<sup>2</sup>. This communication presents four unrestrained rear seat passenger fatalities, in two similar crashes highlighting the importance of imposing law for the rear seat passengers to wear seat belts in order to prevent such fatalities.

### Case 1

Four vehicle occupants returning home to Kandy from Kegalle, past mid-night were admitted to the hospital following a collision of their modern car with a water bowser from behind at Peradeniya. The driver, on examination had some chest pain on deep breathing and was discharged the same day. He had no memory of the accident and claimed that he was aware about the timely deployment of air bags. The front seat passenger was discharged the following day with only some discomfort in his chest. Both of them showed negative results for the clinical examination for the drunkenness.

Both rear seat occupants were dead on admission, one with a large scalp laceration and a hinge fracture of the skull and the other with a flail chest and cardiopulmonary contusion detected at autopsy. None of the deceased persons had blood alcohol.

The examination of the scene revealed no tire marks to suggest any braking. Gross damage on car's front crumple zone (Figure 1) suggested a high speed when it was collided the water bowser.



**Figure 1: Extensive crumple zone damage and deployed air bags**

## Case 2

A family returning after visiting their relatives in Mathara in their modern car collided with a bus from behind in Kegalle close to mid-night. The driver, who was the elder son and father, who was the front seat passenger, wore seat belts and survived with no injuries. The two unrestrained rear seat passengers, mother and younger son suffered head and cervical spine injuries and succumbed to the injuries shortly on admission. None had blood alcohol. Scene examination revealed extensive collapse of the frontal crumple zone of the car (Figure 2).



**Figure 2: Extensively collapsed crumple zone.**

## DISCUSSION

When struck against another, the motion of vehicles and occupants are left to the laws of physics of momentum and inertia. In both case scenarios the rear seat passengers who were unrestrained, possibly hurled inside the vehicles dashing against seats, tempered glass and hard/sharp objects carried inside passenger compartment. In a research done in Japan, the unbelted rear seat dummies were thrown around inside the passenger compartment, making contact at several locations such as thrown over the front seat, making contact with the front seat, roof and instrument panel<sup>3</sup>. This study demonstrated that a rear seatbelt is useful for preventing hard contact with the vehicle interior<sup>3</sup>. Restrained rear seat passenger does not only prevent serious injuries/fatalities against him/her but, those against front seat passenger/driver too<sup>2</sup>.

Wearing of rear seat belts has been made compulsory by law in Australia, Czech Republic, Finland, France, Germany and many other countries<sup>4</sup> though it has not been made compulsory in India, Indonesia, and Philippines including Sri Lanka<sup>4</sup>. The availability of highways, modern fast cars with up-to date safety features could not counter the negligence of not wearing the readily available rear passenger seat belt. The situation worsens when it is associated with fatigue of long distance travel that falters driver reflexes and even causing the driver to fall asleep as it appears clearly to be the case in 1<sup>st</sup> case scenario described above.

## CONCLUSION

Imposing of regulations in Sri Lanka to wear seatbelts for rear passengers is strongly recommended as it minimizes fatalities/injuries, not only in rear seat passengers but in all the occupants of a vehicle.



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# NOVEL DEVICE TO MEASURE BODY LENGTH AT AUTOPSY

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## ABSTRACT

Every text book or manual on autopsy procedure instructs that the length of the body is to be measured at every post mortem examination conducted. However, how, and with what instrument, this is to be carried out is not described. An internet search failed to find resources describing the technique; nor could any images of an appropriate instrument to measure body length at autopsy, or videos demonstrating the technique, be found. The method of ascertaining the length of the body varies from place to place. Either they are not accurate, require two operators for an accurate reading, or require the use of a cumbersome instrument. Therefore, the authors invented, and have successfully used, an accurate, low cost, small device which is simple to use by a single operator, to measure the length of bodies at autopsy. A detailed description of the device, and method of using, to obtain an accurate length is given for the benefit of those carrying out pathological, coronial or forensic autopsies.

**Key words:** Post-mortem, Length, Measurement, Portable, Instrument.

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## INTRODUCTION

Every text book or manual on autopsy procedure mentions that the heel to crown length of every deceased that undergoes a forensic autopsy has to be measured and recorded [1,2]. The body length is part of every autopsy report and is important, together with the weight, for the court to have an idea about the stature of the person. This is especially important in suspicious deaths, hanging, homicides and sexual offences. Surprisingly, an internet search did not reveal any literature on how this is to be specifically done; neither was there any images of an instrument to measure length of a body at autopsy or videos demonstrating the technique.

## OBJECTIVE

To design a low cost, small, lightweight, portable device, to accurately measure body length at autopsy, by a single operator.

## MATERIALS AND METHOD

The device consists of a three sided rectangular box into which the feet are placed. There is an extension arm at the level of the heel, into which the hook of the retractable 3m steel tape is inserted (Figure 1).



***Figure 1: The device with steel measuring tape hooked on the extension arm***

The tape is drawn out parallel to the body and the autopsy ruler is placed on the crown of the head perpendicular to the steel tape (Figure 2). The reading is taken at this point.



***Figure 2: A single operator using the device to obtain an accurate length in a volunteer***

The error caused by the ruler not being at right angles to the tape can be minimised by using a commercial tri set square or two pieces of wood or plastic placed at right angles to each other (Figure 3).



***Figure 3: Reading taken at the head parallel to the heel at right angles to the tape***

The device can be made from wood, plastic or fibreglass and measures 30 x 20 x 6cm. The retractable steel tape can be purchased in any store and measures 7 x 7 x 3cm.

## **DISCUSSION**

The method and instrument used to measure body length varies from place to place. One instrument used is an “L” shaped rigid rod with a scale 2m in length with a fixed head piece at right angles to zero on the scale. The length of the body is measured by placing the head piece on top of the head and placing the autopsy ruler parallel to the head piece on the heel and taking the reading where it meets the 2m scale. A modification of this instrument, to reduce the error of the ruler not being held parallel to the head piece, is to have a sliding foot piece attached at right angles to the long limb. This instrument is accurate and measurement can be done by a single person. However, it is cumbersome to use, transport and store. Another method is to use a plastic tape placed alongside the body. However, two operators are required; one to hold the tape at the level of the top of the head (crown) while the other takes a similar reading at the heel. Even though a plastic tape

is small and easily transportable this method is prone to errors since the tape is placed some distance away from the top of head and heel along the autopsy table, along the widest point of the body – the shoulders or hips. Therefore, there is a chance of error when ascertaining the level at head and heel, especially if the total length of the tape is less than the body length. If the tape is placed along the surface of the body, from head to toe, the error is intensified. Not only does the tape follow the contours of the anterior aspect of the body, but also, this measurement is the undertaker's length (as it is head to toe) and may be several centimetres more than the crown to heel length. The use of the autopsy foot ruler is even worse as the margin of error is very much greater.

The above device can be used at autopsies conveniently and easily, even by a single person, with a high degree of accuracy. In

addition, the size makes it easily transportable to a scene, or to conduct an autopsy in another location. An added advantage, especially for resource poor developing countries, is that it can be easily manufactured locally at very minimal cost. It is hoped that publication will disseminate this information far and wide. The authors have not patented this post mortem body length measuring device to enable anyone to reproduce, use and improve it for the benefit of society.

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### **DISCLOSURES**

A poster presentation on the above device titled 'Novel device to measure body length at autopsy', was done at the 10<sup>th</sup> Indo Pacific Congress on Legal Medicine and Forensic Sciences, held in New Delhi, India from 25-30 October 2010.

### **FUNDING**

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### **CONFLICT OF INTEREST**

Fernando DMG declares he has no conflict of interest.

Gunatilake PGL declares he has no conflict of interest.

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