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- Make available a platform for forensic practitioners to publish their work;
- Educate medico-legal practitioners of new knowledge and skills so that they will utilize them in their work related to the administration of justice
- Develop and promote a research writing culture amongst the medico-legal community.

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CONTENTS

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ESITORIAL

Predatory journals

-Dinesh Fernando-

The aim of the scientific community, or any researcher, is to share their knowledge and research findings with the rest of the world. To this end, scientific journals play a large role. In this e-era, with so many spurious / bogus claims spreading as fast as the delta variant of the corona virus, it is important to have peer reviewed scientific publications which can be trusted. However, with the advent of open access journals, this long held trust in academic publications have been shaken. This is due to the proliferation of journals that charge the author article processing fees (APC), but do not sufficiently provide the vetting by peers, required of academic publishing. These are the pseudo journals; more commonly known as predatory journals. These generally publish low quality articles, which do not undergo the expected stringent publishing practices of legitimate journals, since their main goal is financial gain[1].

The three pillars of scholarly publishing – business ethics, research ethics and publishing ethics[2] – are washed away on a wave of financial greed and easy money. The promise of publication in a "reputable" journal with a high "impact factor" with short turnaround times, in return for a relatively low fee, tempts researchers, particularly from low and middle income countries - with no institutional support for publications - to submit their papers; thus, being easy 'prey' to these 'predatory' journals. In the most extreme cases, the articles are published on line without any peer or editorial review / corrections as soon as it is submitted.

By no means are all open access journals using the gold (author pays) model of questionable quality. However, it cannot be denied that they face a great temptation to accept unworthy manuscripts: on one hand, the more they accept the greater the profit margins, while on the other hand, if they reject it their income is reduced - and most likely it will be accepted by a competitor journal.

It cannot be denied that some graduate students and academics, caught in the 'publish or perish' cycle, choose to submit and publish their work in 'questionable' journals, in order to fulfill requirements of a degree or promotion. Hence, they are not 'prey', and therefore the term 'pseudo' journals, is preferred[3]. Checking of each and every journal listed by the applicant for authenticity and quality by the evaluator, is easier said than done. Senior academics have been slow to recognize the proliferation of these spurious journals: they published in an era of subscription journals which were well respected and of good quality. The established high quality subscription journals were governed by a high level of research integrity at all levels – from researchers to peer reviewers to editors to readers. Therefore, the findings were accepted without question and used by other researchers for future research. With the advent of spurious journals the appearance of spurious research is inevitable.

More and more questionable medical or pseudo medical research is being published, which makes it more difficult for authors – and evaluators – to sift through when citing papers. Not only publishing in pseudo journals, but also citation of pseudo journals should not be encouraged; not only since the authenticity and quality of the publication is questionable, but also, since citations indirectly promote these journals.

Subscription journals use an in-built quality control system. Since there is a limited budget for publishing an issue, only the best papers are selected; therefore, the readers (and the libraries purchasing these journals) were presented with high quality articles. This in turn prompted more authors submitting better papers and thereby the quality

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was improved. In the 'gold' open access model there is no increased cost involved in publishing more and more papers, and therefore, the publishers may be prone to accept lower quality papers rather than rejecting them. This cycle continues in the exact opposite way of the subscription model.

Is there a compromise between these two models? Yes there is; the "diamond model" where the publisher does not charge article processing fees from the author. The cost is borne by the institution publishing the journal. The articles are freely available (like in gold), while the quality can be maintained as there is no financial conflict involved in the decision making process. The quality is maintained like the subscription model, with the advantages of open access leading to wider readership and more citations. The Sri Lanka Journal of Forensic Medicine, Science and Law follows this model; the University of Peradeniya bears the publishing costs. If all academic institutions adopt this model it will pave the way to a boon of open access publishing, ending the bane of predatory journals.

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ORIGINAL RESEARCH PAPER

Estimation and epidemiological assessment of undiagnosed HIV cases and their co-positivity with hidden HBV & HCV in Lucknow and surrounding districts of northern India – a post mortem study

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ABSTRACT

Background: Undiagnosed HIV cases are continuously jeopardizing the efforts to combat HIV/AIDS. Screening of these hidden cases is necessary to sensitize our policymakers and more so our healthcare workers to this occupational hazard.

Objectives: To determine the serostatus of HIV, HBV & HCV in human corpses with unknown status and to correlate HIV infectivity with HBV-HCV infectivity, socio-demographic character, behavioural pattern, and habitat.

Methods: This was an observational cross-sectional study that included all human corpses with unknown serostatus, brought to a single institute in India for medicolegal autopsy. Serum was extracted and an ELISA kit was used to screen these cases.

Results: 929 blood samples were collected. The prevalence of undiagnosed HIV, HBV, and HCV was 1%, 1.9%, and 1.4%. This was much higher than the known prevalence in the North India region. The co-positivity of HBV & HCV cases was also found to be statistically significant. The multivariate logistic regression analysis revealed that marital status, addiction habits, and homelessness were found to be significantly associated with the prevalence of HIV.

Conclusion: There is a need for healthcare agencies worldwide to have policies for screening of undiagnosed cases since these obscure cases endanger the healthcare workers.

Keywords: Undiagnosed HIV cases, Obscure HBV-HCV cases, Occupational hazards, Autopsy room, HIV epidemiology.

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INTRODUCTION

Undiagnosed HIV cases are continuously jeopardizing the efforts to combat HIV/AIDS. Gap report published by UNAIDS 2013, revealed that globally 75% of persons with HIV are from 15 countries, India securing 3rd place after South Africa and Nigeria both in PLHIV and AIDS-related deaths. They also reported that of the 2.1 million new HIV infections that occurred in 2013, India secured 4th place after South Africa, Nigeria, and Uganda[1]. Many surveys around the world showed declining HIV incidence and prevalence. However, literature survey did not reveal any studies done to estimate the

actual burden of undiagnosed disease. The problem of undiagnosed cases is not only limited to developing and underdeveloped countries, but the rate of new HIV infections in European country continues to rise, with one-quarter of cases remaining undiagnosed[2,3]. In North America, mainly in New York City initially, health care providers experienced that positivity rates are significantly lower than the expected national estimate as most of the residents are unaware of being infected[4]. In India, very little data regarding undiagnosed cases are available. The reason behind the low detection of cases is best explained in Manipur, a small state of India which demonstrate a low-to-moderate lifetime rate of HIV testing despite an increased prevalence rate of HIV among the people who inject drugs (PWID)[5]. As these HIV-positive individuals are either completely unaware or hide their infectivity status due to stigma, data regarding the extent of undiagnosed HIV cases and uptake of HIV testing in the Indian setting is minimal. An extensive study conducted more than 25 years ago identified the virus in 21 of 41 (51%) serum specimens or blood mononuclear cell fractions from cadavers where the longest post-mortem interval at the time of testing was 37.5 hours (The virus can be detected up to 21.5 hours post-mortem). The virus was detected on a skull bone six days and from a stored specimen of the spleen even after 14 days 6. The post-mortem room is a source of potential hazards where the staff need to minimize risk[7]. USA, in 2003, reported the first documented case of occupational HIV transmission in the world[8]. It is reported that even most experienced autopsy surgeon who is not wearing cut-resistant mesh, have a chance of percutaneous injury exposure at a rate of 1 per 53 cases and other health care workers, not wearing a cut-resistant mesh have a risk of 2.4% for occupational HIV exposure[9]. Besides HIV, the presence of hepatitis B and hepatitis C virus in human corpses, with undiagnosed serostatus, brought for autopsy, endanger health care workers and result in stigmatization. This not only make health care personnel more anxious but also reluctant towards performing their duty. Co-infectivity of blood-borne viruses with HIV is a hard blow on the efforts to reduce morbidity and mortality. This study will not only protect the healthcare worker by increasing awareness but also provide a database of undiagnosed seroprevalences of HIV, HBV, and HCV to national and international health care agencies.

OBJECTIVE

To determine the sero-status of HIV, HBV & HCV in human corpses with unknown status and to determine correlation of HIV infectivity with HBV-HCV infectivity, socio-demographic character, behavioural pattern, and habitat.

MATERIAL AND METHOD

This was an observational cross-sectional study conducted from August 2015 to March 2019. The study was carried out on human corpses brought randomly, to the mortuary of a tertiary care centre, for medicolegal autopsy, where the serostatus was unknown. This centre caters to a large population from both urban and rural settings of Lucknow and the nearby district of northern India. It receives an average of 5000 to 6000 corpses annually for medicolegal autopsy.

Sample size calculation & Sampling technique:

Sample size= (Z1-α/2)2 x P (1-P) /d2

Z1-α/2-is standard normal variate at 5% type 1 error (p<0.005), it is 1.96 and at 1% type 1 error (P<0.01) it is 2.58). As in most studies, P values are considered significant below 0.05 hence 1.96 is used in the formula.

p = Expected prevalence in population-based on previous or pilot studies.
d = Precision –decided by the researcher.

So, taking Z1-α/2=1.96, P=50% (0.5) for infinite population, d=3.25% absolute for considering relative power of study 80% for checking the hypothesis that prevalence of HBV/HCV among HIV positive cases

Sample size= (1.96)2 x 0.50(1-0.50)/ (0.0325)2

Sample size= 910

Based on the assumption of data loss during study, a total of 1018 samples were collected using nonprobability convenient sampling method.

The following exclusion criteria were considered:
1. Human corpse with known sero status
2. Inability to obtain consent from next to kin.
3. Haemolysed blood samples

We have collected 5 ml of blood from the right chamber of the heart under universal precautions, after obtaining consent from the next of kin. The samples were centrifuged, serum separated, labelled, and stored at -20̊C. Thousand eighteen blood samples were collected randomly, of which 89 had to be discarded due to poor quality serum. Nine

hundred and twenty nine were analysed using Microlisa HIV kits of J.Mitra & Co. Pvt to detect the seropositivity status of all 3 viruses.

RESULTS

The Monte Carlo chi-square test was used to compare the categorical variables. The univariate and multivariate backward conditional binary logistic regression was carried out to determine the strength of association between the prevalence of HIV and various factors. The odds ratio (OR) with 95% confidence interval (CI) was calculated and the p-value<0.05 was considered significant. This analysis was carried out on the SPSS 16.0 version of Chicago, Inc., USA. The study results are presented in percentages. The prevalence of HIV, HBV and HCV was 1% (n=9), 1.9% (n=18) and 1.4% (n=13). The HBV was found to be positive in 44.4% of positive HIV subjects. However, HCV was positive in 22.2% of positive HIV subjects. The association was statistically significant. None of the subjects were found to be co- positive for all HIV, HBV, and HCV. Co-positivity of HBV and HCV was present in 4 subjects (0.4%). (Table 1).

Table 1: Association of HIV with HBV and HCV

	HIV				
	Positive (n=9)		Negative (n=920)		p-value[1]
	No.	%	No.	%	
HBV					
Positive	4	44.4	14	1.5	0.0001*
Negative	5	55.6	906	98.5	
HCV					
Positive	2	22.2	11	1.2	0.0001*
Negative	7	77.8	909	98.8	

[1]Chi-square test, *Significant

The prevalence of HIV was observed to be higher among older subjects compared to subjects less than 18 years of age. The prevalence of HIV was found to be 80 % lower among the 31-45 years of age group than >45 years (OR=0.20, 95%CI=0.04-1.01, p=0.06). There was no significant (p>0.05) association between prevalence of HIV with the place of residence and religion. The ratio of males & females corpse is approximately 80:20, but prevalence was found to be higher among females in this study (Table-II). Majority of HIV positive cases were from the lower-middle and upper-lower socioeconomic status (Kuppuswamy 2015 & Revised Udai Pareek Scale). The relation of HIV positivity to gender and socioeconomic status was statistically insignificant. Prevalence of HIV was significantly higher among divorced/widowed individuals (Table 2).

Table 2: Prevalenceand association of HIV infection according to socio-demographic characters

Character-istics	Study population (n=929)		Prevalene of HIV		OR (95%CI)	p-value[1]
Age in years	No	%	No	%		
<18	36	3.9	0	0.0	-	-
18-30	367	39.5	0	0.0	-	-
31-45	303	32.6	2	0.7	0.20 (0.04-1.01	0.06
>45	223	24.0	7	3.1	1.00 (Ref.)	
Gender						
Male	736	79.2	6	0.8	0.52 (0.12-2.10)	0.35
Female	193	20.8	3	1.6	1.00 (Ref.)	
Place of residence						
Rural	258	27.8	4	1.6	1.37 (0.25-7.60)	0.71
Urban	494	53.2	3	0.6	0.53 (0.08-3.22)	0.49
Semi-urban	177	19.1	2	1.1	1.00 (Ref.)	
Religion						
Hindu	797	85.8	8	1.0	1.00 (Ref.)	
Muslim	128	13.8	1	0.8	0.87 (0.10-7.17)	0.90
Sikh	4	0.4	0	0.0	-	
Socio-economic status						
Lower	34	3.7	0	0.0	-	-
Lower-middle	235	25.3	3	1.3	-	-
Middle	97	10.4	1	1.0	-	-
Upper-lower	286	30.8	5	1.7	-	-
Upper-middle	248	26.7	0	0.0	-	-
Upper	29	3.1	0	0.0	-	-

OR-Odds ratio, CI-Confidence interval, [1]Binary logistic regression, Ref.-Reference, *Significant

The prevalence of HIV was significantly (p=0.02) higher among alcoholics (2.1%) than non-alcoholics (0.5%) (Table-III). The prevalence of HIV was higher among people with history of frequent hospitalization while assessing HIV testing status, no case was found among people who have tested for HIV within 5 years of time (Table-III). The prevalence of HIV was higher but insignificantly (>0.05) associated with migrant status and significantly (p=0.0001) associated with homelessness (Table 3).

Table 3: Prevalence and association of HIV infection according to addiction habit, health care & habitat status

Addiction habit	Study population (n=929)		Prevalence of HIV		OR (95%CI)	p-value[1]
	No	%	No	%		
Alcohol						
Yes	287	30.9	6	2.1	4.54 (1.12-18.31)	0.02*
No	642	69.1	3	0.5	1.00 (Ref.)	
Drug						
Yes	60	6.5	2	3.3	4.24 (0.86-20.90)	0.06
No	869	93.5	7	0.8	1.00 (Ref.)	
Frequent hospitalization						
Yes	36	3.9	1	2.8	3.16 (038-25.96)	0.25
No	893	96.1	8	0.9	1.00 (Ref.)	
HIV testing status						
<5 years	14	1.5	0	0.0	-	-
≥ 5 years	29	3.1	1	3.4	4.23 (0.50-35.55)	0.18
Not remembered	50	5.4	1	2.0	2.41 (0.29-20.03)	0.41
Unknown	836	90.0	7	0.8	1.00 (Ref.)	
Migrant status						
Migrant	160	17.2	2	1.2	1.37 (0.28-6.69)	0.69
Non-migrant	769	82.8	7	0.9	1.00 (Ref.)	
Homelessness						
Homelessness	46	5.0	8	17.4	185.68 (22.64-1522.50)	0.0001*
Non-homelessness	883	95.0	1	0.1	1.00 (Ref.)	

OR-Odds ratio, CI-Confidence interval, [1]Binary logistic regression, Ref.-Reference, *Significant

DISCUSSION

The prevalence of HIV infection in human corpses brought for medicolegal autopsy is around 1.0%, while the known prevalence of HIV infection in the general population is 0.24 % in this region10. HBV and HCV prevalence were also found in 1.9% and 1.4% of these undiagnosed cases respectively. This is an alarming situation for both the healthcare workers and the lawmakers as this difference in prevalence may indicate a rise in undiagnosed cases like other studies[11]. Estimation of the actual burden of this undiagnosed disease at one point of time is not possible so time to time studies has been programmed in different countries like South Africa & Peru region etc and results were alarming, these results showed a clear rise in the prevalence of HIV among corpses than HIV% in general population[12, 13]. Another study from the USA demonstrated that persons who are unaware of their HIV seropositivity status contribute nearly one-third of the current transmission[14]. Co-infection with HBV and HCV virus was found to be significant in our study population, which is like many other studies, programmed in recent past[15]. Commonly associated risk behavior and mode of transmission must be a significant player behind this.

In the general population maximum prevalence was found among the 31 to 45 age group but in our settings prevalence was maximum in age group >45 (Table 2). If we have a look at a similar study of undiagnosed HIV cases but in the emergency department, in that setting too our results regarding the prevalence of undiagnosed HIV cases among different age groups are quite different[16]. Our study sample and demographic characteristics are different from these previous studies. So, the present study, even though not representing the general population but it provides a clear insight into undiagnosed HIV seroprevalence in the autopsy room. This often creates panic among health care worker and put them under undue risk of occupational exposure of HIV infection. It was seen in many studies that even most experienced autopsy surgeons who are not wearing cut-resistant mesh, have a chance of percutaneous injury exposure at a rate of 1 per 53[9]. In our scenario unavailability of this cut resistance mesh increase the risk of occupational HIV exposure many folds.

Due to lack of available facilities, rural areas remain the most neglected areas hence have a higher prevalence rate of undiagnosed HIV/AIDS. Poor literacy rate, along with lack of awareness of HIV/AIDS, not only predisposes them to infection but also makes them unscreened for the disease, hence providing a major contribution to the pool of undiagnosed cases. Stigma related to HIV/AIDS is also a major setback in the diagnosis of HIV/AIDS in rural populations[17]. So, this study indicates the importance of placing equal emphasis on HIV screening in rural areas.

Socioeconomic status represents the standard of living, income & educational status of a person. All cases in our study were found in the lower-middle, middle, and upper-lower class, no case was found in the upper-middle and upper class. Socioeconomic status is a strong predictor of mental and physical health-related problems. It was shown that youth

having low social living, have more chance to indulge in unprotected sex and getting infected with HIV[18]. In comparison to developed countries, underdeveloped, and developing countries are likely to have a greater chance of developing HIV epidemics. The utilization of different facilities to combat HIV/AIDS also depends upon socioeconomic strata. Many studies reported that HIV/AIDS-related stigma is also more concentrated among people with lower socioeconomic strata than upper[19]. Low education and poverty are some important reasons behind this stigma concept and because of them, these people are unaware of different mass media campaigns held by Government to combat HIV/AIDS. Marital status is also a determinant risk factor associated with HIV infection. Like other studies, the prevalence was significantly greater among divorcee/widows[20]. These separated or divorced people are more prone to indulge in prostitution and promiscuity.

Alcohol, drugs, and frequent hospitalization present with higher prevalence in our study sample (Table III). Alcohol has a disinhibiting effect with increased sexual desire and expression of masculinity, thus increasing the risk[21, 22]. The underdeveloped and developing areas of the world cater higher prevalence of HIV infection among the drug abusers and this was estimated by United Nations Office on Drugs and Crime (UNODC)[23]. Similarly, in our study, we found a higher prevalence of HIV seropositivity among drug users. It was also seen that unsafe injection practices are closely associated with unsafe sexual behaviors[24]. These people often indulge in compulsive and promiscuous sexual activity. Awareness-raising programs for possible risk of blood-borne viruses and other preventive measures such as installation of street condom vending machines and maintenance therapy like methadone should be vigorously introduced in these neglected areas. Like other studies, hospitalization rates are higher in people with HIV than the general population due to immunodeficiency[25]. Frequent hospitalization is a marker of advanced disease, associated with the ostracized behavior of relatives & family. We found in our study that the prevalence of HIV is significantly higher in subjects who either did not remember their testing time or had been tested more than 5 years ago. The study suggests that a high level of repeat HIV testing is a need of the hour to minimize an unsatisfactorily high percentage of undiagnosed cases. This also minimizes the time between the onset of infection and diagnosis and thus we can reverse the global AIDS epidemic[26].

In our study prevalence of HIV among migrant people is greater than among non-migrant. Migrants report more unprotected sexual encounters. The results of the studies have suggested that migrant man after being separated from their partner, often indulge in frequent and potentially riskier sexual activity[27]. Similar results are also valid for female migrants too for having a higher number of sexual partners than female non-migrants[28]. Homelessness is also a separate risk factor in HIV epidemiology. In India, an exponential rise in population lead to the migration of people towards metro cities, which are not fully equipped to accommodate the migrants. These people with very poor means of survival are often involved in risky sexual behaviour to fulfil their sexual desire hence have higher susceptibility and prevalence of HIV/AIDS[29,30]. These people are psychologically and physically unfit and destitute, have higher morbidity and mortality in comparison to people at home. So, some interventional programs should also be introduced to strengthen socio-emotional coping strategies in these street people as well as to address contextual risk factors such as stigma and discrimination by the public. So, like other studies, our study also suggests that tracing risk areas detect a higher percentage of undiagnosed cases than outreach-based testing or respondent-driven sampling[31]. A major strength of this study is that it has a large sample size that provides a clear insight into the higher prevalence of these undiagnosed HIV, HBV & HCV cases in the general population brought to autopsy rooms. Due to its only limitation, this study may not represent the true picture of the general population but surely it gives a clear insight of increased undiagnosed cases & associated risk in an autopsy room.

The result of this study will sensitize all healthcare workers to these hidden cases enabling them to protect themselves against occupational hazards.

CONCLUSION

There is a high prevalence of hidden HIV, HBV & HCV cases in the general population. Significant co-positivity with HBV and HCV is also an independent risk factor for the community and more so to our health care worker. Prevalence of undiagnosed HIV Infection is found to be significantly associated with addiction habit & habitat status.

RECOMMENDATIONS

A regular screening prior to autopsy is required not only to get an idea of the prevalence of HIV, HBV, and HCV in the community but also to protect those

involved in the autopsy process. Screening of addict, migrant and homeless population is also recommended. Regular KAP (Knowledge Attitude and Practice) sessions are recommended for health care worker and for the people visited in mortuary to create awareness and also sensitize them against this blood borne viruses.

CONFLICTS OF INTEREST

The authors have no conflicts of interests to disclose

ETHICAL ISSUES

None

AUTHOR CONTRIBUTIONS

RS: concept and design of the study, results interpretation, preparation of first draft and critical version of the manuscript, **AKV**: final approval of the version to be published, **RK**: drafting, concept and coordination of the overall study, **HS**: statistically analysed the interpreted, reviewed the literature, manuscript preparation and drafting, **MS**: preparation of the manuscript, analysed language and interpretation, **RR**: preparation and revision of the manuscript

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ORIGINAL RESEARCH PAPER

Patient's knowledge, attitudes and practices on informed consent in a clinical setting; A study done at Colombo North Teaching Hospital, Sri Lanka

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ABSTRACT

Introduction: The signing of a consent form is a process with legal and ethical implications. It is required that informed written consent be obtained from a patient for an invasive procedure after proper explanation of the risks, benefits and alternative procedures.

Objective: To determine knowledge, attitudes and practices related to informed consent among patients.

Materials and Methods: A cross sectional descriptive study was carried out over a period of one year in a Tertiary care hospital in Sri Lanka. The participants were medical or surgical inward patients who were 18 years or above, who had consented to invasive procedure or surgery. The quantitative data of 420 patients were analyzed.

Results: Majority (96%) agreed that consent is important in medical practice. Many (61%) were of the view that it helps to make an informed decision. Majority (92%) preferred a doctor, who can explain more in the consent process than a nursing officer (11%). However, 61% were of the view that consent should be taken from the patient and relatives both, even if the patient is competent of giving consent. Majority of the participants (84%) wanted to discuss with family members before giving consent.

Conclusion: Majority of patients were aware of the concept of consent in medical practice and preferred the doctor and family members to be involved in the decision-making process. This finding is important to adopt a doctor-patient-family model in the consent taking process while respecting the patient's wishes.

Keywords: Informed consent, patient, autonomy, reasonable patient based standard, doctor-patient-family model

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INTRODUCTION

Informed consent had been a necessary requirement for medical treatment, medical research and donation of human tissue and organs for the past few decades in Sri Lanka[1, 2]. In Asian countries like Sri Lanka, where paternalism is entrenched in culture, concepts such as 'informed consent' are not as equally understood as in the West[3].

Consent is obtained by giving sufficient information to a competent patient or to the next of kin or legal guardian to make decisions on therapeutic process or participation in research after being educated of the purpose, procedure, alternatives, risk, benefit and outcome[4, 5].

Even though multiple purposes of informed consent such as legal, ethical and administrative compliance overlaps with each other[6], most importantly it protects the patient's right for self-determination [7,8] and it will promote the patient's 'autonomy[9], which is considered to be one of the four principles of medical ethics. It is also thought to act as a protection against coercion, deceit, abuse and exploitation[10]. It strengthens the trust between the physician and his patient[11] and gives the patient a sense of 'ownership' of his decision[12]. The current practice that the patient signing on the Bed Head Ticket (BHT) giving consent for 'any surgery' does not help the patient understand this process[13,14]. In contrast, signing a formal consent form with understanding allows the patient to be truly informed, while respecting the patient's autonomy and giving protection to the doctor, reducing malpractice claims[15].

OBJECTIVE

To determine the knowledge, attitudes and practices of hospitalized patients on 'informed consent'.

MATERIAL AND METHOD

A cross sectional descriptive study was carried out over a period of one year in a Tertiary care hospital in Sri Lanka. The participants were medical or surgical inward patients. The admission registry in the ward was perused on convenient days and every other patient who was admitted to the ward who was 18 years or above, who had consented to invasive procedure or surgery were included in the study. Their BHT was scrutinized to assist selection based on inclusion and exclusion criteria. Patients who were not competent enough to give informed consent or seriously ill to provide information were excluded from the study.

The sample size was calculated as 420, keeping a margin of error of 5 % and a confidence interval (CI) of 95%.

Information was gathered using an interviewer administered questionnaire with the consent from the patient, by a trained pre-intern medical officer. The questionnaire was constructed based on the literature[16,17] and consisted of the following sections; (a) demographic details of the patient (b) knowledge of the patient regarding the consent process (c) attitudes to consent and (d) practices related to the giving of consent. The types of consent which can be given as a gesture or verbal or written was introduced to the patient in the 3rd, 5th and 7th questions in Table 1. Before administering it was pilot tested on ten patients. The modified version was assessed for face and content validity.

Attitudes of the patients were assessed on a 5-point Likert scale. "Strongly agree" and "agree" were summed up to "agree", and "strongly disagree" and "disagree" were summed up to "disagree" during analysis. Descriptive statistics were applied to analyze the study using SPSS version 19.

Ethical clearance for the study was obtained from the Ethics Review Committee, Faculty of Medicine, Ragama. Permission to conduct the study was obtained from the hospital administration.

RESULTS

Characteristics of the participants

Majority of patients were female (55%). Forty one percent were in the 18-40-year category while 38% were between 41 to 59 and 21% over 60 years. The mean age was 42 years. A significant majority (94%) had been educated beyond the 5th grade with 13% having received higher education. A majority were Buddhist (62%).

Knowledge regarding consent was high among participants. Majority of patients expressed that verbal consent was adequate in vaginal or anal examination (Table 1).

Majority of participants agreed that the consent process helped to make a decision with understanding. However most of them were of the view that consent should be taken both from the patient and relatives even if the patient was of sound mind (Table 2).

A majority of patients (93%) preferred a doctor to obtain consent than a nursing officer.

Perceptions regarding practices in the ward during the process of obtaining consent

A majority agreed that they received adequate information (77%), discussed with family members (84%) and understood the procedure adequately (74%) before giving consent. However, 47% said that they gave consent because they trusted the doctors (47%) while 21% said they gave consent without properly reading or listening to the information given.

Table 1: Patients knowledge on consent in medical practice

Statement	Yes (%)	No (%)	Not sure (%)	Mean score
Do you know that 'consent' is important in medical practice?	95	4	1	1
Is consent needed for simple examination such as listening to the heartbeat?	25	75	-	2
If consent is needed what type of consent is sufficient for above mentioned procedure? *	Gesture 76	Verbal 23	Written 1	
Is consent needed for vaginal or anal examination?	82	17	1	1
What type of consent is sufficient for above mentioned procedure? *	Gesture 14	Verbal 68	Written 18	
Is consent needed for invasive investigations such as coronary angiogram?	93	7	-	1
What type of consent is sufficient for above mentioned procedure? *	Gesture 5	Verbal 12	Written 83	
Consent of next of kin can be taken if the patient is incapable of giving consent such as unconscious.	94	5	1	1
Consent should be taken from the patient if patient is capable of giving consent.	92	7	1	1
It is not necessary to take consent from the patient if surgery is necessary for life saving.	77	23	-	1
Should risks/ complications be informed to the patient during consent taking?	95	3	1	1
12. Should desired benefits/ outcomes of the procedure be informed to the patient during consent taking?	95	3	2	1
Can the patient refuse medical treatment including surgery even if the doctors feel that it is for patient's benefit?	68	24	18	1
Do you know consent can be revoked at any time?	54	26	20	2

*Type of consent which is necessary for the procedure is asked from the patient after introducing three types of consent.

Table 2: Patients attitudes to consent in medical practice

Statement	Agree (%)	Neutral (%)	Disagree (%)	Mean score
Consent reduces patient anxiety about the procedure.	62	9	29	3
It improves the doctor patient relationship.	91	6	3	2
Consent process helps to take a decision with understanding.	61	9	30	2
Disclosing information about potentially harmful risks may be worrying and disadvantageous for the patient.	38	14	48	3
Consent from the patient is not important as doctors know what is best for the patient.	38	8	54	3
While getting consent all the relevant information should be given to the patient irrespective of the educational level and social status of the patient.	62	11	27	2
While getting consent details should only be given if the patients asks for them.	34	5	61	3
Consent should be taken from both the relatives and patient even if the patient is capable of giving consent.	61	39	-	1

* Scores vary from 1 (strong agreement) to 5 (strong disagreement) in the visual analogue scale. A value of 3 represent uncertain or neutral view

DISCUSSION

Colombo North Teaching Hospital is situated north of the commercial capital of Sri Lanka and caters to a large urban and semi-urban population. The study population (n=420) consisted of a male to female ratio of 9:11. Around 2/5th of the study population represented the age group 18-40 years. More than 3/5th were Buddhist representing the trend in the Western province of Sri Lanka. The majority of them had secondary education.

1. Knowledge on 'consent'

A significant majority accepted that 'consent' is an important concept in medical practice. Qualitative meta-aggregation done by Convie revealed that the knowledge on consent helps to understand the consent process[18] which includes necessity of consent, rights of the patients, medical condition of the patient, available treatment options and outcome of the chosen option. A systematic review by Tam et al. for a 30-year duration has shown that 3/4th of participants understood the concept of consent in clinical trials[19].

Analysis of the patient's knowledge on the necessity of consent and relevant types of consent showed that majority knew simple procedures such as auscultation does not need consent and if consent is needed, it can be given by a mere gesture. They knew that per rectal and per vaginal examination needs consent. Contrary to the belief that these procedures need informed consent, majority of patients stated that verbal consent is adequate. This may be due to the fact that in surgical wards, patients may have considered these procedures as routine therapeutic examinations with minimal or no complications and thus think that verbal consent would suffice. However a significant proportion were not aware that consent by gesture was inadequate in such situations. Majority of patients knew that consent is necessary and it should be written for complex investigations such as coronary angiography.

Most of the patients agreed that in a case of an unconscious patient, consent can be obtained from the next of kin and in an emergency the physician can proceed without consent to save the life of the patient. Almost all the patients agreed that physicians need to educate them about risks and complications, desired benefits and outcomes and alternative forms of the treatment.

Although most of the participants stated that they were aware of informed consent, only 2/3 of them had the understanding that it is possible for a patient to refuse treatment, even if the physicians felt that it is for the patient's benefit. Further qualitative study is needed to assess whether they believe refusing treatment is morally or legally wrong.

Consent is a time-consuming dynamic process but it always reduces the burden on the physician20 and intensifies the patient's satisfaction. In this study only half of patients knew that their consent can be withdrawn at any time before the procedure. Similar results were shown in other studies done in developing as well as developed countries[21, 22] indicating that a substantial number of patients did not recognize 'consent' as a dynamic process[23]. A study by Oonagh described that lack of knowledge on any aspect of the consent process is potentially a disadvantage to the patient[24]. It hinders the capability of the patient to obtain necessary clarifications from the physician. It also hinders the patient's participation in the decision-making process and makes them feel inferior, which hampers the objectives of the consent process.

2. Benefits of consent to the patient

Ronald *et al*. observed that most of the participants knew that consent is beneficial to them[25]. Our study showed that patients recognized the benefits of informed consent as 3/5th of them agreed that consent reduces patient anxiety about the procedure, while majority agreed that it improves the doctor patient relationship[26]. However, a significant proportion of patients were of the view that disclosing information about potentially harmful risks may be worrying and disadvantageous for them while others disagreed.

Expected outcomes of the consent process includes comprehension of the presented facts by the patient and involving them in the decision-making process. Among the participants, only 62.4% agreed that consent helps to take decisions with understanding. Others who didn't agree may have taken decisions without having adequate understanding. A literature review by Sherlock at el. concluded that the comprehension level of patients during consent is relatively low, especially among elderly patients[27] .Therefore, we need to establish a systematic approach in the consent taking process to improve the comprehension ability of the patient. Studies highlight that simple measures such as asking a patient to repeat what they have understood[28,29] spending more time in the consent taking process,30 introducing learning aids and involvement of support staff 27 will help in this regard. Brody at el.

reported that a proper consent process will improve the quality of healthcare for the patient, 31 which is another advantage to the patient.

3. Physician knows the best

The concept of "physician knows best" is interconnected with medical paternalism which challenges the autonomy of the patient. However, having a reliable physician who is accountable and patient centred is worth it for patient management. Studies have shown that trusting doctors will improve the therapeutic outcomes of the patient[32, 33] .In our study, a substantial number of patients had given consent for the medical procedure because they trusted the physician. Even 2/5th have expressed that consent from the patient is not important as the physician knows what is best for the patient. Majority stated that consent should be taken from the patient by the physician and not by the nurses. This may indicate that a considerable number of Sri Lankan patients believe in the notion of 'doctors know best' and trust the physician's knowledge. A study involving seldom-heard groups also were of the same view[34]. A study carried out by Masaki at el. on Japanese patients showed that a majority has selected family participation in decision making rather than individual decision making35. A Qualitative study done in six countries (Bangladesh, Sri Lanka, Nepal, Indonesia, Myanmar and India) by the WHO, having similar cultural basis revealed that patients consider physicians as duty bound responsible professionals36. This tendency could result in patients depending on their physicians and other healthcare professionals to make decisions on their behalf. Therefore, extreme care must be taken by the physicians for the best interest of the patient to prevent criticism and allegations of negligence and accusations of being solely responsible for a poor outcome.

4. Standard of disclosure

The amount of information needed to be disclosed to a patient for the 'consent' to be 'informed' has been and still is a contentious issue. There are three different legal standards available for the physician, namely 'Professional standard', which is the amount of information given by the reasonably prudent physician, 'Objective Patient Based Standard', which is the amount of information a reasonable patient would want and 'Subjective Patient Based Standard', which is the level of information desired by the individual patient[37,38] .

Most of the developed countries are guided by the standard of disclosure based on court rulings39 .In Sri Lanka, lack of court decisions and clear guidelines from the regulatory body have given the physicians freedom to decide on the 'standard' of disclosure. Since our study does not involve the physicians, analysis of data will not show us the standard the physicians use in the hospital. However, it may be possible for us to know what the patients think about the amount of information given in order for them to grant consent, by analysing their responses. Through this, we may be able to infer whether the physicians have fulfilled at least 'reasonable patient's standard'. From the patients 3/4th stated that they have received adequate information and have understood sufficiently about the treatment procedure to give consent. This indicates that the physicians have attempted to maintain 'patient based standard' with at least ¾ of the cases. The rest of the participants were not satisfied with the amount of information received. However, it has to be remembered that subjective satisfaction of patients does not necessarily mean that consent procedures are being properly followed in the hospital or that the patient had made an informed decision.

However, when they were asked whether 'all the relevant information should be given to the patient irrespective of the educational level and social status' most of them agreed with the mean of 2.42. When they were asked whether the 'details should only be given if the patient asks for them' some agreed while majority disagreed with the mean of 3.39. This may indicate that a majority of our participants believe in the 'reasonable patient's standard' when it comes to the standard of disclosure. A study done by Hammami *et al*. on perception of information disclosure among patients revealed that disclosure of desired information related to the benefits and post-procedures were more than the disclosure of the risks and available alternatives to the patient[40].

5. Responsibility of the patient and physician

In the consent process, it is important that the patients have received all the information that they wanted, comprehended the presented facts and felt that they were not deceived or compelled. Majority of our participants were satisfied that they had received adequate information and that they had understood adequately about the procedure. However, a study conducted in Sweden by Lynoe at el. had indicated that this perception is not always correct[21]. Comprehension of the patient depends on various factors such as age, education, intelligence, cognitive functions and anxiety[41]. Therefore, during the consent process, physicians should not

overestimate the patient's ability to comprehend. Strategies such as re-evaluation of the consent process is needed to improve a patient's comprehension, which will further minimize legal allegations and strengthen the ethical values.

Around 1/5th of the patients in this study accepted that they had given the consent without properly listening or reading the consent form. They might not have appropriately realized the importance of consent in their medical management and their responsibility as an equal partner in decision making. This is a significant draw back in the consent taking process.

6. Culture and patients' behavior

Sri Lanka applies concepts of medical ethics, including 'informed consent', which originated in the West. In most Western societies, individualism is preferred in decision making compared to some parts of the world, where they preferred community norms and family over individual rights[42]. Therefore, in some of the aspects of informed consent, there are differences between the theory and practice. We may find it difficult to implement the same western standards to a similar effect in our society. It is an accepted practice in Sri Lanka to divulge information of the old parents to their children without prior permission. Some parents are unaware of their disease and die without getting information of the disease from the children or receiving minimum information from the physician depending on the relatives wishes. Specially, this situation prevails in cancer patients. In Sri Lankan culture, patients are still reluctant to confront doctors with questions about a diagnosis or treatment regimes. This is a cultural difference in perceived 'autonomy' and 'self-determination' than in the West.

Unlike in the West, Sri Lankans still have the benefits of extended family. In a case of disease, public healthcare benefits alone are not adequate and family support is indispensable, especially in long term management. As a result, when a patient is hospitalized and decisions are made, not only their immediate family but also extended family are concerned. During a crucial decision, it is more likely to be a family centered decision rather than an individual-centered decision. A similar situation is seen in other Asian countries such as India[7], Japan, [35, 43]. Taiwan and China[44, 45, 46]. In such cultures, and in Sri Lanka, doctor-patient- family model is more appropriate while respecting the patient's wishes rather than patient centered consultation[47, 48].

This trend is amply demonstrated in this study as 3/5th of patients were in favour of obtaining consent from themselves and their relatives, even if they were fully capable of granting consent. Most of the patients in our study stated that they had discussed with their relatives before giving consent for the medical procedure, even though it is not mandatory. However, they were aware of their rights as individuals, as almost all of them said that consent should be taken from the patient and not from the relatives if the patient has the capacity to give consent. Even though patients are aware of their rights, it appears that they are willing to share their autonomy of decision making with close relatives. A study by Al-Bahri *at el*. on the role of patients' families in cancer treatment decision-making had pointed out a similar situation even in Western countries[49].

CONCLUSION

Majority of patients were aware of the aspects of medical consent. However, analysis of their knowledge and attitudes indicated that they do not understand 'consent' as a dynamic process. Patients' attitudes towards consent is moving away from a paternalistic perspective to a more patient centered ideology. In the consent taking process, information disclosure to the patient should be maintained at "reasonable patient based standard" as indicated in the study. This study suggests that in the practice of obtaining consent, the physician needs to be attentive to the aspect of comprehension, as a considerable number of patients give consent without comprehension.

This study indicates that the cultural dimensions of the patient should be considered when obtaining consent. Therefore, in Sri Lanka, the doctor-patient-family model is more appropriate in the consent taking process to ensure that the patients' decision-making process is meaningful, while maintaining their self-respect.

CONFLICTS OF INTEREST

The authors have no conflicts of interests to disclose

ETHICAL ISSUES

None

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AUTHOR CONTRIBUTIONS

WNSP: Conceptualization, drafting proposal, Writing manuscript, Literature survey, Data analysis; **BPPP:** Improving concept, Improving proposal, Data analysis, Editing and reviewing of manuscript; **PP:** Improving concept, improving proposal, Editing and reviewing of manuscript.

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ORIGINAL RESEARCH PAPER

The discrimination potential of VSC, TLC and HPLC for ballpoint inks

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ABSTRACT

Introduction: The necessity arises to analyse blue and black ballpoint pen inks frequently encountered in forensic documents.

Objective: To evaluate the discrimination potential of Video Spectral Comparator (VSC), Thin Layer Chromatography (TLC), and High Performance Liquid Chromatography (HPLC) methods in analysing blue and black ballpoint pen inks in documents.

Methods: A selection of 10 blue and 10 black ballpoint inks were examined by a Video Spectral Comparator (VSC), Thin Layer Chromatography (TLC), and High Performance Liquid Chromatography (HPLC) methods.

Results: The discriminating powers for VSC, TLC, and HPLC methods were determined to be 0.73, 0.82, and 0.84 for the blue inks and 0.56, 0.78, and 0.84 for the black inks. The overall discrimination powers of three methods were 0.91 and 0.84 for the black and blue inks, respectively.

HPLC method differentiated the highest number of blue and black pairs and its discrimination power is slightly higher than TLC. The VSC showed a significant discrimination power improvement of blue over black inks. Statistical analysis confirmed that the VSC has higher discrimination power to differentiate blue ballpoint inks than black ballpoint inks. None of the techniques discriminated the full range of ink pairs studied.

Conclusion: The power of the individual techniques to discriminate between inks varied. The results show that these three techniques are complementary to some extent. A combination of all three techniques provides the greatest discrimination power.

Keywords: Destructive and non- destructive, ink analysis, questioned documents, discrimination powers

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INTRODUCTION

Forensic Science is the application of scientific knowledge to the law. It provides impartial, reliable, pertinent and often definitive evidence about a given case for use in the courts of law[1]. Document examination is a branch of forensic science that includes the analysis of handwriting as well as the detection of forged documents. Documents such as cheques, contracts, vouchers, bills and various other documents are frequently entrusted to the laboratory for analysis. These documents may contain one or more forgeries commonly encountered such as alterations, additions, substitutions, counterfeiting or obliterations. The detection of forgeries on a document is a key function within document examination, since valuable evidence can be obtained by using a series

of different analytical techniques[2]. In this research, it is necessary to discriminate pen inks on questioned documents to determine authenticity or to decipher fraud[3]. In some cases, two or more entries are compared to determine similarities or differences in the inks. Sometimes, the suspected writing implement is submitted to compare with the writing on a paper. As a consequence of this, many techniques have been researched to discriminate between ink formulations on paper and to improve the discrimination power of ink analysis methods[4,5]. Although a number of techniques have been developed to discriminate ballpoint ink samples, most forensic laboratories, including developing countries, widely use Video Spectral Comparator (VSC), Thin Layer Chromatography (TLC) and High Performance Liquid Chromatography (HPLC) as discriminating techniques because of their favourable combination of performance, economy, and simplicity[6]. Therefore, any research on the discrimination potential of these techniques for the analysis of black and blue ballpoint inks is important for the future of forensic document examination. Therefore, the knowledge on ink analysis techniques and their discriminatory powers is essential for correct opinions.

OBJECTIVE

To evaluate the discrimination potential of Video Spectral Comparator (VSC), Thin Layer Chromatography (TLC), and High Performance Liquid Chromatography (HPLC) methods in analysing blue and black ballpoint pen inks in documents.

MATERIAL AND METHOD

A total of 20 ballpoint pens (10 black and 10 blue varieties) belonging to different brands were purchased from a local market in order to form a broad collection of pens available at the time of study. The blue ballpoint pens were marked from P1 to P10 and black pens were marked from P11 to P20. For the ease of analysis, the pen numbers were written on white copy papers to simulate casework as shown in Figure 1. Two sets of writings were performed to determine the reproducibility of each technique.

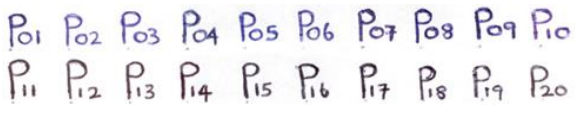

Fig. 1: Ink samples used for the analysis

Ballpoint inks were analysed using a stereo microscope, a Video Spectral Comparator, TLC, and HPLC methods in order to determine the capability of each technique to discriminate entries produced by blue and black ballpoint pens. The ballpoint pen inks of each color were inter-compared with each other forming 45 blue pairs and 45 black pairs.

A. Video Spectral Analysis

The P1 to P20 inks were examined using infrared and ultraviolet lights integrated into the Video Spectral Comparator (VSC 5000, Foster+Freeman Ltd, England). While examining inks under infrared radiation, three functions of the VSC were utilized: (1) flood lighting, (2) spot (Luminescence) and (3) Plot spectrum. UV reactions of inks were examined using UV 365 nm energy. Each ink was examined on one paper at the same time using the same wavelength to avoid any change of light examination factors.

B. Thin Layer Chromatography

Twenty one plastic vials (eppendorfs –Fisher scientific) were marked as P1 to P20 and C (C for control). Six plugs from each pen line and the same number of plugs of paper from a control area were punched out using a micro punch (Harris micro-punch 1.20 mm) and samples were placed into the relevant plastic vials. 10 µl of absolute ethanol was used as the extraction solvent. The samples were agitated using the ultrasonic bath for 10 minutes to maximize the amount of ink extracted. TLC analysis was performed in accordance with ASTM international standard guide E1422-057. The spotted (Whatman glass-backed silica) plates were placed in developing tanks previously equilibrated for 15 minutes with solvent system: ethyl acetate : absolute ethanol : water (70:35:30, v/v). The distance travelled by the solvent and the distance travelled by each spot were measured and the retardation factor (Rf value) was determined for each spot. Each TLC separation was performed three times using the same conditions.

C. High Performance Liquid Chromatography

In this study ten plugs from each pen line were punched out using a micro punch (Harris micro-punch 1.20 mm) and samples were placed into the plastic vials marked as P1 to P20. 40 µl of HPLC grade methanol (Fisher scientific) was added to the samples. The samples were sonicated for 10 minutes to maximize the amount of ink extracted. The HPLC system employed for the analytical work consisted of a GILSON separation pump with a UVD340S multi-

diode array detector (scanning range from 200 nm to 600 nm). The software used to operate, collect and manipulate data was Chromeleon Client 6.10. The analytical columns used for this work were a SHANDON 4mm 15 cm C-18 column and a BECKMAN 4.6mm x 15 cm C-18 column. The sample injection volume was 20 µl. Six different mobile phases were tested to achieve optimal separation: (1) acetonitrile: methanol: water (30:45:25 v/v), (2) 100% acetonitrile, (3) acetonitrile:water (70:30 v/v), (4) acetonitrile:water (60:40 v/v), (5) acetonitrile:water (50:50 v/v) and (6) acetonitrile:water (50:50 v/v) with 1 ml acetic acid per litre of solvent. Each mobile phase was eluted for 10 min at a flow rate of 1 ml/min. Each HPLC separation was repeated using the same conditions so as to test the reproducibility.

D. Discrimination Power (DP) and Statistical Analysis

The discriminating powers of each method for blue and black ballpoint pens were arranged in a contingency table. The Chi-squared test for association was conducted by means of "R" to determine if there was association between techniques and colour of pens. The association plot was also drawn to observe the relationship between methods and pens graphically. The discrimination power of three techniques, VSC, TLC, and HPLC was calculated in accordance with the equation introduced by Smalldon and Moffat8:

$$DP = \frac{\text{Number of discriminated pairs}}{\text{Number of possible pairs}}$$

RESULTS

A. Video Spectral Comparison

The results obtained for all the VSC functions, flood (IR reflectance mode), spot (Luminescence), plot spectrum and UV fluorescence, were arranged in pairs so as to evaluate the discrimination potential of each function of VSC. Table 1 shows the discrimination powers of each VSC function and total discrimination power of VSC when combined. All four VSC functions failed to discriminate twenty pairs of black ink out of 45 pairs studied. Although none of the functions showed any difference for black ballpoint inks, the discrimination powers for blue ballpoint inks were varied. IR Luminescence and absorption spectrometry showed the highest discrimination power for blue inks while IR reflectance showed the lowest. The combination of four VSC functions increased the discrimination power of VSC technique.

Table 1: Discrimination Powers of each VSC function

Technique	Discrimination Power	
	Blue	**Black**
IR Reflectance	0.53 (24)	0.56 (25)
IR Luminescence	0.64 (29)	0.56 (25)
Absorption spectrometry	0.64 (29)	0.56 (25)
UV Fluorescence	0.60 (27)	0.56 (25)
Combination of 4 VSC functions	0.73 (33)	0.56 (25)

B. Thin Layer Chromatography

Based on the number of bands, Rf values and colour of the spots, TLC was able to classify blue inks into 6 groups and black inks into 4 groups. Also TLC could completely discriminate 4 blue inks (P4, P5, P7, P10) from the 10 samples and 1 black ink (P15) from the 10 black samples.

C. High Performance Liquid Chromatography

High performance liquid chromatography was conducted using different eluent systems [Six different mobile phases were tested to achieve optimal separation: (1) acetonitrile: methanol: water (30:45:25 v/v), (2) 100% acetonitrile, (3) acetonitrile:water (70:30 v/v), (4) acetonitrile:water (60:40 v/v), (5) acetonitrile:water (50:50 v/v) and (6) acetontrile:water (50:50 v/v) with 1 ml acetic acid per litre of solvent]. Since the BECKMAN C-18 column with acetonitrile:water (50:50 v/v) mobile phase yielded the best chromatograms at 205 nm wavelength, resultant chromatograms were selected for analysis. HPLC classified blue inks into 6 groups and black inks into 5 groups based on the retention times. HPLC could completely discriminate 4 blue inks (P4, P5, P7, P9) from the 10 samples and 2 black inks (P15, P18) from the 10 samples.

D. Discrimination Power and Statistical Analysis

Table 2 illustrates how the VSC, TLC, and HPLC methods discriminated each pair of blue ballpoint inks. It shows the discrimination powers (& no. of discriminated pairs) of methods examined in this study.

Table 2: Discrimination Powers of VSC, TLC, and HPLC techniques

Technique	Discrimination Power (DP)	
	Blue	Black
VSC	0.73 (33)	0.56 (25)
TLC	0.82 (37)	0.78 (35)
HPLC	0.84 (38)	0.84 (38)
Total	0.91 (41)	0.84 (38)

The obtained results showed that VSC analysis had a higher discrimination power for blue inks 0.73(33) than black inks 0.56(25). Out of 45 pairs of blue ballpoint pen inks, 37 pairs were discriminated by TLC yielding a discrimination power of 0.82. Analysis of chromatograms allowed the discrimination of 35 out of 45 pairs of black inks. The discrimination power for black ink via TLC was 0.78. The results showed that, from the 45 pairs, 41 pairs of blue ink were discriminated by all methods giving the discrimination power of 0.91 whereas these three techniques could discriminate 38 pairs of black ink giving discrimination power of 0.84. HPLC showed the highest discrimination power of the three techniques for both inks.

DISCUSSION

Ten blue and ten black ballpoint pen inks of different brands were analysed by means of VSC, TLC, and HPLC techniques. The obtained results revealed that the three techniques tested in this study did not yield identical results in discrimination of ballpoint pen inks. The discrimination powers for VSC, TLC, and HPLC methods were determined to be 0.73, 0.82, and 0.84 for the blue inks and 0.56, 0.78, and 0.84 for the black inks, respectively. The overall discrimination powers of three methods were 0.91 and 0.84 for the blue and black inks respectively (Table 2). None of the techniques discriminated the full range of ink pairs studied. All methods failed to discriminate four pairs of blue ink and seven pairs of black inks, it is possible that the same ink is used in those brands or failure to discriminate these inks by VSC, TLC, and HPLC methods. HPLC method differentiated the highest number of blue and black pairs. However, the discrimination power is only slightly higher for HPLC than for TLC. Since the discriminating abilities of TLC and HPLC techniques for both blue and black inks were high, these chromatographic methods can undoubtedly be used in cases of ballpoint ink analysis.

According to the association plot, blue inks have positive association with VSC method whereas black inks have negative association. This indicates that the VSC is more suitable for analysis of blue inks rather than the analysis of black inks. This argument is supported by the discrimination powers of blue and black inks for the VSC method. It was 0.73 for blue inks and 0.56 for black inks. Since blue inks show broader colour variation with different components than that of black inks VSC might show a significant favouring of blue over black inks. It was seen in microscopic examination and TLC analysis too. Thus, black inks have positive association with both TLC and HPLC methods while it shows negative association for VSC method. This relationship indicates that TLC and HPLC methods are more suitable for analysis of black inks than the VSC method. Black inks showed higher discrimination powers for TLC and HPLC methods than that of the VSC method.

The VSC, TLC, and HPLC can be used for ink analysis, but as seen above not all of the techniques suitable at every time. HPLC showed the highest discrimination power of all techniques. This is because HPLC can detect not only colourants of inks but also it can detect other components: solvents, additives etc. Conversely VSC and TLC reveal the results of colourants only. In addition it should be pointed out that the VSC is a comparator and not an analytical instrument like HPLC.

CONCLUSION

The three techniques are complementary to some extent. However, all three methods failed to discriminate eleven pairs of ink studied: 4 pairs of blue ink and seven pairs of black ink. Although the VSC shows a lesser discrimination power than TLC and HPLC, it should be used first, because of its advantages over chromatographic techniques: non-destructive and no sample preparation needed. A combination of all three techniques provides the greatest discrimination power. In this study, the total discrimination powers were achieved 0.91 and 0.84 for blue and black ballpoint inks respectively, which confirm that the used techniques were able to discriminate a significant number of pairs of ink. However, the failure to discriminate eleven pairs of ink by these techniques suggests the importance of the use of other techniques other than VSC, TLC and HPLC.

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CONFLICTS OF INTEREST

The authors have no conflicts of interests to disclose

ETHICAL ISSUES

None

AUTHOR CONTRIBUTIONS

KASK: Total work done by the author

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REVIEW

A critique of the application of DNA evidence in the criminal justice system of Sri Lanka in the light of developments in the United Kingdom, United States and Australia

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ABSTRACT

Introduction: This study is regarding the use of DNA evidence in criminal cases in Sri Lanka. There is no consistency in the application of DNA evidence in the criminal justice system of Sri Lanka mainly due to the inadequacies in the knowledge and skills of DNA evidence on the part of lawyers and judges to work within an adversarial system. In order to solve this problem Sri Lanka should learn from the experience of the United Kingdom, United States and Australia.

Objectives: To examine the use of DNA evidence in the criminal courts of Sri Lanka and how professional legal education and training may enhance its effective use.

Methodology: Judicial pronouncements in court cases and legislative enactments in Sri Lanka as well as other jurisdictions, recommendations in studies and reports in the United Kingdom, United States and Australia, views of experts and researchers in this field were considered and evaluated using a qualitative exploratory research methodology.

Results: The United Kingdom, United States and Australia endeavour to address issues such as wrongful convictions by the proper use of DNA evidence within their adversarial system of adjudication. This is the path that Sri Lanka too should follow.

Conclusion and recommendation: Adjudication of both civil and criminal cases in Sri Lanka is based on the adversarial system which may provide opportunities for the parties to win their case rather than finding the truth. Nevertheless, the interests of justice demand that the stakeholders in the legal and judicial process, in the criminal justice system in particular, be adequately equipped to meet the challenges in delivering justice.

Keywords: Administration of justice, adversarial system, criminal justice system, DNA evidence, legal education

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INTRODUCTION

According to sections 184 and 199 of the Code of Criminal Procedure Act No. 15 of 1979[1] of Sri Lanka, criminal trials are conducted according to the adversarial system. The accusatorial or adversarial system has been defined as: "A system of criminal justice in which conclusions as to liability are reached by the process of prosecution and defence….while the judge acts as an impartial umpire…."[2]. In 2009 a critical report of the National Research Council in the United States has stated that the adversarial system is not suitable for finding scientific truth3. In this scenario DNA technology came into use in 1980s offering new opportunities

inter alia for identification purposes relating to forensic matters[3].

DNA evidence was introduced into court proceedings during mid-1980s[4]. It was in Hokandara Case5 that DNA evidence was used for the first time in Sri Lanka[6]. However, it appears from the decision of the Supreme Court in this case that the convictions had been based solely on circumstantial evidence and other scientific evidence such as chiral fingerprinting rather than DNA evidence[5]. Nevertheless, the importance attached to DNA evidence seems to have increased in a number of subsequent cases which will be discussed later in this paper.

The critical report in 2009 by the National Research Council of the United States on scientific evidence including DNA3 and a study commissioned by President Obama in 2015[7] have been referred to by the House of Lords in the United Kingdom in proposing improvements to the criminal justice system of the United Kingdom with a view to enhancing public trust in it[8]. Furthermore, the Federal Bureau of Investigation (FBI) in the United States has formulated standards for scientific evidence[9]. Similarly, the Scientific Working Group on DNA Analysis Methods (SWGDAM) has provided guidelines inter alia for the collection and interpretation of biological evidence[10].

As for Australia the report presented to the Department of Justice on the circumstances that led to the wrongful conviction of Farah Jama11 has made several proposals with a view to improving the use of DNA evidence in criminal proceedings. Such proposals include measures for improving the quality of DNA evidence as well as for updating the knowledge and competence of lawyers and judges in the use of such evidence[11].

Sri Lanka appears to have made considerable progress in adapting to the advances in the field of forensic science by learning from the experience of other countries[12]. Those improvements include a modern laboratory, equipment and training for staff in the Government Analyst's Department[12]. Nevertheless, it is not clear whether the legal profession in Sri Lanka is adequately equipped to make use of such developments in applying DNA evidence in criminal court proceedings. In the circumstances this research paper examines whether the lawyers and judges in Sri Lanka are equipped to effectively apply DNA evidence generated by forensic science. Hence, this study aims to generate transferable evidence on the efficacy of the application of DNA evidence in the legal process of the criminal justice system of Sri Lanka, with a view to making proposals and recommendations to the legislature and the providers of professional legal education.

OBJECTIVES

The main aim of this study is to investigate the application of DNA evidence in the legal process of the criminal justice system in Sri Lanka. Further we want to draw the attention of the authorities, particularly the legislative branch of the government of Sri Lanka, and the providers of professional legal education to the findings and recommendations of this study and necessary action.

MATERIALS AND METHODS

A qualitative exploratory research methodology was adopted to study how DNA evidence is used in the legal process of criminal litigation in Sri Lanka in comparison with the United Kingdom, United States and Australia. Hence, resources relevant only to criminal matters were included in this study and those dealing with civil matters were excluded. Primary legal sources, namely, statutes and court decisions in Sri Lanka, United Kingdom, United States and Australia were used when they were available and accessible. In addition, reports on this subject in the countries under consideration were utilised. Secondary sources such as journal articles had to be used to substantiate the arguments and proposals made in the paper or where primary sources were unavailable or inaccessible.

Reported and unreported cases which are in the public domain were accessed either by referring to the printed versions of the case reports or by accessing the soft copies available on the internet. Unreported cases not in the public domain were accessed from case records.

RESULTS AND DISCUSSION

Section 101 of the Evidence Ordinance of Sri Lanka introduces the principle that he who asserts must prove it[13]. Thus, in criminal cases the burden of proof is on the prosecution and as the House of Lords has declared in Woolmington v Director of Public Prosecutions, [14] the prosecution is required to prove its case beyond reasonable doubt. Consequently, an accused is presumed to be innocent until he is proved to be guilty. The presumption of innocence is enshrined in Article 13 (5) of our Constitution as a fundamental right[15].

Although these principles provide a high degree of protection to accused persons, cases in other jurisdictions like The Queen v Farah Jama[16] have shown that there can be wrongful convictions unless further measures are in place.

The Supreme Court of Victoria Court of Appeal allowed the appeal of Farah Jama and quashed his conviction[16]. This case demonstrated a miscarriage of justice and the Ministry of Justice desirous of preventing such incidents commissioned Vincent to present a report on it[11]. The report he presented to the Ministry after conducting an inquiry into the circumstances that led to the conviction reveals how a miscarriage of justice can occur in trial courts. For instance, Vincent Report states that Jama would not have been convicted if the trial judge and lawyers possessed an adequate knowledge and experience relating to DNA evidence[11]. Consequent to this weakness they had relied so much on DNA evidence that it had even come into conflict with the highest standard of proof required in criminal cases[11].

Jama's conviction was based on a single piece of evidence, namely, a slide and a swab collected during a medical examination at the Austin Hospital and DNA scientists had attributed an extraordinary level of probability to it[11]. Forensic samples had been collected in the same unit of the same hospital from the female victim and another female with whom Jama had had sexual relationships[11]. On discovering that the DNA evidence may have been contaminated Jama's verdict was set aside by the Supreme Court of Victoria Court of Appeal[16].

A report of the House of Lords in the United Kingdom states at paragraph 125 that the knowledge and understanding of forensic science among lawyers and judges stands at variable levels and in some cases amounts to a lack of understanding[8]. In the United States the National Research Council at page 12 of its report discloses that judges and lawyers generally lack sufficient expertise in the application of forensic evidence[3]. Alwis, a retired judicial medical officer, recommends for judges and lawyers the courses on forensic medicine and science conducted by the Universities of Colombo and Peradeniya[17].

The above discussion reveals that an issue common to Sri Lanka, United Kingdom, United States and Australia; the lack or insufficient expertise of judges and lawyers to apply DNA evidence effectively. This must be resolved without delay in order to uphold justice and ensure fairness in criminal cases. As for Sri Lanka a curriculum revision committee under the chairmanship of Marsoof, a judge of the Supreme Court of Sri Lanka, made several recommendations in 2012[18]. Among these was a proposal to incorporate the subject of forensic science as a core module in the curricula at Sri Lanka Law College which is the sole institute that trains professional lawyers and conducts their examinations[18]. However, the curricula at Sri Lanka Law College[19] remains unchanged and this proposal has not been implemented to date.

Furthermore, recommendation 10 of the Vincent report has proposed the conduct of training courses on DNA evidence for lawyers and judges[11]. This proposal is worthy of emulation and it is proposed that the Bar Association of Sri Lanka should conduct programmes on DNA evidence for the benefit of lawyers while the Judges' Institute of Sri Lanka should have similar programmes for judges.

A selected number of criminal cases explain the status of the application of DNA evidence in Sri Lanka. The entire case of the prosecution before the High court in Sajeewa alias Ukkuwa and others v The Attorney General (Hokandara Case) [5] was based on circumstantial evidence and the accused persons were convicted. The Supreme Court affirmed the convictions but neither the judges nor the lawyers had raised the issue of DNA[5].

The circumstantial evidence in Hokandara Case comprised inter alia finger prints on a tin of biscuits which was objected to by the defence.5 Nevertheless, the Supreme Court rejected this objection being satisfied with circumstantial evidence[5]. It is arguable that it would have been fair if DNA evidence were considered in accepting or rejecting the said objection of the defence.

As the Court of Appeal has declared in Wahumpurage Wasantha v Attorney General[20], too much of reliance on one type of evidence by a judge may result in a miscarriage of justice[20]. Considering the views of the judges in this case and those of the cases referred to in it and the views of scholars like Vincent[11] and Kirby[21] the better view appears to be that all relevant evidence including DNA must be considered.

The above-mentioned comment that DNA evidence should have been used in the Hokandara Case may be substantiated with the approach of the High Court and the Supreme Court in Ambepitiya Murder case[22]. The High Court trial-at-bar, accepted that the DNA analysis had clearly established that the vomit found at the place pointed out by the eye-witness belonged to the 3rd accused in the case. It was further held that the said expert testimony of DNA

evidence had corroborated the direct evidence of the eye witness[22]. All accused in this case were convicted and their convictions were affirmed by the Supreme Court[22].

In Don Shamantha Jude Anthony Jayamaha v Attorney General[23] (Royal Park Murder Case) both the trial court and the appellate court appear to have given due weight to DNA evidence. The Court of Appeal has set aside the verdict of the High Court that had found the accused guilty of the lesser offence of culpable homicide not amounting to murder and convicted him of murder[23].

In the serial killings of 17 female victims in Kotakethana DNA was successfully utilised to identify some perpetrators and to exclude the innocent suspects while linking some murders committed by the same perpetrator at different places[24]. Those found responsible for the murders were convicted[24].

In Seya Sadewmi murder case25 DNA evidence was usefully utilised to exonerate innocent suspects arrested by the Police and indict the accused who was convicted by the High Court of Negombo[25]. Similarly, in Sivaloganathan Vithiya gang rape and murder case the Magistrate in Kayts ordered the Police to cause the suspects to undergo a DNA test[26]. Nine Accused persons were indicted before a Trial at Bar in Jaffna. Of them seven were convicted[26].

Rita Joan murder case[27] demonstrates a situation where the Attorney General had granted a conditional pardon to one of the accused under section 256 of the Code of Criminal Procedure Act No. 15 of 1979[1] for which he was criticised by the Supreme Court[27]. In this case the question of DNA evidence did not arise as there was sufficient other evidence to convict the accused persons. The rationale behind section 256 of the Code of Criminal Procedure Act No. 15 of 1979[1] appears to be the necessity to obtain evidence from an accomplice to successfully conduct prosecutions. However, now it may be argued that the use of this provision should be restricted as the grant of a pardon to an accomplice may not be just and equitable where scientific evidence including DNA is available.

The cases discussed in this paper demonstrate the different ways in which judges have performed the duty cast on them to determine the admissibility of evidence under section 230 of the Code of Criminal Procedure Act1 in relation to DNA evidence. Similar issues in other jurisdictions have been attributed to different levels of knowledge and understanding of forensic science of the lawyers and judges[3, 7, 8, 11]. As evident from the Sri Lankan cases [5, 20, 22-27] and the Australian case of The Queen v Farah Jama[16], this may lead to an inconsistency in the approaches by courts to scientific evidence. For instance, in Hokandara Case[5] it appears from the Supreme Court case report that the application of DNA evidence had not been raised as an issue[5]. In Wahampurage Wasantha v Attorney General[20] the conviction had been based solely on circumstantial evidence that led to a misdirection to the jury by the judge based entirely on circumstantial evidence other than DNA[20]. On the other hand, a balanced judicial approach to DNA evidence appears from Ambepitiya murder case[22] and the Royal Park murder case[23]. Similarly, in the other Sri Lankan cases discussed in this paper such as Kotakethana serial murder cases[24], Seya Sadewmi murder case[25] and Sivaloganathan Vithiya murder case[26] DNA evidence has been usefully utilised in exonerating innocent suspects and convicting the accused. In the Australian case of The Queen v Farah Jama[16] a miscarriage of justice has occurred by the comparison of DNA of the accused found in a hospital with a DNA database which resulted in his wrongful conviction.

The court decisions discussed above reveal an inconsistency in the legal and judicial approach to DNA evidence which may have an adverse effect on the administration of criminal justice. The recommendations suggested in reports in the United Kingdom8, United States[3, 7] and Australia[11] to address this issue include inter alia providing continuous education and training for the stakeholders such as Judges, prosecutors and defence counsel. It is recommended that Sri Lanka should draw from these recommendations in order to improve the administration of criminal justice.

CONCLUSION

It is important to prepare and continuously reform the legal environment in Sri Lanka to be conducive to the use of DNA evidence. The proposed curriculum development at Sri Lanka Law College18 will pave the way for preparing future lawyers and judges in discharging their professional duties including those relating to scientific evidence effectively. The Incorporated Council of Legal Education of Sri Lanka may give effect to this proposal under the rule making power conferred on it by section 7 of the Council of Legal Education Ordinance No2 of 190028 to provide for mandatory periodical curriculum development and annual review of curricula. In addition, the proposals relating to the updating of the knowledge and skills of practicing lawyers and

sitting judges will equip them to meet the challenges in the application of DNA evidence. Furthermore, these recommendations would serve as the basis for future research in order to enable Sri Lanka to keep pace with the developments in DNA evidence.

ETHICAL ISSUES

None

CONFLICTS OF INTEREST

None

AUTHOR CONTRIBUTIONS

WOR: Total work done by the author

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REVIEW

Strengthening the "multidisciplinary child protection committees" in the community

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ABSTRACT

Introduction: Child abuse and neglect have been widespread since time immemorial. It is not only detrimental to the affected child, but families, societies and cultures as well.

Although the exact prevalence of child abuse is not known in Sri Lanka, reported literature shows that it is a significant problem and the available statistical data on the prevalence of child abuse, is only the tip of the iceberg.

Case Reports: Three case reports are elaborated and its forensic clinical examination findings are discussed along with the medico-legal value of each case. These highlight the importance of empowerment with proper statutory amendments, educating the judiciary about practical background of these abuses by clinical forensic practitioners with sufficient practical experience and strengthening of the "Multidisciplinary child protection committees" for early detection of child abuse within the community.

Discussion: We suggest making the best use of the existing 'praja' committees, as first responders to recognize 'high risk' children within their community and reporting to a central authority such as National Child Protection Authority NCPA. Incorporating details of 'high risk' children into an electronic database would enhance easy reference, and electronic data linked to the '1929' child-line would ensure a better outcome. Confidentiality should be maintained at all times. 'High risk' children and their families should be visited by the Child Rights Protection Officers on a regular basis and immediate action should be taken if any form of abuse is suspected. Representatives from schools attended to by 'high risk' children and the 'Gramaseva Niladhari' should be part of these committees. It is also necessary to register all families who have a single parent, with parents working abroad, involved in civil or criminal court cases, with psychiatric illness/addictions with the Grama Niladhari, police and local probation and childcare office.

Conclusion: "Multidisciplinary Child Protection Committees" should be strengthened in the community under the supervision of the NCPA using existing facilities and with the participation of multi-sectorial stake holders. This will help in early detection of child abuse and community monitoring of high-risk children.

Keywords: 'high risk' children, Multidisciplinary Child Protection Committees, first responders

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INTRODUCTION

Child abuse and neglect have been widespread since time immemorial. It is not only detrimental to the affected child, but families, societies and culture as well. According to the World Health Organisation (WHO), child abuse includes all forms of physical and emotional ill-treatment, sexual abuse, neglect and negligent treatment and exploitation done by parent, guardians or any other strangers[1].

The most tormenting issue is the occurrence of abuse within the families. Studies have revealed that poverty, overcrowded households, poorly educated parents, young parents, unrealistic expectations from child, parental substance abuse, history of parents being abused as children and mental and physical disabilities of child are the major risk factors for child maltreatment[2, 3].

Ill-health caused by child abuse, contributes significantly to the global health burden and the victims are more prone to psychiatric disorders and suicidal behaviour[4].

Although the exact prevalence of child abuse is not known in Sri Lanka, reported literature shows that it is a significant problem[5]. A study conducted in Sri Lanka revealed that a considerable proportion of both male (22.4%) and female (15.7%) school children have been victims of physical abuse[6]. Most of the perpetrators are known to the victim and a significant number of them had experienced some form of physical or sexual maltreatment during their childhood[7]. A study conducted among adults showed that 44% have experienced some form of sexual abuse and 36% have been physically maltreated during childhood[5]. However, these statistics are only tip of the iceberg[8].

The objective of this paper is to highlight the importance of strengthening the "Multidisciplinary Child Protection Committees" in the community for recognition and monitoring of high-risk children using case reports.

CASE REPORTS

Scenario 1: A child with developmental delay following physical abuse

A 3-year-old child was admitted to a Teaching Hospital, by the father and maternal grandmother, stating that she was physically abused by her step-uncle. History suggests that the mother of this baby had disputes with the baby's father and had made multiple complaints against him at the police, restricting him from coming home or seeing the baby. She had left the baby with her elder sister's family and had gone abroad. The elder sister who had a 7-year-old daughter, had separated from her husband, was living with another man. This man is said to have sexually abused the older child and physically abused the 3-year-old.

Significant developmental delay was observed in physical growth and cognitive functions during examination of this child. Multiple abrasions, tram-line contusions, various patterned injuries and extensive burn injuries to the pubic area were noted confirming child physical abuse. Vaginal examination was unremarkable.

This case highlights the necessity of early detection of risk factors and vulnerability of a child by community monitoring when the affected children present to the legal system with family disputes.

Scenario 2: A case of chronic, repeated child sexual abuse

A 14-year-old girl was brought for clinical forensic examination by the police following a complaint from the neighbourhood to Gramaseva Niladhari that this girl wanders around with several boys, and that these boys visit her home. The girl's parents were deaf and dumb, and her mother who is a housewife watches pornography in front of her children. Her elder sister had eloped with a man when she was 15 years of age, and was subjected to medico-legal examination in 2018. During the Institutional Case Conference held at 'Lama Piyasa' it was recommended that the elder child is safer under the probationary care and her sister and brother also need close supervision. Her aunt agreed to take care of children with a court order. However, change of custody of care had not been arranged by the police through a court order and the two children were handed over only with a verbal agreement. Later, the father had fought with the aunt's family and had brought the two children back home. The girl revealed that she goes to an abandoned house with boys, smokes cannabis and engages in sexual intercourse while her 10-year-old brother stays on guard. Her mother had been aware of this practice.

Genital examination findings were compatible with chronic, repeated hymenal penetration, indicating child sexual abuse.

This case illustrates the need of a system to follow-up children with risk even after decisions have been

taken by a multi-disciplinary team, strengthening the knowledge of stakeholders on the proper implementation of agreed decisions and educating the police and the judiciary.

Scenario 3: Importance of monitoring 'risk' environments

A 9-year-old girl was brought for clinical forensic examination following a complaint made by the schoolteacher on the history of physical abuse by the student's daycare teacher. Further interviewing revealed that her mother lives with several partners and is involved in drug trafficking. Five months ago she had abandoned her daughter at the daycare centre and had not come back for her. The teacher of the daycare centre had then started to 'take care of the child'. The child revealed that she was forced to do household chores and was subject to physical abuse, and that the husband of the teacher engaged in genital fingering and oral intercourse with her, while the teacher videoed such acts on her mobile phone.

The genital examination findings were not compatible with hymenal penetration, but the given history cannot be excluded.

There was a history of this daycare centre staff physically abusing children in their care and had been warned by the police and courts previously.

This case illustrates the need for a system of background check and repeated monitoring by the authorities when such places are reported.

DISCUSSION

Sri Lankan lawmakers and law enforcing authorities have been working hard to fight for the protection of children. Sri Lanka has a system to deal with child protection matters which has significantly developed since 1996 with the appointment of the Presidential Task Force on child protection. The National Child Protection Authority (NCPA) was established under Act No.50 of 1998 with recommendations of the task force[9]. Empowerment of Probation & Childcare Officers is the need of the hour.

In spite of a powerful legal system, Sri Lanka still struggles to combat crimes against children. Need for amendments and training of judiciary is essential. NCPA has received 146,375 complaints in the year 2018. One thousand two hundred and sixty seven children were not receiving essential education, 536 were complaints of neglect, 555 complaints of sexual harassment, 311 complaints of rape and 375 complaints of grave sexual abuse[10].

Most cases of child abuse frequently go under-reported. Major causes for under reporting may be the inability of parents to identify abuse at the right time and the lack of emotional attachment between parents and child. In some cases, the injuries are interpreted mistakenly as accidental in origin, and they fail to seek medico-legal assessment.

Parents/guardians are reluctant to bring their abused children to seek justice due to the intimidations they have to face during the entire justice-seeking process, inconvenience caused at the police stations and Government hospitals, undue delays in the process of examination, investigations and legal proceedings that cause significant hindrance in their daily pursuits.

In the absence of coherent assistance, abused children will struggle with evolving into functioning and independent members of the society. This will perhaps have an adverse impact on the development and culture of the country.

Schools should be a target to create awareness about child abuse. Simple teaching techniques on 'good touch' 'bad touch' should be widely established. Healthcare professionals and social support officers should actively work towards removing the social taboo of sexual health education in schools. Sexual health education should begin at primary education level in little children in an appropriate and understandable manner.

Further strengthening of laws if necessary and the Government and relevant authorities working collaboratively with law enforcement and social support officers are vital to prevent abuse and provide support where relevant[11].

Sri Lanka already has a well-integrated support system. However, this system usually detects a child after the abuse has taken place. Homes and institutions were mothers and children from families with domestic violence can live together have to be established to deal with cases of child abuse. We propose refinement of the existing system, to recognize the submerged part of the iceberg for the prevention of child abuse. There should be timely intervention to detect and prevent any form of child abuse. Continuity of care and follow-up is as equally important as early detection. If not, as illustrated by Scenarios 1 and 2, even after the detection of possible child abuse, the affected child or other

children in the family can still end up in a devastating situation.

There are established 'Praja committees" in each Grama Niladhari division, which comprise a Chairperson – a respectable and credible personality of the community, the Grama Niladhari as the secretary and around twenty members. The Government Circular for community police states that every Grama Niladhari division should have one community police officer. But this is not implemented in most areas due to lack of police officers. Furthermore, as one community police officer is responsible for several 'praja' committees, it may reduce the efficiency of such committees. Each police division comprises an OIC for a larger 'praja' committee and group of 10 eminent members of the police division works in collaboration with this officer, and advices him on the needs and drawbacks of the community.

We propose making the best use of these existing committees, where these committees could be the first responders to look into any form of child abuse or to recognize high risk children within their community. They should be able to report to a Central authority such as NCPA and to maintain a list of children/families with risk factors for child abuse, as mentioned above. The system would work better, if information of 'high risk' children are incorporated into an electronic database, which would enhance easy reference. However, confidentiality needs to be ensured. Data should be perusable by the National Child Protection Authority and the Department of Probation and Child Care Services through an integrated system. It is preferable if this database is linked with the '1929' child-line.

If these families move into another community data base should be updated and relevant "Grama Niladhari" should be informed.

High risk, vulnerable groups of children who are in the database should be brought to the attention of the child rights protection officers of the area by the NCPA. 'High risk' children and their families should be visited by the Child Rights Protection Officers on a regular basis and immediate action should be taken if any form of abuse is suspected. Schools attended by these 'high risk' children should also be notified, and careful monitoring of school performance and behavioural changes should be carried out by the school teachers. As illustrated in Scenario 3, if not for the school, the child may still be suffering tormenting abuse.

What is most important in the establishing and maintenance of the proposed system is to preserve the confidentiality of the children, in order to prevent victimization and unnecessary stigmatization within society. Therefore, we suggest the strengthening of "Multidisciplinary Child Protection Committees" in the community under the supervision of NCPA using existing facilities with the participation of multi-sectorial stake holders for early detection and community monitoring of high-risk children. Legal provisions need to be made for compulsory hospitalization of children suspected of abuse. Police stations must be provided with more facilities to keep children and mothers till the primary inquiry is complete. More funds have to be allocated for transport of officers to visit homes frequently. Furthermore, it is necessary to provide trained matrons to be kept with children at police stations and in hospitals.

ETHICAL ISSUES

None

CONFLICTS OF INTEREST

None

AUTHOR CONTRIBUTIONS

YT: Examination of clinical cases, writing of manuscript, Literature survey; **WNSP:** Concept-ualization, Editing and reviewing of manuscript, Supervision; **MT:** Examination of clinical cases, Literature survey.

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CASE REPORT

A bizarre death caused by an anti-aircraft bullet

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ABSTRACT

In 2009, towards end of the civil war with the Sri Lankan government, the Liberation Tigers of the Tamil Elam (LTTE) carried out a suicide mission using two light aircraft. Both planes were later shot down by anti-aircraft fire. A young girl living in the suburbs who was watching the incident died after sustaining injuries due to an anti-aircraft bullet. The bullet had entered the root of neck and was found inside the left chest cavity. Atypical firearm injury is an important issue in the practice of forensic medicine. Interpretation of the injury and determination of the manner of death are important areas a forensic pathologist should deal with. A fair knowledge about aero-physics and behaviour of falling bullets is necessary to deal with this type of case. The morbidity and mortality depends on the site of impact of the bullet. This is the first such case reported in Sri Lanka. Though it has occurred under extra-ordinary circumstances it highlights the importance of following instructions given to the public under such circumstances.

Keywords: Anti-aircraft fire, falling bullets, chest cavity, atypical Firearms

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INTRODUCTION

Stray bullet injuries are a unique subset of firearm related injuries. Most are unintended consequences of intentional violence. There are many instances where injuries and death are caused by anti-aircraft fire. Many such deaths were reported especially during the Second World War. The essence of air defence is to detect and destroy hostile aircrafts. The critical issue is to strike a target moving in three-dimensional space; an attack must not only match these three coordinates but must do so at the time the target is at that position. This means that projectiles either have to be guided to hit the target, or aimed at the predicted position of the target at the time the projectile reaches it. However under these circumstances it is very likely that many bullet will miss the target and fly astray resulting in possible injuries and even death to general public.

CASE HISTORY

Towards the end of the civil war between the government and the Liberation Tigers of Tamil Elam (LTTE), on the night of 20th February 2009 the LTTE launched their first aerial suicide attack[1, 2]. They launched the attack using two light aircrafts filled with explosives. However, the air defense system of city was activated when the two aircrafts entered the city limits[3] and the power supply to the city of Colombo was cut, plunging the city into darkness[1, 4]. Anti-aircraft fire struck one of the planes which crashed into the 12th floor of a high rise building[3, 4]. The other aircraft attempted to retreat and was shot down near the airport by the Sri Lanka Air Force.3 This anti-aircraft fire resulted in the death of a girl some distance away from the point of fire.

The victim, a 14-year-old girl, accompanied by several others, was outside her home which was about 7.5km from Colombo fort watching the ongoing events. They were standing under a mango tree when the victim collapsed on to the ground.

Others around were unaware of what happened, but subsequently noticed that the victim was injured and took her to the emergency department. The girl was pronounced dead on admission.

AUTOPSY EXAMINATION

The body was that of an adolescent girl, averagely grown with brown skin complexion, clad in a T-shirt and a skirt. A 3X2 cm penetrating injury was noted at the root of the neck on the right side. It was irregular in shape with abraded margins. There was no burning, blackening or tattooing **(Figure 1).**

Fig 1: Entry wound

The right clavicle was fractured close to the sternoclavicular junction. The first and second right ribs were also fractured close to the sternum. The bullet track extended downward and medially involving the right subclavian artery, trachea, and oesophagus **(Figures 2 & 3).**

Fig 2: Injury caused to the subclavian artery, trachea, and oesophagus.

The tract extended to the left side, involving the left main bronchus and crossed the midline at the root of the neck. The right side of the chest cavity contained 800 ml of blood and left contained 150 ml. A 12.7 mm (0.5 inch) caliber anti-aircraft bullet was found in the left chest cavity **(Figure 4).** There were no other injuries. Length of the bullet was 14.2cm.

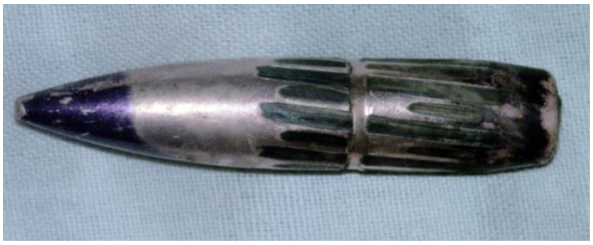

Fig 3: 12.7 mm bullet recovered from the left chest cavity

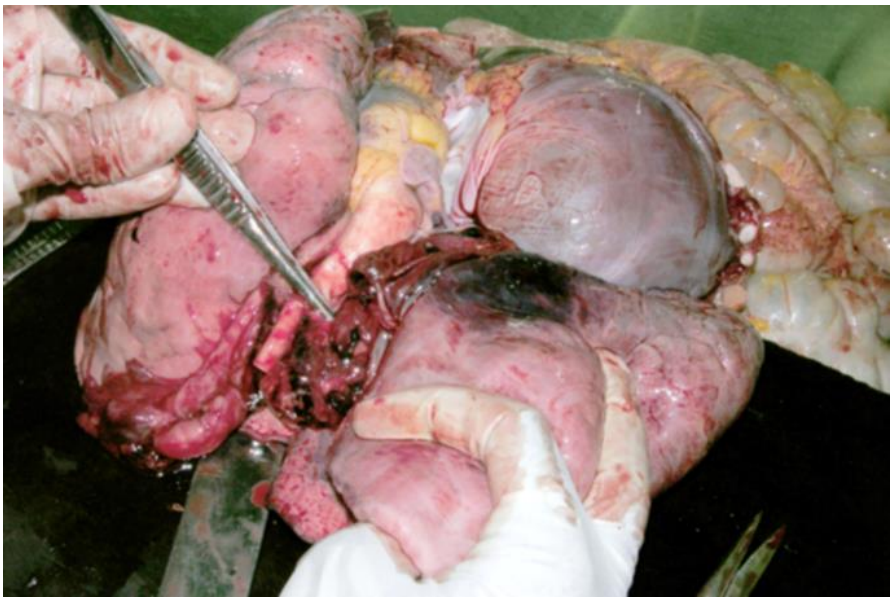

Fig 2: The tract of the bullet at the root of the neck

The cause of death was determined to be haemothorax following subclavian artery damage due to an anti-aircraft bullet.

DISCUSSION

Gunshot injuries are common in Sri Lanka. However, accidental death following anti-aircraft fire has never been reported. Horizontally or near horizontally traveling bullets will have higher kinetic energy than the bullets fired up into the air and traveling in a parabolic trajectory5. Bullets fired straight up will usually fall under the gravitational pull, and they possess the lowest amount of kinetic energy in comparison to the other two types[5].However, in this case, we cannot classify the offending bullet as a falling bullet due to the circumstances under which it had been fired.

External injury, in this case, was at the root of the neck on the right side. Examination of the wound tract revealed it to be extending downwards, medial, and to the left. According to the parents, the deceased, was standing outside and looking up at the sky at the time of incident. Findings are consistent with a bullet falling from above. Could it be categorized as a falling bullet? In this case, the finding of a 12.7 mm bullet in the left chest cavity confirms that the bullet was discharged from an anti-aircraft gun. Facts revealed the reason for firing the weapon as to defend the city. In this case, though the exact direction of firing is not known, it is unlikely to be vertical or near-vertical. The distance between the probable location of the fire and the point of the incident is about 7.5 kilometers. Therefore this is likely to be a bullet traveling in a parabolic trajectory than a 'falling bullet' under gravitational pull.

When considering the trajectory of the bullet and the kinetic energy it possesses, a question remains to be answered - does a bullet falling under gravitational pull or one at the end of the parabolic trajectory have enough kinetic energy to cause injury or death? A bullet at the end of its parabolic trajectory is likely to possess more energy than that of a falling bullet.

The mechanism of injury has to be explained using external ballistics and aerophysics. The M41 LAAG (Light Anti-Aircraft Gun) is the main weapon that has been used in this instance. It is a triple-barrelled, electric-powered, link less, belt-fed weapon. It fires 450 to 550 12.7x99 mm armour penetrating rounds per minute[6].

The muzzle velocity could be up to 1488 - 2232 meters per second[7]. Therefore, if the target is hit before the end of the trajectory there is a high possibility of the velocity of the bullet being above the velocity which is needed to penetrate the skin.

Literature revealed that the terminal velocity of a falling bullet fired with a standard rifle weapon is between 60 – 100 m/s (200 - 330 ft/s) [8]. Therefore, a bullet travelling in a parabolic trajectory, would possess more energy than that of a falling bullet.8 A velocity of between 45.1 and 60.0 m/s (148 and 197 feet/s) is required for a bullet to penetrate the skin, which is easily reached by a falling bullet[5]. Vertical shooting is considered to be less lethal than angulated shooting[8]. The larger the caliber of the falling bullet, the higher the terminal velocity as compared to smaller caliber bullets[8]. A 12.7mm bullet is a reasonably large bullet with an average weight between 50 -60 grams, which makes it potentially lethal even when falling under gravitational pull.

The morbidity and mortality depend on where in the body the bullet strikes. The site of the injuries caused by falling bullets varies with the posture of the victim at the time of trauma. Usually, in the case of falling bullets, they tend to hit on the upper parts of the body when the victim is in erect or seated posture.

A report made by the Center for Disease Control (CDC) in the United States of America states that the commonest site to receive injuries is the head[9]. A study carried out by Al-Tarshihi reveals that the commonest areas to sustain injuries have been identified as the chest and lower extremities[10].

The CDC in the United States of America has also reported that 80% of these stray bullet injuries are to the head, followed by feet and shoulders.

This is a unique case of accidental death following an anti-aircraft fire. In this instance, a young girl succumbed to injuries sustained due to an anti-aircraft bullet. This is an unfortunate rare event. It also emphasizes the lethal effect of a high-speed bullet, causing the death of a person at a distance from the offending gun. However discussion and analysis of certain facts e.g. determining exact direction and trajectory of the bullet was limited as the exact location of the gun could not be obtained due to security concerns.

CONCLUSIONS

This case highlights the importance of performing medico-legal investigations and autopsies with an open mind as in the initial stages in the investigation did not suggest firearm injury. It also highlights the possibility of occurrence of unexpected injuries and fatalities in aerial firing.

ETHICAL ISSUES

None

CONFLICTS OF INTEREST

There are no conflicts of interest.

AUTHOR CONTRIBUTIONS

NDNAM: Total work done by the author.

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CASE REPORT

Electric entry mark in a decomposed body

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ABSTRACT

Background: The electric traps using a live non-insulated cable, one end of which is connected to domestic utility bare line is used to hunt animals in several geographical areas in Sri Lanka. In some instances the humans fatalities are also reported. The alteration of the scene by the trappers and the frequent late recovery of the bodies challenge the Forensic Pathologist in determination the cause of death.

Case description: A moderately decomposed body with discolouration, desquamation and maggot infestation which was recovered from a jungle was brought for medico legal investigation. There was a greyish white oval shape mark with central black area on the right leg. The mark on the right leg showed macroscopic features of an electric entry mark. The mark was still identifiable with the naked eye. The characteristic histology features were observed on the sections obtained from the mark.

Conclusion: The electric entry mark is demonstrable in decomposed bodies and a meticulous external examination is helpful to identify the suspected lesions. The histology findings are resistant for decomposition and helpful to confirm the diagnosis of electrocution.

Keywords: electric entry mark, decomposed body, histopathology

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INTRODUCTION

Electric traps are used for hunting animals for food and to protect crops in several geographical areas in Sri Lanka. A live non-insulated electric cable, one end of which is connected to a low voltage (230 V) utility bare line is laid across the known trails of animals. In some instances human fatalities are also reported. The alteration of the scene by the trappers and the frequent late recovery of the bodies are challenging the forensic pathologist in determination the cause of death.

The electric entry mark (EEM) on the skin is a pathognomic[1] of electrocution and inflicted at the point of contact and may be the only evidence of electrocution. But the decomposition process which leads to desquamation may mask the injury[2] which implies that the EEM may not be visible on a decomposed body. In such situations histology may be helpful if tissue sections from the suspected EEM is obtained.

The case report below describes the determination of the cause of death in a decomposed body. It emphasizes the importance of a meticulous post mortem examination of a decomposed body which still provides evidence to determine the cause of death.

CASE HISTORY

A decomposed body was brought to the medico legal mortuary, of a Hospital in Southern Province, Sri Lanka which was recovered from a jungle by the police. The body was identified by the wife from the clothing and the personnel effects. The deceased had left home 3 days before the recovery of the body.

The body was in a state of moderate decomposition with discolouration, swelling, marbling and generalized desquamation of epidermis with severe maggot infestation (Fig.1). The external genital organs with lower abdominal wall and the abdominal visceral organs were absent.

Fig 1: The decomposed body with desquamation, discolouration and maggot infestation

There was 4x1 cm oval shaped mark situated on the inner aspect of the right leg which was situated 20 cm above the heel. The mark was greyish white with black in the central part and on palpation the mark was firm and parched (Fig. 2). The dissection of the available internal organs were unremarkable except the putrefactive changes.

Fig 2: The greyish white mark on the right leg

The histopathology examination of the sections from the mark on the skin showed epidermis, dermis with underlying subcutaneous tissue. There were areas without epidermis. The nuclei of the basal layer elongated (nuclear streaming) and were tightly packed giving characteristic palisading appearance and dermo-epidermal and intra-epidermal separation (Fig.3,4). The underlying adnexal structures were intact. Coagulative necrosis was present in the dermal and underlying tissue.

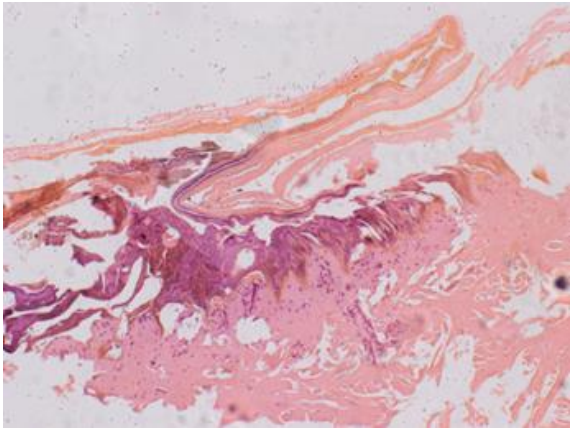

Fig 3: Intra-epidermal, epidermo-dermal separation with coagulative necrosis of dermal tissue. H&E (x40)

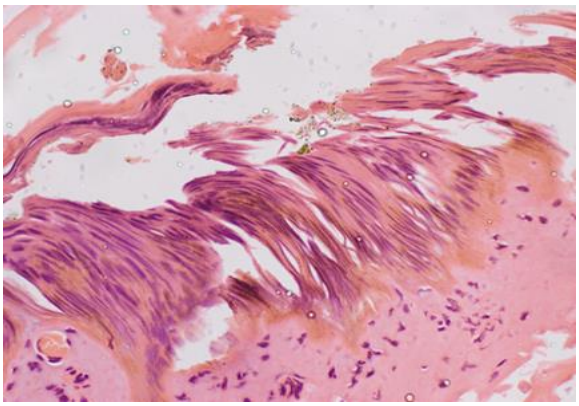

Fig 4: Elongated and packed basal layer of the skin. H&E (x100)

According to the investigating police there were several reported incidences of illegal electric trapping with several human fatalities in the area. The cause of death was concluded as electrocution.

DISCUSSION

The electric entry mark due to contact with domestic current is a thermal burn which is a key diagnostic indicator of electrocution and characterized by a yellow grey puncture area or a crater with central necrosis[1.] The deceased had a mark on the leg with similar features suggestive of EEM. The peeling off of the skin during the process of putrefaction may have caused disappearance of some of the external features of the injuries like the appearance of crater.
Histology is an important ancillary investigation in diagnosis of electrical injuries. The epidermal nuclear elongations/nuclear streaming or palisading is a typical histological hallmark of electrical mark and of great diagnostic value in electrocution[3]. The burnt epidermis, denudation[4], intraepidermal, dermo-epidermal separation, coagulative necrosis, vacuolated appearance in dermis and intact adnexal structures are frequent histology findings[1]. The histopathology of the injury in this case showed most of the above-mentioned characteristic features of EEM. The features like singeing of hair follicles, metallization which are described in the literature [4] were not observed.

Although the current mark is a proof of electrocution, the vital reaction decides the ante mortem or post mortem nature[1]. There was no inflammatory reaction which may be due to the fact that the time interval between the electrocution and the death was short to develop inflammatory reaction.

Varying degree of nuclear elongation is seen in flame burns and in abrasions[5]. However, a significant degree of nuclear elongation and intraepidermal separation which were observed on the deceased are characteristic of EEM.

The post mortem animal predation may have caused the defect on the abdominal wall with removal of abdominal organs.

CONCLUSIONS

The characteristic macroscopical features of electric entry mark was demonstrable even in a decomposed body on the third post mortem day and a meticulous external examination is helpful to identify the suspected lesions. The microscopic features of electric mark is resistant to at least mild to moderate decomposition.

ETHICAL ISSUES

None

CONFLICTS OF INTEREST

There are no conflicts of interest.

AUTHOR CONTRIBUTIONS

JW: Total work done by the author.

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