HOW THE LEVEL OF RESOURCES AND HOSPITAL STAFF ATTITUDE IN PRIMARY CARE HOSPITALS IN RURAL SRI LANKA AFFECT POISONING PATIENT OUTCOME.

A Small Scale Study

(Minor Thesis)

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23 rd October 2006

Summary of the Study

Background:

Deliberately self poisoning with poisonous substances like agrochemicals has become an epidemic in rural parts of developing countries. This situation is common for rural Sri Lankan districts where pesticide poisoning has become one of the first main causes of hospital deaths. A high percentage of patients present initially to peripheral hospitals and are being treated or transferred to secondary care. The lack of facilities, staff and antidotes in peripheral hospitals, lack of training for the management of poisoned patients for hospital staff, difficulties in transferring patients to and between hospitals and the high toxicity of locally available poisons may be the reasons for high mortality. Also the knowledge and attitude of the staff may also affect treatments provided and hence outcome.

A baseline evaluation of the available resources and treatment protocols in Peripheral hospitals is required to see how the variations between hospitals affect the patient outcome at the peripheral hospital level. It would help to create a guideline on providing resources to peripheral hospitals.

Methodology:

A cross-sectional study with qualitative components included was peformed. All the peripheral hospitals in North Central Province of Sri Lanka and all poisoned patients admitted to those hospitals during six month period were audited. Data was collected on hospitals resources; number of staff, equipment, medication, and resuscitation facilities and treatments protocols from each hospital. Ingested poison details, initial examinations, treatments and outcome details (transferred, died or discharges alive) were retrospectively collected from patient records. In-depth interviews were conducted using unstructured open ended questionnaire guide with individual doctors (15 interviews).

Results:

There were 1025 patients admitted to 40 hospitals during six months period. There was a significant difference between poison ingested by males and females. However gender did not affect the transfer rate.

691 were transferred for secondary hospital care, 330 were discharged from peripheral hospitals and only 4 patients died there. 47 patients died after transfer.

Except Atropine (100%), other antidotes were not available in few hospitals, the next most common being activated charcoal (45%) and Fullers earth (50%).

There were medical officers in 82.5% of hospitals while others run by registered medical officers alone. 70% and 95% hospitals had nurses and attendants respectively.

Doctor workload and nurse/attendant workload showed an association with transfer rate.

Initials examinations recorded in peripheral hospitals usually limited to BP (65%), Pulse rate (55%) and pupils (51% for organophosphates). Respiratory rate and lung examinations were done only for 8.5% and 9.5%. Gastric Decontamination, Intravenous fluids and atropine (for OP) were common treatments. Other antidote administration was minimal. There was a difference between what doctors stated they wanted to do according to interview results and the real clinical findings. The attitude of the hospital staff is mainly based on the confidence of treatments, interaction with staff and patient relatives and inability to practice free in low resource settings.

Conclusion: The availability of antidotes, other medications and equipments were not adequate in peripheral hospitals. Considering treatment protocols, there was a mismatch between recommendations from guidelines and doctors' practice.

The resource parameters act as markers for the level of hospitals care and examination findings and treatments act as causes of transfer decisions. Both markers and causes show direct and indirect effects on patients outcome; mainly transfer rates.

Introduction of a minimum antidote list and emergency treatments kits would be useful to increase the level of resources. Education interventions and assessment of the use of current guidelines can results better treatment protocols. Themes revealed from qualitative finding should be used when planing educational and other awareness programs.

Acknowledgements

I would like to thank to everybody for helping me to make this research and thesis a success.

- South Asian Clinical Toxicology Research Collaboration (SACTRC)
- Provincial Department of Heralth, North Central Province, Sri Lanka
- Prof Andrew Dawson, Director, South Asian Clinical Toxicology Research Collaboration, Sri Lanka
- Prof Nick Buckley, Department of Clinical Pharmacology and Toxicology, Canberra clinical School, Australia
- Dr W Attapattu, Provincial Director of Health, North Central Province, Sri Lanka
- Dr Dhammika de Silva, Planning Unit, Provincial Director of Health, North Central Province, Sri Lanka
- Dr Jon Adams, Senior lecturer in Health Social Sciences, University of Queensland, Australia
- Ms Rasika Jayathilaka, Department of Statistics, University of Colombo Sri Lanka
- Prof Roshini Sooriarachci, Department of Statistics, University of Colombo Sri Lanka
- Doctors, Nurses and other staff member of all peripheral hospitals in North central province.
- Dr Priyadarshani Galappaththi, Department of Pharmacology, University of Colombo Sri Lanka
- Dr Michael Eddleston, Dr Darren Roberts, Mr Fahim Mohamed and all SACTRC colleagues.
- My mother, father and four sisters and their families

Table of Contents

List of Tables	**06**
List of Figures	**07**
List of Appendices	**08**
Background of the study	**09**
Study Aims and Research Question	**13**
-Aims of the study	**13**
-Research Questions	**13**
Methodology	**14**
-Subjects and study Methods	**14**
-Quantitative Data Collection	**1**
-Qualitative Data Collection	**17**
-Ethics Approval	**17**
Results	**18**
-Hospital Resources	**18**
-Infrastructure of the Hospitals	**18**
-Available Beds and Distance from Referral Centre	**18**
-Annual Admissions	**21**
-Availability of Medication	**24**
-Availability of Equipments	**25**
-Staff Details	**26**
-Patient Details	**28**
-Treatment Protocols	**34**
-Multiple Logistic Regressions	**37**
-Qualitative Analysis Results	**39**
Discussion	**43**
Conclusions	**52**
- Solutions & Recommendations	**55**
Reference	**57**
Appendix	**59**

List of Tables

		Page
Table 1:	**Number of admissions, admissions per bed and poisoning admissions in the Peripheral Hospitals of North Central Province, Sri Lanka**	**23 - 24**
Table 2:	**Availability (& price) of antidotes and medications in the Peripheral Hospitals of the North Central Province**	**25**
Table 3:	**Availability of Equipment in the Peripheral Hospitals of the North Central Province**	**26**
Table 04:	**Number of staff in Peripheral Hospitals – under each category**	**27**
Table 05:	**Poisons ingested in peripheral hospitals admissions according to gender**	**29**
Table 06:	**Workload per each staff category and number of transferred poisoned patients**	**32**
Table 07:	**Recorded initial examinations for poisoned patients in Peripheral Hospitals**	**35**
Table 08:	**Treatments/Investigations done in Peripheral Hospitals and percentages of patients**	**36**
Table 09:	**Significant Parameters in the Logistic Regression Model for hospital parameters and patient outcome**	**38**

List of Figures

		Page
Figure 10:	**Categorization of hospitals and place of each hospital in Sri Lankan health system in delivering order of resources.**	**24**
Figure 02:	**Number of beds in the peripheral hospitals of the North Central Province**	**19**
Figure 03:	**Distance to peripheral hospitals in study from secondary referral hospitals**	**19**
Figure 04A:	**Location of hospitals-Polonnaruwa district, North Central Province**	**20**
Figure 04B:	**Location of hospitals-Anuradhapura district, North Central Province**	**21**
Figure 05:	**Number of admissions in the peripheral hospitals of North Central Province**	**22**
Figure 06:	**Age distribution of poisoned patients according to gender**	**28**
Figure 07:	**Flow chart of 1025 patients who were accounted for analyses**	**30**
Figure 08:	**Transfers from peripheral hospitals to secondary hospitals in North Central Province for each type of poison**	**31**

Figure 9A: **Doctor Workload Vs Percentage of transferred poisoned patients** **33**

Figure 9B: **Number of patients (for all causes) for a attendant/nurse per year Vs percentage of transferred poisoned patients** **34**

Figure 10A: **Themes related to the attitude of medical staff (doctors) on poisoned patients** **39**

Figure 10B: **Themes for issues related to different attitudes of peripheral hospital doctors in poisoned patient treatments** **41**

List of Appendices

Appendix A: Hospital Data Collection Form	**59 - 61**
Appendix B1: Standard Case Scenario Sheet	**62 - 63**
Appendix B2: Questionnaire – Organophosphate Poisoning	**64 - 66**
Appendix B3: Questionnaire – MCPA Poisoning	**67 – 69**
Appendix B4: Questionnaire – Paraquat Poisoning	**70 – 72**
Appendix B5: Questionnaire – Oleander Poisoning	**73 - 75**
Appendix C: Questionnaire Guide for Qualitative Interviews	**76 - 77**
Appendix D: Complete Analysis results for Qualitative Phase	**78 - 89**

Background of the Study:

Acute poisoning is a significant cause of hospital admissions in developing countries. Previous studies have shown that most acute poisoning cases are intentional[1]. Although deliberate self poisoning is major problem worldwide, the situation is different in developing countries where a much higher in-hospital case fatality ratio (CFR) is observed. Typically 10 % to 20% of poisoned patients die compared to <0.5% in Europe, US or Australia[2],[3]. In Sri Lankan rural agricultural districts, the most commonly ingested poisons are pesticides and yellow oleander seeds[4, 5]. Pesticide poisoning is also the commonest cause of hospital death in these districts. The high case fatality in these districts is likely to be attributable to a combination of the high toxicity of locally available poisons, difficulties in transferring patients to and between hospitals, and the lack of facilities, staff, antidotes, and training for the management of poisoning patients[6, 7].

Peripheral hospitals in rural Sri Lanka act as first treatment centres for acute poisoning patients. Initial medical management depends on the available resources in terms of trained medical staff, availability of antidotes and other medications, availability of resuscitation facilities, appropriate treatment protocols and also on the attitude of hospital staff. The secondary care hospitals in each province of Sri Lanka act as secondary referral centres. A recent study in the north central province has shown that nearly 50% of the poisoning patients admitted to rural hospital are transferred for secondary care and there are differences between hospitals in numbers transferred. The distance, number of poisoned patient admissions depend on the transfer rates, higher number of admissions, lower the possibility of transferring[8].

Pharmacological rationale and animal studies suggest that early use of appropriate treatment and antidotes for pesticide toxicity should be associated with better outcomes[6, 9-12]. The rapid and effective stabilisation and treatment of pesticide-poisoned patients on hospital admission should reduce the numbers of early deaths, improve the prognosis of surviving patients over the next few days, and reduce the number and severity of long term sequelae[13]. Some clinical guidelines indicate that there may be benefits of giving gastric lavage and administering activated charcoal within one hour of poison ingestion[9, 10].

Therefore in Peripheral hospitals , from where most of the poisoning patients get initial treatments should have resources and appropriate treatment protocols to treat acute poisoning patients with a adequate number of appropriately trained doctors and nurses [13, 14].

M. Eddleston et al[8] conducted a prospective study in rural Sri Lanka that aimed to determine the pattern of patient transfer from Peripheral hospital to secondary or tertiary care hospitals and to establish how these transfers influenced the Case Fatality Ratio (CFR) noted in the secondary hospital. Within the study details of 485 patients admitted to 17 Peripheral hospitals over 6 months period had been collected. This study has revealed that nearly 50% of poisoning patients admitted to Peripheral hospital in the particular study district were being treated and discharged home from these hospitals. Greater the distance from the secondary care centre the less likely patients were to be transferred.

Further, the study revealed that Peripheral hospital played a significant role in most poisoned patient's initial managements in rural areas. The necessity of further studies to explore the impact of treatment protocols, resources on patients' outcomes is highlighted in this study.

W. Van Der Hoek et al[15] explains the scope of the problem, poisoning, in his case study and literature review "Pesticide poisoning: a major health problem in Sri Lanka" . In this case study in two areas of the North Central province of Sri Lanka, the authors attempted to analyse the reasons for the high incidence of poisoning admissions and deaths. The study explored the underline reasons for the episodes, but also highlighted the importance of the availability of medical facilities to treat poisoning patients. In particular, they noted that there were no antidotes available in Peripheral hospitals to treat poisoning patients and this may contribute to high death rates.

In his paper “pesticide poisoning in South India: Opportunities for prevention and improved medical management” CH. Srinivas Rao et al[16] assessed the treatment protocols to explore the relationship between treatments and outcomes according to each pesticide. During the study, only 11% of the patients were transferred from other Peripheral hospitals and the case fatality among transferred patients was lower than that for direct admissions. This suggested that the actual number of deaths for the whole province may be higher than recorded in this paper. Many ill patients admitted to small Peripheral hospitals may have died before or during transfer to the referral hospital. Unavailability of appropriate initial treatments may have contributed to early deaths. This study also emphasizes the importance of focusing on rural primary care hospitals to reduce pesticide poisoning deaths.

In summary, previous studies suggest evidence based treatment protocols with appropriate resources and trained dedicated medical and nursing staff might help to reduce number of deaths not only in referral secondary care hospitals, but also in primary care Peripheral hospitals. As a first step to evaluating the implementation of this strategy, a baseline evaluation of the available resources and treatment protocols in Peripheral hospitals are required to see how the variations between hospitals affect the patient outcome (death, discharged alive or transfer) at the Peripheral hospital

Treating suicidal patients represent difficult clinical situations[17]. Therefore the attitude of medical staff is also an important factor which together with the available resources directly effects initial management and decision making. The rural hospital’s lack of facilities has negative impacts not only on the patients but also on the hospital staff. An unsatisfactory working environment may affect their attitude towards patient care.

In the presence of limited resources, deliberate self harm patients may not get priority comparing to patients with snake bite or myocardial Infarction. The lack of resources and training may affect decision making and attitudes. Therefore it is necessary to look at the knowledge, attitude practice of peripheral hospital staff together with the level of resources. Changing knowledge and attitude might also be necessary to improve the treatment in these hospitals.

Study Aims, Research Questions.

Aims of the study:

To assess the availability of resources in terms of available facilities, staff, medication and current initial treatment protocols which are needed to treat poisoned patients; and to find out the impact on patient outcome in peripheral hospitals across the North Central Province, Sri Lanka.

To explore the attitude of medical staff towards treating poisoned patients in the peripheral hospital setting and the possible effects on treatment and patient outcomes.

Research Questions:

i. Are the antidotes for treating poisoned patients (and other medications which are not specifically for poisoning but essential for all medical and emergency care) available in peripheral hospitals in North Central Province, Sri Lanka?

How has this availability affected the outcome of poisoned patients in the province?

ii. Are there adequate numbers of Medical staff (Medical Officers, Assistant Medical Officers, Nurses, Attendants, Pharmacists, Labourers, and Ambulance Drivers) available in peripheral hospitals in North Central Province, Sri Lanka?

How has staff availability affected the outcome of poisoning patients in the province?

iii. Are appropriate treatment protocols (in terms of gastric decontamination method, administration and dosing of antidotes (eg: initial dose of atropine for organophosphate and oleander patients) used in the peripheral hospital setting to treat poisoning patients? How has the current treatment protocols affected patient treatment and outcomes?

iv. What is the epidemiology of poisoning in the rural districts of the North Central Province of Sri Lanka? Are there any relationships between age, gender, area, type of poison ingested, treatment and outcome?

v. What is the attitude of medical staff – medical officers – towards treating poisoning patients in a peripheral hospital setting? How do these different attitudes and views impact on treatment decisions?

Methodology

Subjects and Study Methods

During this study I planned to explore variation in resources and treatment protocols between hospitals and compare these with the patient outcome in each institution. A cross-sectional design appeared to be the most appropriate study method as it is possible to assess both the existing conditions and the associated outcomes in each hospital together.

The study consists of two phases, the quantitative data collection and qualitative interviews to explore the attitudes of the medical staff regarding poisoned patients and treatments. The themes which were identified from the qualitative study were used to conceptualize the context of the results from quantitative phase.

Sri Lankan Health System consists of a network of hospitals of different functional categories. Allocation of resources is planned based on the category.

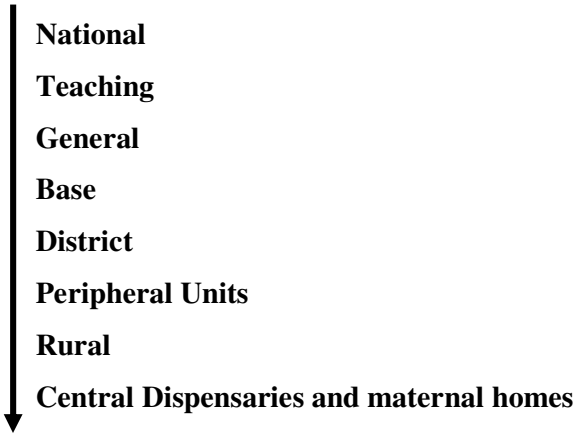

Figure 01: Categorization of hospitals and place of each hospital in Sri Lankan health system in delivering order of resources.

All 44 peripheral hospitals defined as hospitals below general hospital level (Figure 01) in the North Central province of Sri Lanka with in-patient facilities were selected for this study. There were 56 hospitals listed in the Provincial Director of Health's office. However, 12 only operated as central dispensaries due to lack of resources and staff and are not included in the study.

Quantitative Data Collection:

The quantitative part of the cross sectional study collected and contrasted two sets of data. The first set of data includes information on the available resources and treatment protocols from selected peripheral hospitals. Resources which were measured in this study include antidotes, other medications, resuscitation and other facilities to treat poisoning patients, numbers of nursing and medical staff and current treatment information and protocols.

Mainly the staff consist of medical officers (hereafter mentioned as Mos), registered medical officers (hereafter mentioned as RMOs), nursing officers, attendants, ambulance drivers, pharmacists, dispensers, laboratory technicians and labourers. Labourers are divided in to two categories, ordinary labourers and sanitary labourer. Although the defined stated duties are different, ordinary labourers assist attendants and sanitary labourers clean hospital, in practice they do the similar work in Peripheral hospitals due to lack of staff. Sometimes, public health midwifes assist in other ward work, but it is not included in this study as it is difficult to assess.

We considered 13 drugs including antidotes, other preparations and intravenous fluids. These 13 items were selected according to list of available drugs for hospitals by Medical Supply Division, Sri Lanka (annual estimate of drugs – 2005) and after consulting clinicians and toxicologists who treat poisoned patients. Similarly, 11 items of equipment were also studied.

These data were collected with help from the Medical Officer In-charge, Nursing Officer In-charge and other medical officers in each hospital. A data collection form was used for every hospital to enter data regarding resources (Appendix A).

To evaluate the treatment protocols, medical officers from hospitals answered a set of questionnaires regarding treatment of common poisonings in their hospital set up. To standardise the questions, four standard cases (details of four poisoning patients with clinical features on admission) were given (Appendix B1 – B5). Answers to the questionnaire on treatment were then given according to the specific cases. The purpose of this standardisation was to reduce the possible spectrum bias (where some hospitals might routinely see more or less seriously poisoned patients) and therefore how the proposed treatment varied between peripheral hospitals for similar poisoned patients.

The second set of data consisted of information extracted from medical records of patients with a history of poisoning admitted in the 6 months prior to this study's commencement. We estimated from a previous study[8], that there would be approximately 1500 poisoning admissions to peripheral hospitals in the province during this time. The importance of collecting data from all hospital was considered as there wasn't any study before covering all the hospitals in the province, a complete data set from all peripheral hospital would be useful. A decision was taken after consulting experts on the field; to collect data from all the primary care hospitals in the province.

The types and availability of pesticides varies according to the agricultural season. Each season lasts for two to three months[18]. Data collection for a six month (June to December) period aimed to minimise the effect of seasonal variations in poisoning.

Patients with poisoning who were admitted to peripheral hospitals in the North Central Province of Sri Lanka between July 2005 and December 2005 were selected for data collection. These patients were identified by the responsible medical record officer in each hospital. Lists of hospital numbers and Bed Head Tickets (BHTs) –the patient record system in Sri Lanka- were traced to collect details including socio-demographic data, exposure details, treatments given and outcome for each patient. Patients who were transferred to secondary care hospitals were followed up in secondary hospitals and their outcome from those hospitals also recorded.

Qualitative Data Collection:

The qualitative data was obtained from interviews using an unstructured questionnaire guide with open ended questions. Medical officers from Peripheral hospitals participated for this study. Depending on the number of hospitals in the province, it was estimated that interviews with 15 medical officers would be sufficient to explore the research question "how the attitude of medical officers affects the management decisions for poisoned patients and what factors from hospital or outer environment affects the attitude". An experienced qualitative researcher was consulted when decide the number of interviews.

Open invitations were sent to every peripheral hospital in the province. Interested medical officers were asked to contact researcher for further details. They were given information about the study and written consent was obtained before interviewing. Interviews were conducted by the researcher using an interview guide (Appendix 3) with open ended questions and lasted around 20-30 mins. All interviews were recorded and transcribed, coded and analysed to extract themes using Grounded Theory[19].

Ethics Approval:

This study was approved by University of Newcastle Human Research Ethics Committee (Approval Number: H-217-0506) and Ethics Review Committee of Sri Lanka Medical Association (ER001/06). The Provincial Department of Health Services, North Central Province, Sri Lanka approved this research and worked collaboratively by granting access to hospital data in the province. The results will be shared with the Provincial Health Department officials to be used for future planning strategies.

Results:

Hospital Resources:

North Central Province consists of two administrative districts, Anuradhapura and Polonnaruwa. According to Provincial Department of Health (Annual health Bulletin – 2002), There are 56 hospitals in the province with in-patient facilities, 45 in Anuradhapura District and 11 in Polonnaruwa district. There are also two general hospitals that act as secondary referral centres for peripheral hospitals in each district. Eleven of the 56 hospitals currently operate as central dispensaries without inpatient facilities due to lack of facilities and staff. We excluded those 11 hospitals and considered only 45 hospitals for the study. During the time of data collection (March 2006 – August 2006), the security situation in the Northern Province deteriorated and we had to exclude another 5 hospitals from the study as some areas were considered not safe to visit. So in the analysis, data from 40 hospitals were considered.

Infrastructure of the hospitals:

Peripheral hospitals are situated across the province in small towns and villages. All 40 hospitals had transport facilities. The condition of roads leading to the hospitals is variable. None of the 40 hospitals were accessible only on unsealed roads, and the condition of the roads was often very poor –particularly during the wet season.

37 hospitals had one ambulance with a driver and 3 had two ambulances. There were telephone facilities to all hospitals. Therefore peripheral hospital doctors were able to communicate with neighbouring peripheral hospitals and referral hospitals, and also contact the poison information centre.

Available beds and distance from referral hospitals:

The available beds are one measure of hospital capacity. The number of available beds in hospitals ranged from 8 to 133 with a median of 38 (IQR 26-68.5). There are 12 hospitals in the 30-40 category. (Figure 02)

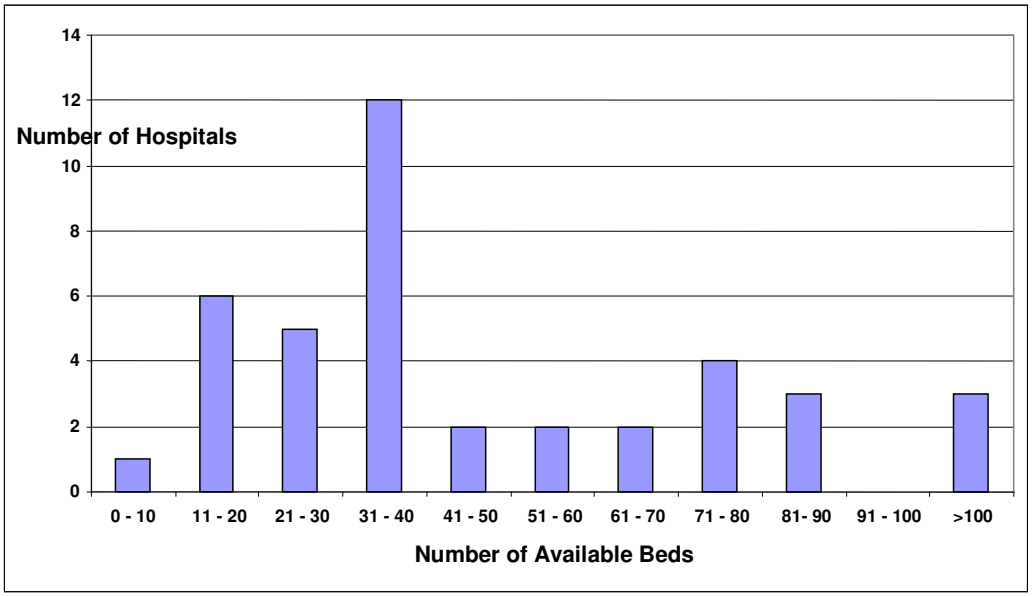

Figure 02 - Number of beds in the peripheral hospitals of the North Central Province

The nearest rural hospital to one of the two secondary hospitals is 6 Km away and the furthest one is 86 km away. The median distance from a secondary hospital was 32 km (IQR 15 – 61)-(Figure 3).

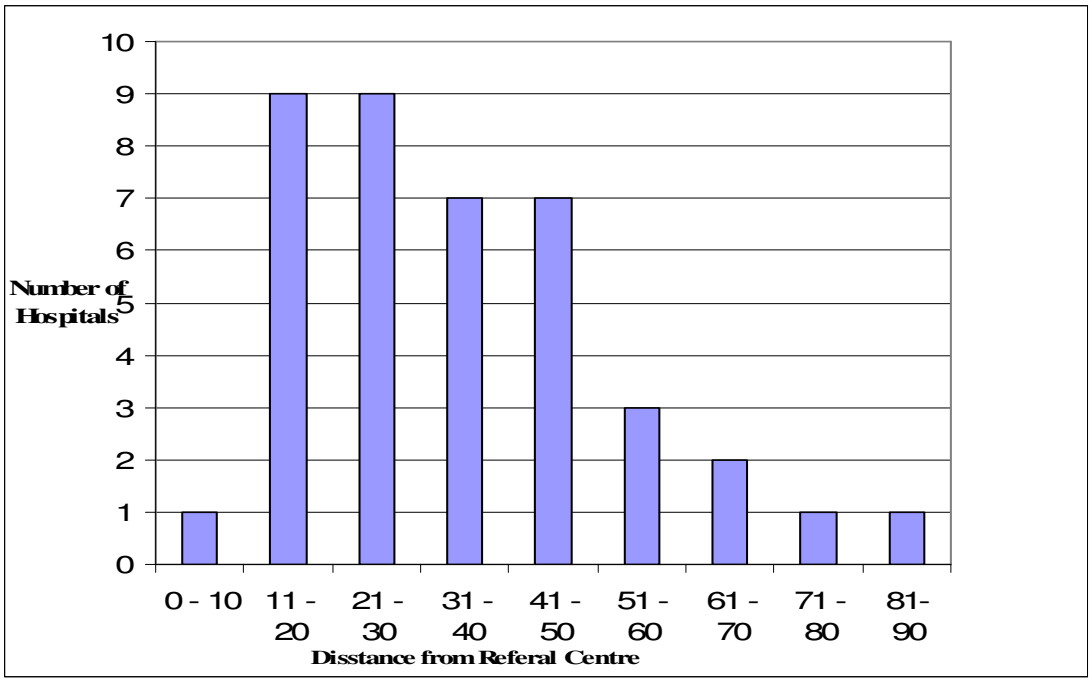

Figure 03: Distance to peripheral hospitals in study from secondary referral hospitals.

The Peripheral hospitals are scattered widely within this province.(Figures 4A & 4B)

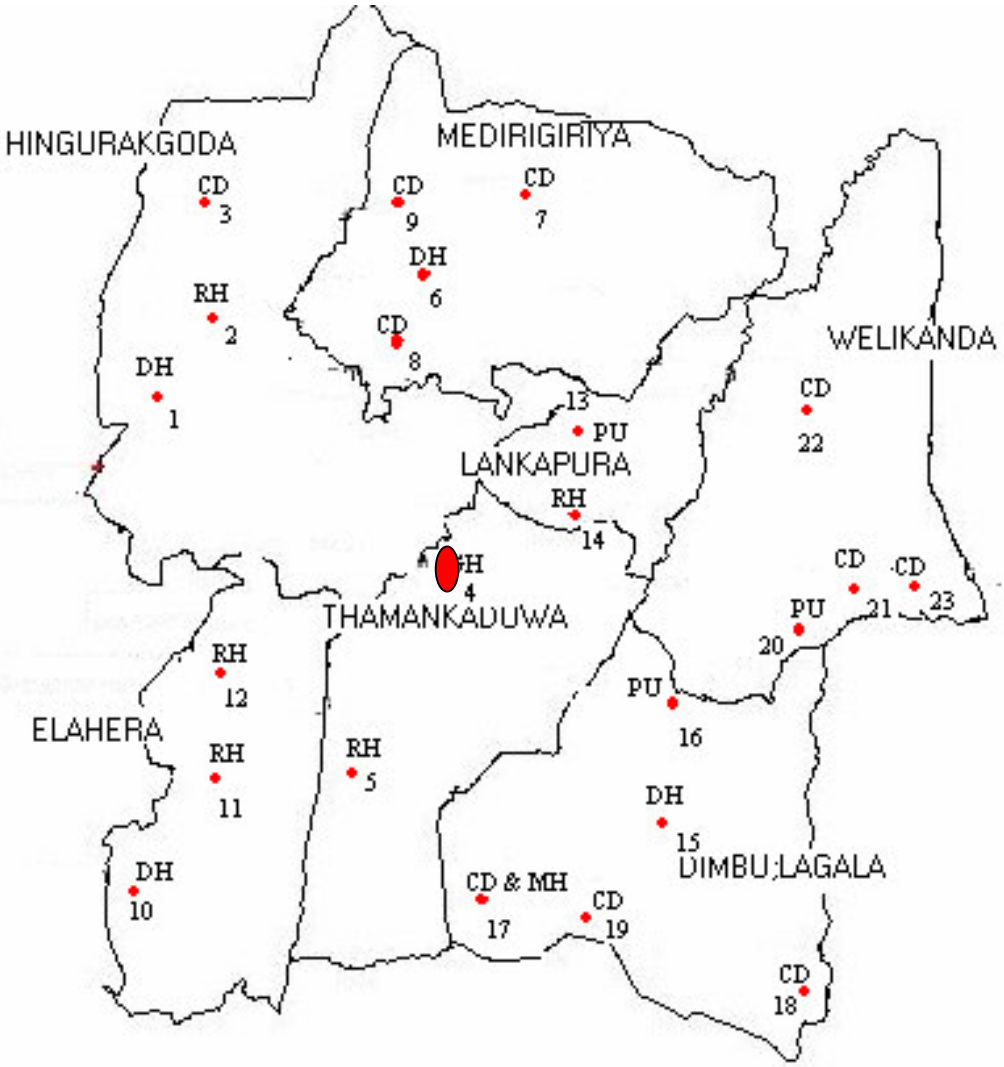

Figure 4A: Location of Hospitals-Polonnaruwa District, North Central province
Secondary Referral Hospital – Polonnaruwa – is marked as

In Figure 4A and 4B, the each secondary referral hospital is situated in the middle part of each district. The letters in the map represent the type of the peripheral hospital according to the government classification; R = Rural hospital, D=District Hospital, P = Peripheral Units, C = Central Dispensaries and Maternal homes.

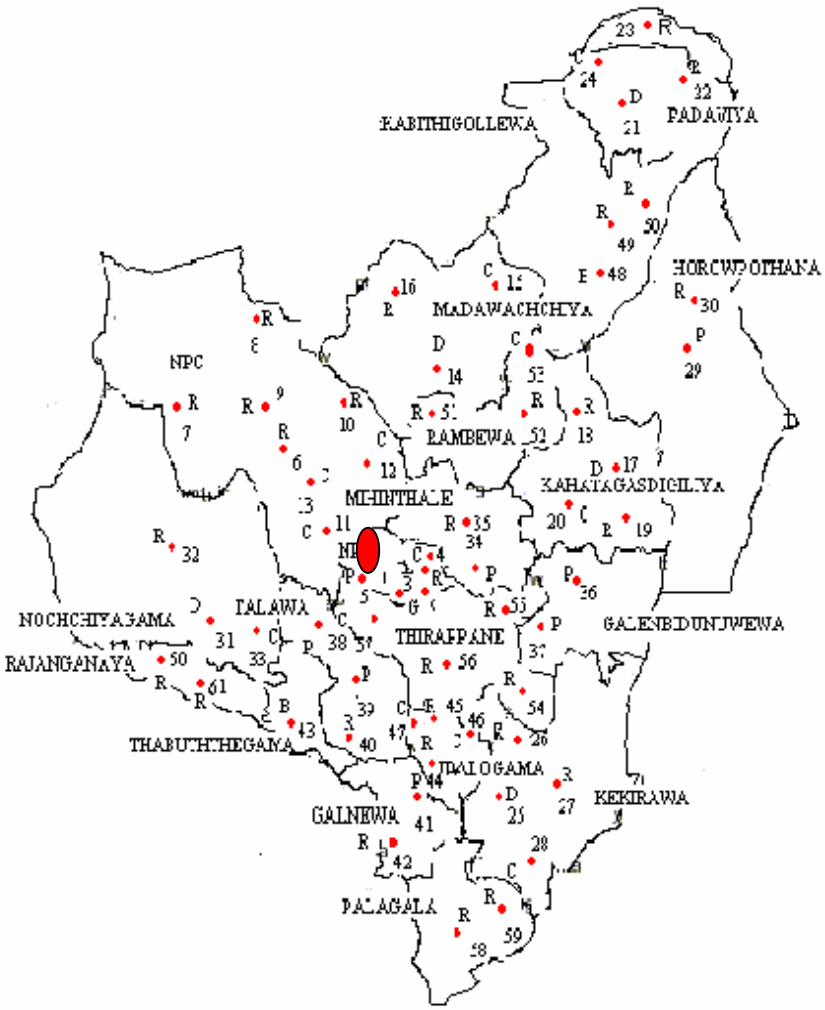

Figure 4B: Location of Hospitals in Anuradhapura District – North Central Province. ((Secondary Referral Hospital – Anuradhapura – is marked as ⬮

Annual Admissions:

In 2005, the median number of annual admissions (due to all medical conditions) to these 40 hospitals was 3600 (IQR 760 to 9000, range (250 to 13 000). Only 17.5% (07) hospitals have more than 6000 admissions per year. (Figure 05)

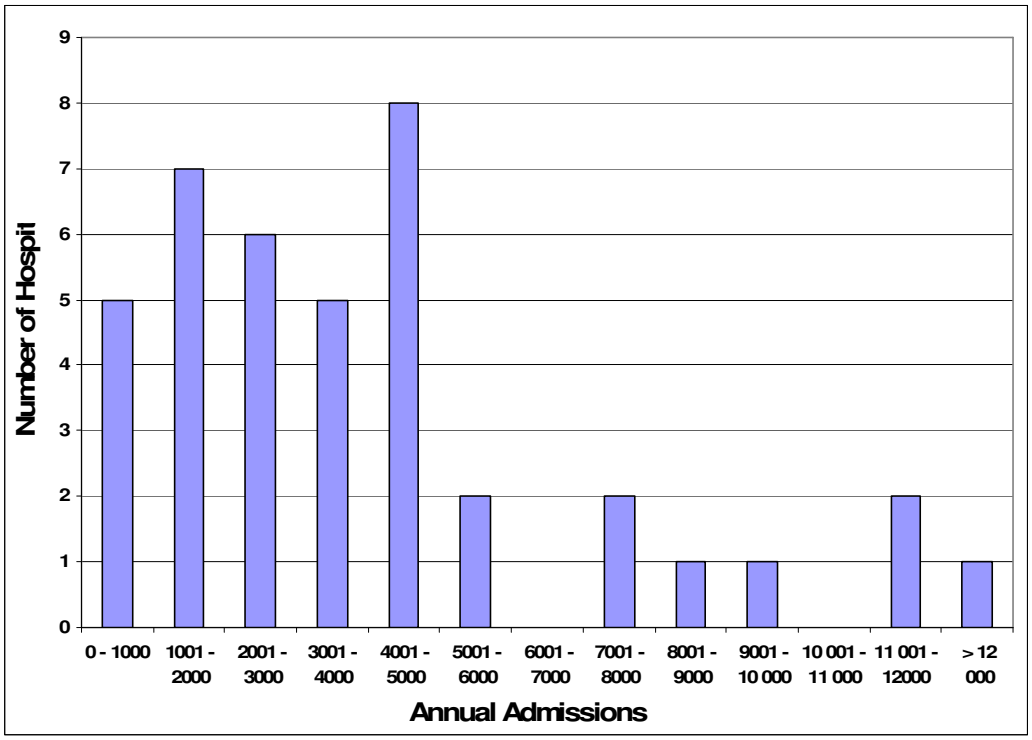

Figure 05 - Number of Admissions in the Peripheral Hospitals of North Central Province

Dividing by the number of beds, we also calculated the annual admissions per bed – (Number of Annual Admissions / Number of beds) (Table 1). There is no statistically significant association between the bed occupancy and number of poisoned patient admissions according to linear regression analysis which has regression coefficient 0.23 which is not significant.

Hospital	Annual Admissions per bed	Annual No of Admissions (All causes)	Poisoning admissions for 6 months
Thantrimale	15	760	7
Rathmalgahawewa	29	700	4
Parasangaswewa	43	1700	5
Pairamaduwa	47	700	7
Bakamoona	48	3800	27
Negampaha	50	1000	6
Mihinthale	52	3760	27
Galamuna	53	2000	17
Kalawewa	63	2500	20
Rajanganaya Tr 11	63	2000	16
Nelubewa	67	2350	27
Galkiriyagama	68	2600	18
Hingurakgoda	75	10 000	77
Thalawa	76	5000	35
Huruluwewa	79	4360	35
Galenbindunuwewa,	80	6000	26
Rajanganaya Tr 05	80	4012	26
Attanakadawala	81	3250	35
Horowpothana	81	4883	15
Kekirawa	90	7350	39
Thambuththegama	92	12 000	88
Kahatagasdigiliya	93	7900	37
Diyabeduma	94	1500	8
Mahawilachchiya	96	2500	10
Galnewa	97	6000	19
Habarana	100	3000	30
Medirigiriya,	103	12 000	54
Maradankadawala	103	3500	12
Andiyagala	106	3700	8
Jayanthipura	111	2000	8
Senapura	114	4100	28
Katiyawa	125	1500	9
Medawachchiya	127	2500	72
Eppawala	131	4600	44
Rambewa	135	4335	20
Thammennawa	142	2700	11

Nochchiyagama	148	13 000	130
Elayapaththuwa	150	1200	4
Kebithigollewa	173	4500	8

Table 1: Number of Admissions, Admissions per Bed and Poisoning Admissions in the Peripheral Hospitals of the North Central Province, Sri Lanka

Availability of Medication:

15 drugs including antidotes, other preparations and intravenous fluids were considered to assess the drug availability. Atropine and Intravenous solutions like normal saline and dextrose were available in all Peripheral hospitals. Most of the Peripheral hospitals had at least one other antidote, most commonly Fullers earth, activated charcoal and pralidoxime. None of these hospitals had methionine (paracetamol poisoning) or methylene blue (Propanil pesticide poisoning) which are antidotes for common poisons ingested in the area (Table 2). A relationship was not seen between the availability and the price for initial treatment course of particular drug. Comparatively expensive drugs like pralidoxime are available in many hospitals while cheaper drugs like methionine are not.

Drug	Hospitals Available (%)	Price per standard initial Treatments (Sri Lankan Rupees)*
Activated Charcoal	18 (45)	282
Fullers Earth	20 (50)	317
Atropine Sulphate	40 (100)	61
Pralidoxime	22 (55)	364
Diazepam (Intravenous)	38 (95)	11
Methylene Blue**	0	-
$NaHCO_3$ (Intravenous)	0	25 (50 mg amp 8.4%)
Normal Saline	40 (100)	16
Dextrose (Intravenous)	40 (100)	22
Adrenalin	36 (90)	11
Methionine	0 (0)	336
N-acetylcysteine	0 (0)	6395
Ethanol 40% (Intravenous)	0 (0)	3148

Table 2: Availability (& price) of Antidotes and Medications in the Peripheral Hospitals of the North Central Province

*** 100 Sri Lankan Rupees = 1 US $**

**** Price Not included in the government estimate list**

Availability of Equipment:

For equipment 11 items which are useful in monitoring or treating poisoned patients were considered. All 40 hospitals had some basic items like blood pressure Apparatus and Intravenous cannula, while some of had equipment for airway management and intubation. However, none of the hospitals had mechanical ventilators. 29 of the 40 hospitals had ECG machines, but only 8 hospitals had a functioning machine. In the other 21 hospitals either the machine was broken or there were no papers or gel. (Table 3)

Equipment	Number (%) of hospitals
BP apparatus	40 (100)
IV Cannula	40 (100)
NG tubes	31 (78)
Air Ways	31 (78)
ET Tubes	28 (70)
Ambu Bags	40 (100)
Laryngoscope	32 (80)
Ventilator	0
Sucker	38 (95)
Oxygen with Flow meter	39 (98)
ECG Recorder	29 (73)
ECG Recorder (working order)	8 (20)
Cardiac Monitor	2 (5)

Table 3: Availability of Equipment in the Peripheral Hospitals of the North Central Province

Laboratory Investigations:

Peripheral hospitals in this province have few laboratory facilities. There are Medical Laboratory Technicians (MLT) in only 3 hospitals. The other hospitals do not perform any laboratory investigations for poisoning patients. There are facilities to measure blood glucose level using a glucometer and strips, but these are not routinely used for poisoning admissions.

Even the hospitals with medical laboratory technicians only have facilities to conduct three basic investigations of little relevance to most poisonings (Urine Full Report, Full Blood Count, and Blood Glucose Level).

Staff Details:

During the study, details about the number of medical, nursing and other staff who have participatory responsibility with managing poisoning patients were collected. There were MBBS qualified Medical Officers (MO) in only 33 hospitals.

The other 7 hospitals had Registered Medical officers (RMO) (who have done a diploma course not a degree programme - a. comparatively short training to allow them to prescribe for some very common conditions). There were nursing officers in only 28 Peripheral hospitals in this province. In other hospitals, there were usually attendants (Table 04). According to the results, nurses were working with MOs in 25 hospitals and working with RMOs in three hospitals

Number of Staff in each category	Number(%) of hospital with number of each staff				
	MOs	RMOs	Nurses	Attendants	Labourers
None	7 (17.5)	10 (25)	12 (30)	2 (5)	0 (0)
1	17 (42.5)	23 (57.5)	2 (5)	2 (5)	6 (15)
2-3	10 (25)	6 (15)	2 (5)	2 (5)	16 (40)
4-5	3 (7)	1 (2.5)	8 (20)	10 (25)	6 (15)
6-8	1 (2.5)	0	6 (15)	15 (37.5)	7 (17.5)
9-12	1 (2.5)	0	4 (10)	6 (15)	4 (10)
More than 12	1* (2.5)	0	6** (15)	3*** (7.5)	1 (2.5)

Table 04: Number of staff in Peripheral Hospitals – under each category.

* Highest is 17 in one hospital ** Highest is 23 Nurses in one hospital

*** Highest is 23 in one hospital

Attendants in Peripheral hospitals have a participatory role in the treatments of poisoned patients. In the hospitals where there are no nurses, attendants help with nursing duties. There are 5 hospitals only with RMOs and attendants. All hospitals have labourers, at least 1 per hospital. Although they usually have no direct interaction with patients, sanitary labourers play a supportive role in patient treatment when there are insufficient other staff.

Considering other staff, all hospitals have midwives. Only 3 hospitals have pharmacists and 38 hospitals have dispensers. Although there are ECG machines in 29 hospitals, none has an ECG technician.

Patient details:

There were 1025 poisoning patients admitted to these 40 Peripheral hospital in North Central Province during the six month period – July 2005 to December 2005. The age ranged from 1 to 84 years with a median of 23 (IQR 18 –34). After excluding the patients below 11 years (n= 60) the median age was 24 (IQR 18 –35).

There were 516 (50.3%) females and 509 (49.7%) male patients admitted during study period. The age distribution was different in males and females. The median age for females was 21 (IQR 17 – 28) while the median age for males was 28 (IQR 20 – 39) (Figure 06).

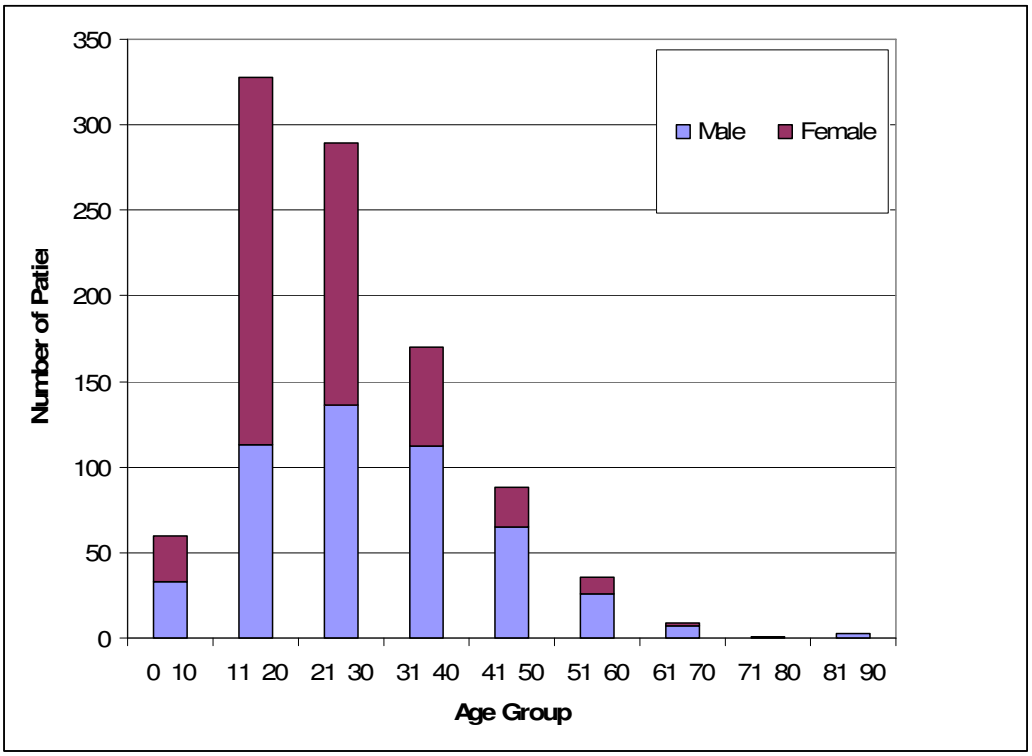

Figure 06: Age Distribution of Poisoned Patients According to Gender

From the 1025 admissions for Peripheral hospital, all patients except two below 11 years were admitted due to accidental poisoning. There were two young boys aged 9 and 10 years who ingested oleander to self harm. Plant substances, hydrocarbons like kerosene, household pesticides and medicinal products were responsible for most of the accidental poisoning.

The type of poison also varied according to gender. Occupational poisoning occurred in 33 patients who inhaled pesticide fumes while spraying at the field or home. 87.8% of occupational poisonings were in males. There is statistically significant difference ($P<0.05$) between the males and females who ingested organophosphate, oleander, MCPA, unknown/unspecified poison, medicinal products and hydrocarbons (Table 05).

Poison Type	**Male (%)**	**Female (%)**	**P value**
Occupational (spray) poisoning	29 (5.6)	4(0.7)	<0.0001
Oral ingestions:			
Organophosphate	112 (21.7)	45 (8.8)	<0.0001
Carbamate	28 (5.4)	22 (4.3)	0.41
Oleander	60 (11.6)	96 (18.9)	0.001
Glyphosate	26 (5)	20 (3.9)	0.40
MCPA	22 (4.2)	10 (2)	0.03
Paraquat	9 (1.7)	12 (2.4)	0.49
Other/Unknown Pesticide	88 (17)	77 (15.1)	0.40
Other/Unknown Poison/unspecified	65 (12.6)	91 (17.9)	0.03
Medicine	34 (6.6)	86 (16.9)	<0.0001
Hydrocarbon	36 (7)	53 (10.4)	0.05
Total Number	516 (100)	509 (100)	

Table 05: Poisons Ingested in Peripheral Hospitals Admissions According to Gender

The two main outcomes examined were the need to transfer patients, and survival. Only 4 patients died in Peripheral hospitals; 2 each in Habarana and 2 in Maradankadawala hospitals.

As there were a very low number of deaths in the Peripheral hospitals themselves, these patients were simply omitted from the analysis of transfers (it was not possible to confidently determine if these patients would have been transferred or not). Therefore the characteristics of those transferred to a secondary hospital and those discharged alive from rural hospital in the first analysis were compared.

After admission to rural hospital, 691(67.4%) patients were transferred to secondary care hospitals; there were 333 (48.2 %) females and 358 (51.8 %) males. Transfer numbers varied depending on the poison ingested. Higher percentage of paraquat, oleander and organophosphate ingested patients were transferred for secondary care – 90%, 86% and 77% (Figure 8).

Steps were taken to obtain data from secondary care hospitals on the outcome of all transferred patients. The researcher had access only to the health institutions in North Central province.

There were 18 patients who were clearly transferred to hospitals outside North Central

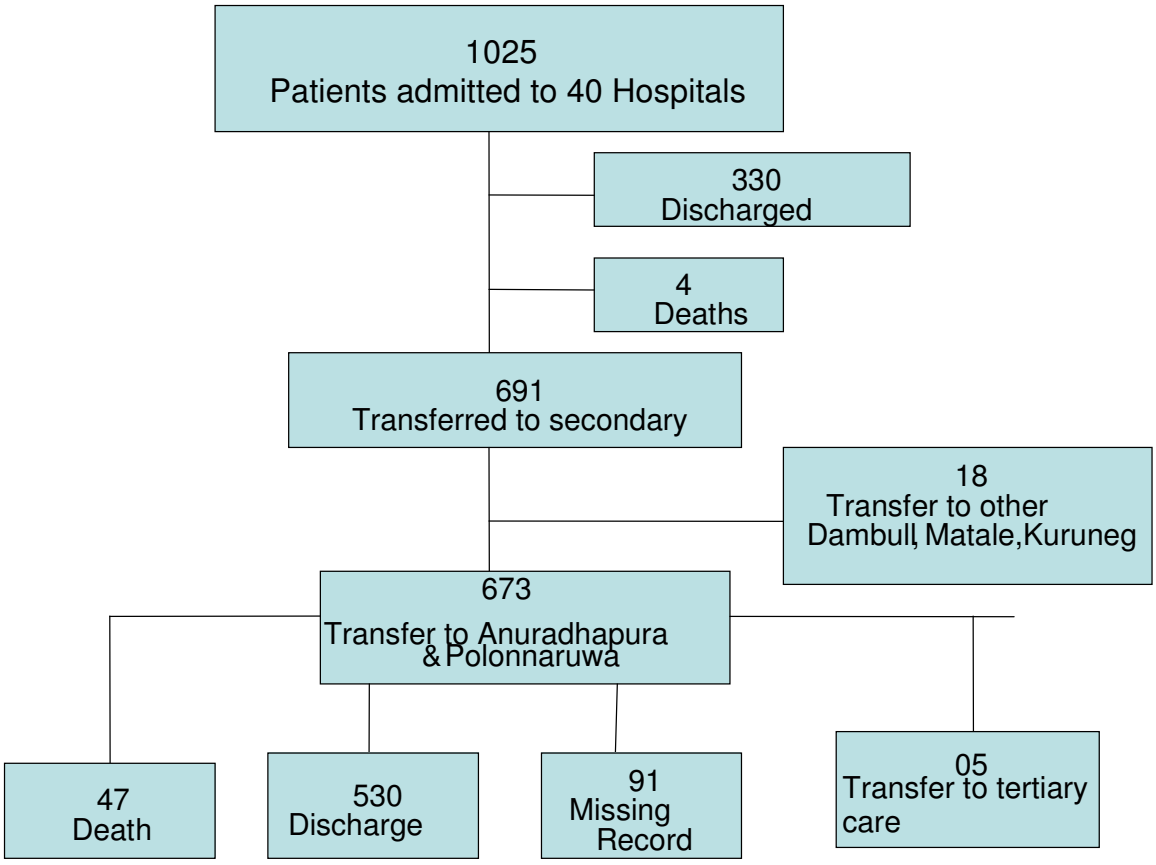

Figure 07: Flow chart of 1025 patients who were accounted for analyses.

The type of poisoning influenced the decision to transfer to secondary care hospitals. paraquat had the highest percentage of transfers (90%) followed by oleander (86%) carbamates (84%), organophosphates (77%) (Figure 8).

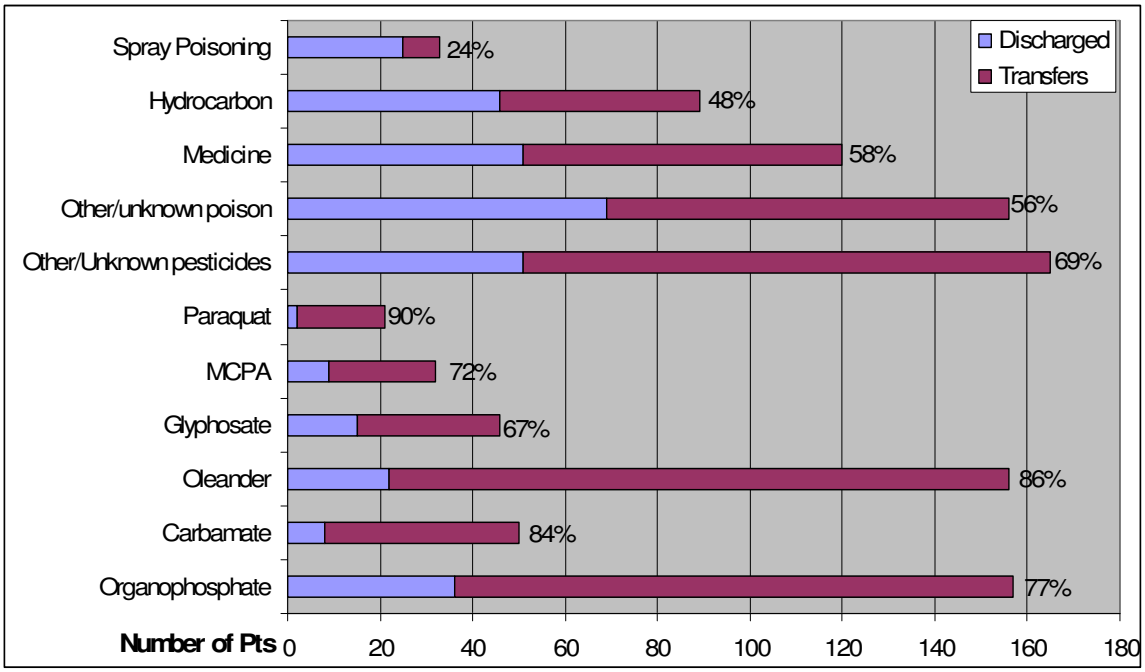

Figure 8: Transfers from Peripheral Hospitals to secondary Hospitals in North Central Province for Each Type of Poisoning.

The total annual admission due to all causes was divided by the number of doctors (medical officers or registered medical officers) to calculate a parameter called Doctor Workload (Total Annual Admissions/Number of Doctors). Similarly, we calculated the nursing workload and combined nursing staff and attendants work load. There were 5 hospitals which had no medical officers, nurses or attendants and these were excluded from this calculation (Table 6).

Hospital(s)	Doctor workload	Nursing workload	Nursing/Attendant Workload	Percent transferred (n)
Rathmalgahawewa	350	233	100	40.0 (2)
Parasangaswewa	1700	No Nurses	850	75.0 (3)
Pairamaduwa	700	No Nurses	175	85.7 (6)
Bakamoona	950	663	271	54.5 (18)
Negampaha	1000	No Nurses	167	33.3 (2)
Mihinthale	1253	289	188	57.7 (15)
Kalawewa	1250	500	192	41.1 (7)
Nelubewa*	2350	392	196	64.3 (18)
Galkiriyagama	1300	520	236	37.5 (6)
Hingurakgoda	1429	667	356	69.7 (46)
Thalawa	1667	455	263	75.0 (27)
Huruluwewa	2180	545	311	77.8 (28)
Galenbindunuwewa,	3000	1000	375	82.1 (23)
Attanakadawala ,	1083	3250	464	97.0 (33)
Kekirawa	1050	490	223	48.7 (19)
Thambuththegama	1091	522	300	25.0 (23)
Kahatagasdigiliya	1975	878	395	41.1 (14)
Diyabeduma	750	No Nurses	375	25.0 (2)
Mahawilachchiya*	2500	No Nurses	2500	88.9 (8)
Galnewa	2000	667	316	21.0 (4)
Habarana	1000	600	333	35.5 (11)
Medirigiriya,	706	750	307	90.2 (46)
Andiyagala	1850	No Nurses	925	87.5 (7)
Jayanthipura	1000	2000	333	80.0 (8)
Senapura	2050	820	410	80.8 (21)
Katiyawa	750	No Nurses	750	60. (6)
Medawachchiya	1800	692	391	54.4 (37)
Eppawala	920	575	307	77.8 (35)
Rambewa	2168	104	361	85.0 (17)
Thammennawa*	2700	No Nurses	675	77.8 (7)
Nochchiyagama	2600	1300	619	95.0 (116)
Kebithigollewa	1125	1125	563	50 (3)
Horowpothana	1628	610	359	58.8 (10)
Rajanganaya Tr 05	4012	802	365	32.0 (8)
Maradankadawala*	1750	700	389	57.1 (8)

Table 6: Workload per Each Staff Category and Number of Transferred Poisoned Patients (* hospitals only with RMOs.)

Two x-y plots were created Doctor Work Load (number of patients for a doctor per year) Vs percentage of transferred poisoned patients during the study period. While plotting data for Doctors Workload, one outlier (one hospital) was removed from data. There is a statistically significant correlation between the doctor work load and percentage of transferred poisoned patients (Figure 9A).

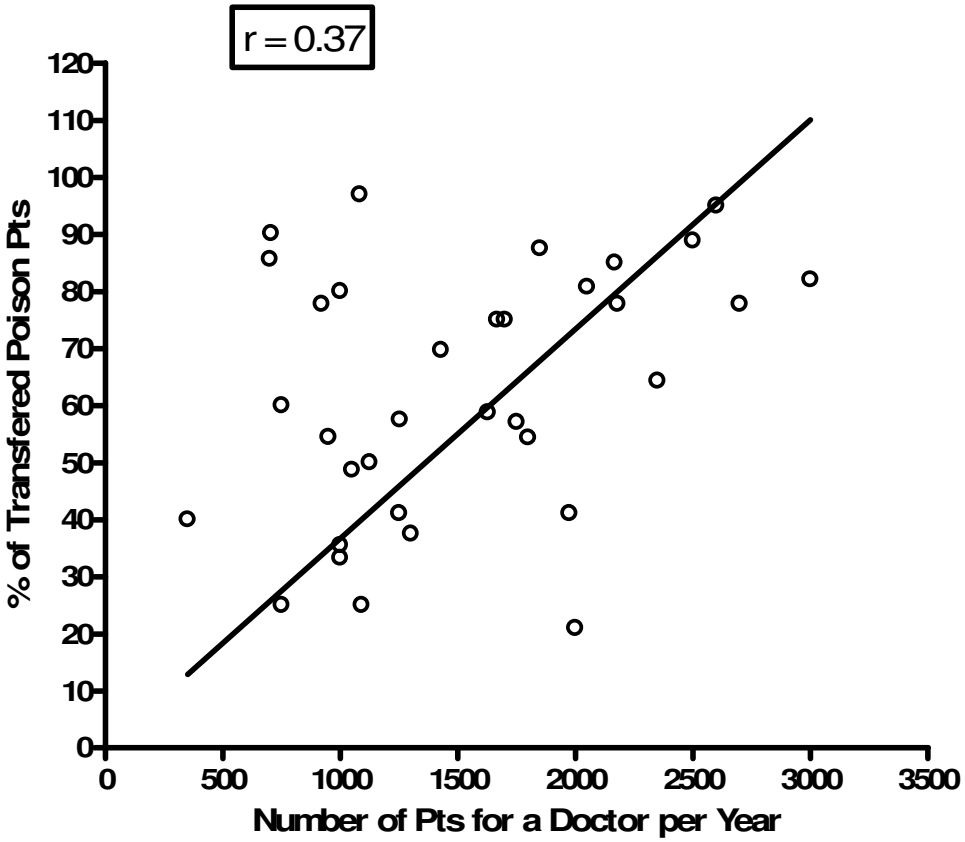

Figure 9A: Doctor Workload Vs percentage of transferred poisoned patients

The work load for nurses and attendants were also used to generate XY plot. One hospital was excluded from analysis as it was an outlier. According to the linear regression analysis, there is a statistically significant correlation between the Nurses/Attendants workload and transfer rate of poisoned patients. The r value is 0.36 with P value less than 0.05 (Figure 9B)

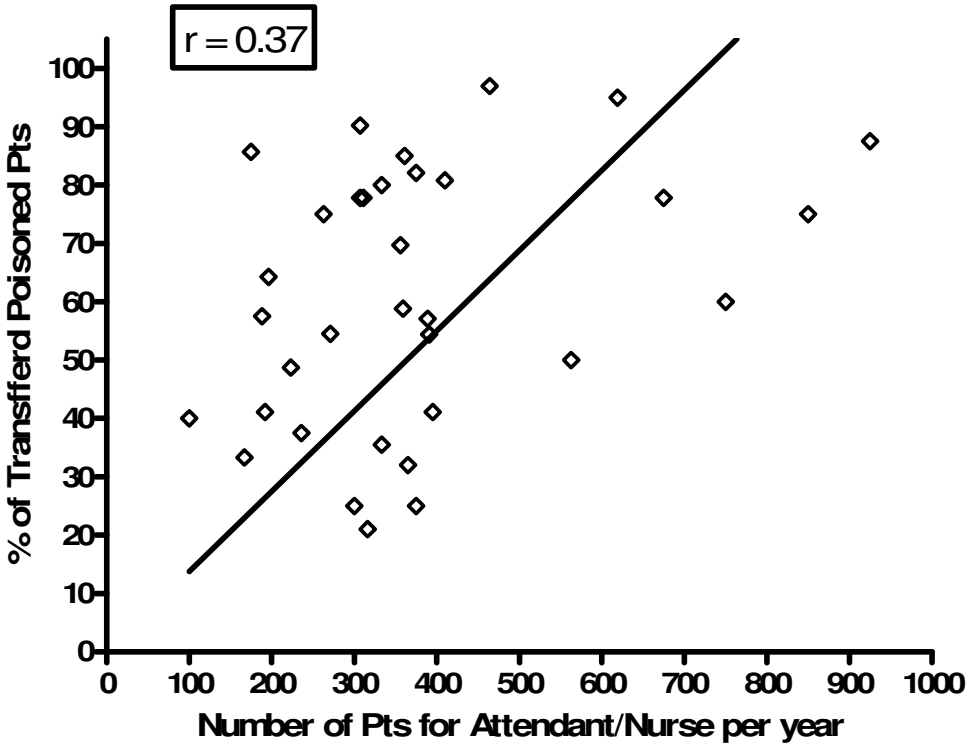

Figure 9B: Number of patients (for all causes) for a attendant/nurse per year Vs percentage of transferred poisoned patients

Treatment protocols:

Recording of patients initial examinations were limited to only few parameters; most commonly this was recorded for conscious level, pulse and blood pressure (83.2%, 55.2% and 65.1% respectively). Lung examinations and respiratory rates were recorded in only 9.5% and 8.5% BHTs. 51.5% and 53.7% percentages of OP and carbamate patient's records have their pupil sizes recorded. (Table 7)

During the interviews, higher percentage of doctors selected to examine blood pressure, pulse rate, and pupils (for OP patients). Although the pattern was similar to f patient records, percentages were higher in interview results.

None of the medical officers mentioned using Glasgow Coma Score (GCS) or measuring body temperature for poisoned patients and we did not find records with those parameters.

Examination measure	Percentage of Pt Records with Measure	Percentage according to the doctor's questionnaire
Pulse Rate	55	79
Respiratory Rate	9	11
Blood Pressure	65	80
Level of Consciousness	83	-
Pupils - OP - Carbamate - Other poison	 52 54 13	 83 - -
Lungs	10	18
GCS	0	0
Temperature	0	0

Table 07: Recorded Initial Examinations for Poisoned Patients in Peripheral hospital

All patients admitted to Peripheral hospitals receive initial treatments. But the levels of initial treatments were not same. After excluding patients who had contraindications (hydrocarbon, Paraquat, acid/alkaline, spray poisoning) 68% of poisoned patients were given either gastric lavage or forced emesis. More frequent (72%) IV line insertion, IV fluids (69%) and IV Dextrose (34%). But the percentage receiving activated charcoal or Fullers earth when it was indicated was low; 6% and 4% respectively. Atropine was given to only 73.3 % of organophosphate poisonings while 63% of Carbamate poisonings received it. Surprisingly And also 53.3% of patients who were not indicated for atropine was given at least a single dose. Monitoring of patients until they were discharged or transferred to secondary care hospitals was done in 38.2%. Other patient records did not refer to monitoring.

The results show that gastric decontamination, IV access and fluids, and antidotes like atropine are the first line treatments in peripheral units; selected to given by 83%, 91.5%, 81.2% and 72.4% doctors respectively. There was a less interest for activated charcoal and Fuller's earth.

Treatments Given	Patients receiving (%) – in records	Percentage of Patients received (%) – according to interview
Gastric decontamination*	67.5	83.0
Body Wash	12.6	56.4
Activated Charcoal**	5.5	38.0
Fullers Earth***	3.7	34.8
Intravenous line	72.1	91.5
Intravenous fluids	69.1	81.2
IV dextrose	33.6	32.2
Atropine****	51.3	72.4
Pralidoxime*****	7.5	30.4
Monitoring	38.2	
ECG	1.8	3.9

Table 08: Treatments/investigations done in Peripheral hospital and received percentage of patients.

* Except hydrocarbon, paraquat and spray poisoning

* Except Hydrocarbon, Paraquat and spray Poisoning

*** Paraquat Poisoning

**** Organophosphate, carbamate and oleander poisoning. (OP = 73.3% Carbamate = 63% Oleander = 25.2%)

*****Organophosphate, Carbamate (OP = 14 % Carbamate = 11.1 %)

Without equipment, laboratory and other facilities, conducting basic medical investigations was difficult. An ECG was taken for only for 20 (1.8%) patients. The full blood count, Urine full report and blood glucose tests were also done for a very small number of patients.

Multiple logistic regressions:

A logistic regression model was generated to find out the relation between hospitals resources, staff, and medication parameters and patient who were transferred.

From descriptive analysis association of the variables with the patients outcomes are analysed one variable at a time. However it is important to analyse the effect of these variables when present together. In addition it is also important to identify most significant factors that affect the outcome. Therefore to achieve these objectives, a logistic regression is fitted to the data.

According to the logistic model, type of poison ingested shows a significant relationship with transferring. With respect to a patients who ingested organophosphate; carbamate, oleander, paraquat and spray poisoned patients shows odds ratios 2.7 (95% CI 1.10 6.69), 5.1 (95% CI 2.82 9.25), 10.29 (95% CI 2.31 45.83) and 0.21 (95 % CI 07 0.67) respectively.

The initial treatments received from rural hospital were also showed a significant relationship with outcome, transferring. With respect to a patient who is not given IV access, a patient who is given IV access has 20 (19.92) times higher chance of being transferred. But the odds ratio for who receive intervenous fluids is lesser (0.15) comparing to non receivers (Table 09).

	Odds ratios of being transferred	**95% Confidence Interval**
Distance	0.97	0.96, 0.99
Examination parameter:		
Pupils recorded	6.45	2.1, 19.8
Consciousness recorded	6.54	1.1, 39.8
Monitoring vital signs	2.48	1.6, 3.8
Treatment Parameters (given)		
IV access	19.92	3.5, 112.5
Atropine	3.07	1.6, 5.8
IV fluids	0.15	0.03, 0.7
Hospital Resources availability		
Fullers Earth	5.3	2.9, 9.5
Nasogastric tubes	3.8	1.8, 8.1
Adrenalin	2.7	1.8, 2.3
Pralidoxime	3.69	2.1, 6.6
Dextrose	0.49	0.4, 0.7

Table 09: Significant parameters in the logistic regression model for hospital parameters and patient outcome.

Although the number of staff in each categories like medical officers, registered medical officers and nurses showed a relationship with patient outcome, it became non-significant with adjusted for interactions with other factors.

Qualitative Analysis Results:

The qualitative analysis involved the exploration of the attitude, issues and beliefs of treating poisoned patients revealed by the rural hospital medical officers. A number of themes and sub themes were revealed from the analysis. These themes can be used to explain some of the variations of patient treatment and outcomes observed in quantitative findings.

During the quantitative phase, it was found out that the treatment of poisoned patients was different between hospitals when there was no significant difference of resources. And also the larger hospitals with more staff and facilities transfer higher percentage of facilities than small hospitals. The reasons could not be explained using the quantitative data. The following themes, sub themes and extracts from interviews would help to understand the different attitudes of rural hospital doctors to patient treatment.

The complete analysis with the theme list is attached (Appendix D).

The attitude of doctors from rural areas related to ideas based on the following themes:

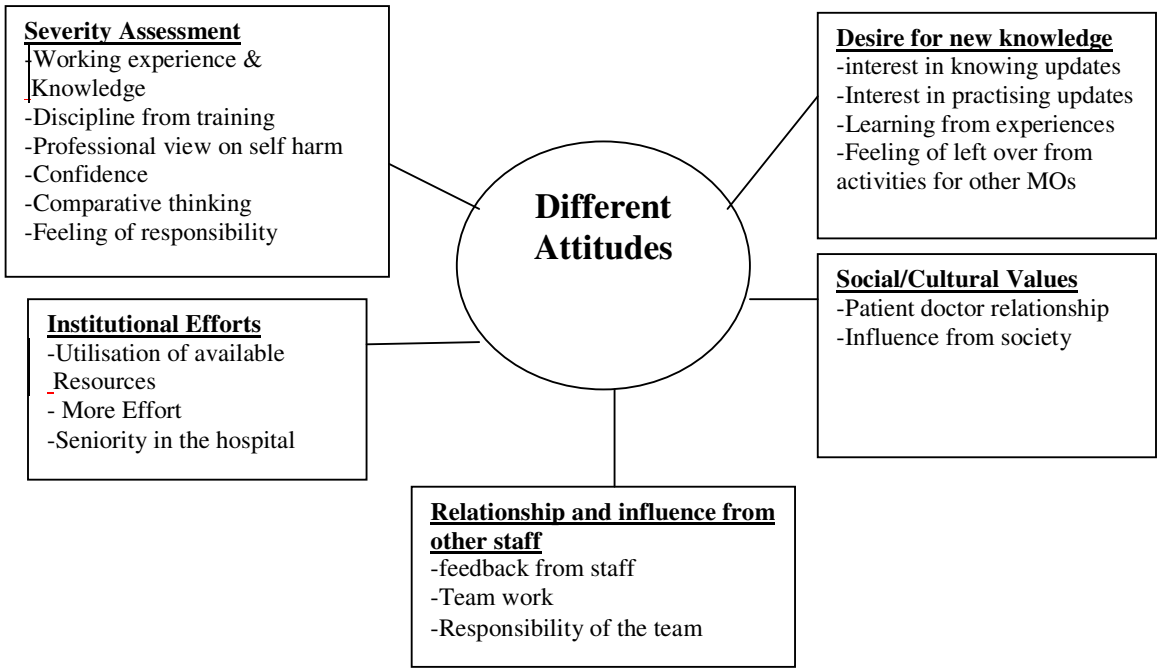

Figure 10A: Themes related to the attitude of medical staff (doctors) on poisoned patients

Different attitudes revealed during interviews by doctors in peripheral hospitals can be explained under five main categories.

Severity assessment was considered as important as it is the first patient physician contact. Further treatments and treatment decisions are based on this. The working experience and knowledge about the particular poison, feeling of responsibility and ability to consider self harm poisoning from a medical professional view can change the attitude in different ways.

Both themes, Institutional efforts and relationship with other staff, represent interconnected situations. It was mentioned in several interviews that in most of the hospitals, they have taken steps to make maximum use of limited resources. Few individual institutions have taken more efforts to maximize the usage.

Interactions between individual doctors was more prominent when consider the seniority. Visions of a senior colleague who is in-charge, limited the decision making capacity of junior doctors, hence a positive attitude towards poisoned patient treatments may be altered.

The feed back from other staff in the hospital was a factor that leads to a doctor to be encouraged or discouraged in a particular view. Positive feed back has felt to be important to have a good relationship with the staff and as effective team.

From the personal views, there are some cultural and social values. Some doctors explained that poisoned patients can be more productive to the society when cured compared to heart patients. The patient-doctor relationship was considered to be important and to influence attitudes.

Up to date knowledge about treatments for different poisoning substances is not readily available for peripheral hospital doctors. Their enthusiasm for new treatments is beneficial for poisoned patients. The education from outside sources is better than gaining experience as this takes time for junior doctors. The feeling of being forgotton is mostly due to isolation in one doctor postings and may have an impact on attitude.

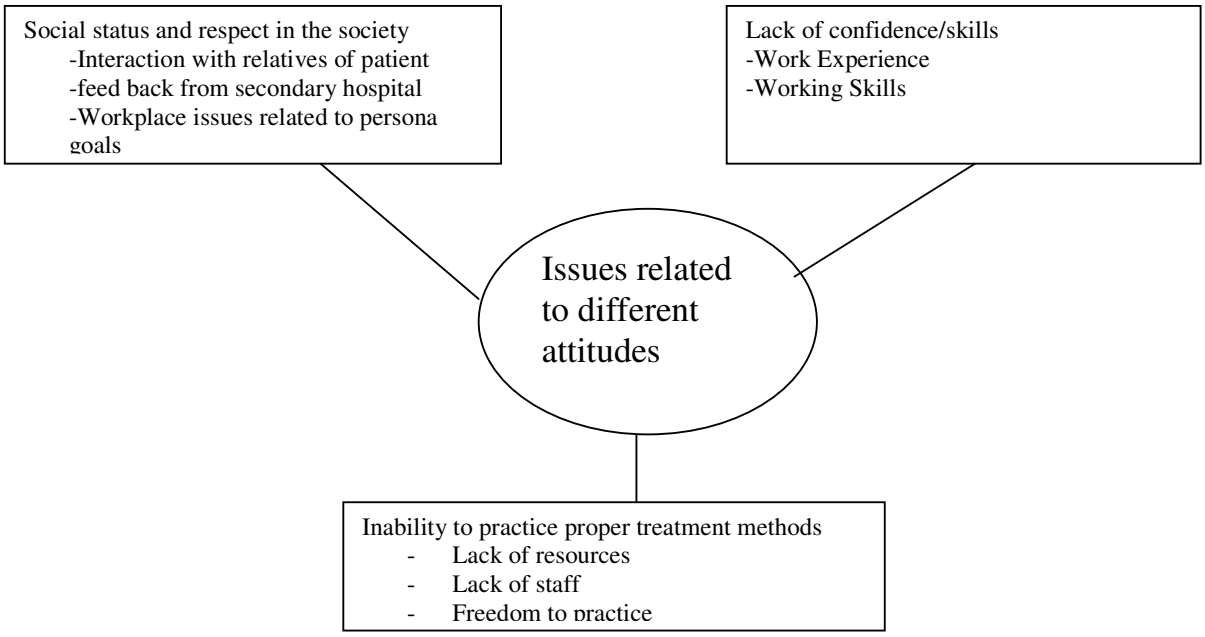

Figure 10B: Themes for issues related to different attitudes of peripheral hospital doctors in poisoned patient treatments.

The issues related to different attitudes were classified under three main themes and explained with sub themes.

The social status and respect as a physician was considered as important by all participants. These social statuses and the feeling about security can be disturbed by interacting with the relatives of poisoned patients, from the negative feedback from secondary care hospitals mainly after transferring patients and from the personal problems related to workplace. Under above circumstances, participated doctors explain their experiences and related those to different attitudes.

Inability to practice proper treatments can generate a discouraging environment which can lead to negative attitudes to poisoned patients treatment. Mainly the lack of resources, lack of adequate staff and not having freedom to do best practice were highlighted by the participants as issues.

When the peripheral hospital staff have no proper skills or confidence, the quality of treatments in those particular institutions may be altered. Considering doctors, it is more important and stressed by few doctors. They explained that the different

negative attitudes are often due to a lack of proper skills. Skills can be gained from experience. According to the few senior doctors who participated for interviews, primary care hospitals should not be a place to gain experience, it should be a place to apply experience and skills learnt from hospitals with more facilities.

Discussion

Central dispensaries (the smallest unit in Sri Lankan Health care institute network) in North Central Province do not deal with inpatients and have no role in poisoned patient management. Therefore those units were not considered for the study. In absence of resources (mainly staffs) some peripheral hospitals were converted to central dispensaries.

The condition of roads affects the transfer decision, as the transfer time becomes longer on poor roads. When the roads are not good, doctors may prefer to transfer moderately poisoned patients before there is any real indication for transfer. However, it was not possible to consider the road condition for analysis as it varies from time to time, depending on the environmental factors, in particularly the amount of rain.

The North Central Province has two districts, Anuradhapura and Polonnaruwa. As there are secondary referral hospitals in both districts, only 5% (2/40) of hospitals are further than 70 km from a secondary hospital. There is one hospital 112 Km away from Anuradhapura, but it had to be excluded from the study due to security issues resulting from conflict between LTTE terrorists and government troops. According to the preliminary data and previous studies,[8] the number of patients from all excluded hospitals is probably less than 10% percent. So the impact of exclusion on final conclusions may be minimal.

Bed capacity is one marker to suggest the hospital category. The numbers of building facilities are not considered for this study. In some hospitals, when there are more buildings, the bed capacity can be high, but not the other facilities. Hence the numbers of admissions are not high.

Annual Admissions

The total numbers of patients admitted due to all causes was considered (total annual admissions. These numbers are an estimate of the hospital workload. The number of available beds and annual admissions were combined to calculate annual admissions per bed, to estimate the bed occupancy of each hospital. When the bed occupancy was low, there were few poisoned patients admitted. When this number increased, for the majority of hospitals, the number of poisoned patients also increased. There was admission of an approximately similar percentage of poisoned patients to each hospital. There were a few exceptions and the reason may be the incomplete recording of poisoning admissions or reduced incidence of poisoning in the particular area. Those issues should be addressed in a separate study, with more specific data collection.

Only 9 hospitals had annual total admissions greater than 6000. This is consistent with the government categorization of hospitals. There were only a few District hospitals which were considered to have more facilities than hospitals in lower categories. There were more admissions to those hospitals. (Figure 09: flowchart to show hospital network). The annual admission details from this study are consistent with previous studies done on the same area.

Hospital Resources – Availability of medication and antidotes

In the Sri Lankan health system, all drugs and medical equipments are supplied to hospitals by a central body called Medical Supply Division (MSD) and Biomedical Engineering Unit (BES), based on hospital category.

Van Der Hoek et al's [15] study in North Central Province of Sri Lanka stated that there were no antidotes for poisoning in Peripheral hospital. But in our study, some antidotes were available in Peripheral hospitals. All the hospitals in this study had antidote (atropine) for the two most important poison types: anticholinesterase pesticides (organophosphorus and carbamates) and oleander. But other antidotes which could be easily used were not available in hospitals. For an example, activated charcoal, Fuller's earth was not available in 55% and 50% hospitals respectively.

Fullers earth is only an antidote for paraquat (to prevent absorption). 13(32.5%) hospitals had neither charcoal nor fullers earth. These hospitals were not capable of doing any decontamination for paraquat patients.

Activated charcoal is believed to be effective in reducing absorption of many poison types to the systemic circulation if given within one hour, except for hydrocarbons, acids/alkaline. As most poisoned patients are admitted to Peripheral hospitals within one hour of ingestion, reducing absorption can be possible. As Fullers earth and charcoal are most effective delivered early it is important that it should be available in primary care hospitals.

A considerable number of admissions due to pharmaceutical poisoning, especially paracetamol, were identified. But the antidotes for paracetamol poisoning, Methionine and N-acetylysteine were not available in peripheral healthcare centres. Methionine is cheaper than N-aetylcysteine and can be given to prevent further complications such as hepatotoxicity. Availability of antidotes in Peripheral hospitals may potentially reduce the transfer rate as the complications following the systemic toxicity can be reduced. But this effect could not be demonstrated in this study as none of the hospitals had methionine or acetylysteine.

Each hospital in Sri Lankan health system has an allocated annual budget for medication and equipment. Limited budgets may act as a barrier to maintain appropriate stocks of medication, especially antidotes. In this study I did not look at the annual budget limit and availability antidotes.

Hospital Resources – Availability of staff

The lack of staff may also have affected the availability of antidotes. When there are no pharmacists and adequate trained staff, maintaining proper stocks is not possible. The other reason may be the lack of up to date knowledge about treating poisoned patients. When the medical staff is not properly educated about benefits of particular antidotes, the interest on maintaining stocks may be low.

In this rural health system, “Doctor” can be a Medical Officer (MO) with a medical degree or a Registered Medical Officer (RMO) with a diploma. RMO service started few decades ago when there are not enough medical graduates to serve in government hospitals. At the present it is considered as an ending (dying) profession and the diploma program was stopped few years back. Although there is no formal policy decision, currently, most the RMOs are attached to Peripheral hospitals or central dispensaries. Therefore the number of RMOs is limited and hospitals run by them are considered to be less resourced centres. There were 5 hospitals out of 40 only with RMO and attendants.

During the data collection period March 2006 – September 2006, MOs were appointed to 2 hospitals that were previously administered by RMOs. Those changes were not considered for the analysis.

Paramedical professionals like pharmacists, medical laboratory technicians and ECG technicians are not appointed in the majority for these hospitals. Pharmacist duties are covered by one of the RMOs and dispensers. This may affect maintenance of proper stocks of antidotes and other medications. The unavailability of common and important antidotes like activated charcoal or Fuller’s earth may be result of shortage of pharmacists. Dispensers are trained only for dispensing purposes and medical officers or registered medical officers are burdened with patient work and hospital administration hence may be too busy to handle the drug store. Potential solutions include trained health care workers who could be appointed to avoid shortages of those emergency medications and antidotes which are useful in primary care setting. Secondly it may be useful to introduce a minimum antidote list to primary care hospitals. A minimum antidote list should consist of required antidotes for all common poison types to be available in primary care hospitals. The concept can be related to the World Health Organisations’ Essential Drug List, which was implemented successfully to make sure the availability of essential medicine.

Hospital Resources – Equipments and resuscitation facilities

Although there are BP apparatus and IV cannula available in all hospitals, there is no other basic equipment to use in medical emergency. Air way protection and safe gastric decontamination are important procedures for poisoned patient treatments in these primary care centres. But the nasogastric tubes (NG tubes), endotracheal tubes (ET tubes) and laryngoscopes are not available in 22.5%, 30% and 20% centres respectively. 32 out of 40 hospitals have laryngoscopes which are required to insert ET tubes, but only 28/40 had stock of ET tubes. This may be due to lack of maintaining proper stocks; ET tubes are consumable, disposable items with an expiry date. It is learnt during the data collection that, many hospitals have expired ET tubes. Details about those items were not recorded.

Although there were electrocardiogram (ECG) machines in 29 hospitals, only 8 machines were in working order. The reasons for not working were given as lack of accessories like printing paper and gel both of which are comparative cheap. 2 hospitals with only RMOs (without MO) have stopped using ECG machines due to lack of training to use the machine. It seems that the levels of hospitals resources were not considered when giving away these machines.

Hospital Resources – Laboratory facilities

None of the Peripheral hospitals had a proper laboratory. In the hospitals where there were medical laboratory technicians, there were no specific facilities to conduct the laboratory investigations. Therefore only urinary full reports, full blood counts and blood glucose could be measured in those hospitals while the rest of the hospitals did not have any laboratory investigations done. However none of these services were available after normal working hours (8 am to 5 pm). Therefore the potential benefit of facilities was minimal as personal communication with peripheral hospitals doctors revealed that most of the poisoning admissions during late afternoon and evening.

Patient details

There is a significant difference in age distribution according to the gender. Between 11 and 30 years, there are more female patients while the male patient number is higher for 30 and above age group. These results are similar to the previous studies done in the same province using secondary hospital data[20]

The types of poison were in a large range and similar types of poison and pesticides were combined to make 11 categories. organophosphates, carbamate, MCPA, glyphosate and paraquat were considered as single pesticides. Although there were only 21 paraquat patients, it was considered as a single agent due to the high toxicity. Unspecified poison types were added to other/Unknown poison category. Some of the patient records had mentioned the poison type as weedicide or insecticide without the pesticide group. These patients were also added to other/unknown pesticide category. This broad categorization may not effect the final patient outcome evaluation as pesticide poisoning patients are initially treated in similar ways if the exact pesticide is not specified.

The number of female patients who ingested Oleander, medicinal products and hydrocarbon was higher than male patients. Pesticide was the common method for men. These results were similar to secondary hospital data from the same province except for hydrocarbon[20]. The number of male patients with hydrocarbon was high from primary hospital data. Higher percentage of hydrocarbon ingested patients was discharged from Peripheral hospitals and it may be the reason for the difference.

Pesticide ingested patients were more likely to transfer for secondary care with and paraquat was in top with 90% transfer rate. And also patients with oleander poisoning were also transferred in higher numbers. There is no known specific treatment for paraquat poisoning except reducing absorption hence it is associated with high mortality rate. It may be the reason for transferring almost all paraquat patients.

Patients with oleander poisoning develop cardiac arrhythmias which should be treated with temporary cardiac pacing which is not available even in secondary hospitals[5].

Therefore higher percentage of oleander patients was transferred to secondary hospital even before they developed toxic symptoms. Patients who developed cardiac dysrhythmias were transferred to tertiary care hospitals from secondary care hospitals. If available, ECG could be used as a screening test to identify symptomatic patients to reduce un-necessary transfers.

Patient records in these Peripheral hospitals were in a poor state. For this study, patient's Bed Head Tickets (BHTs) which was only individual patient record in these hospitals were used and most of the BHTs were not completed and lacked some potentially useful information. This suggests either poor record keeping or a limited assessment and treatment.

Treatment protocols

Data on 8 examination parameters was collected from patient records. All the examination procedures were simple and could be performed in all facilities. Most hospitals have no documentation related to airway protection. Level of consciousness, Blood Pressure and Pulse rate was recorded in 83.2%, 65.1% and 55.24% patient records respectively. Only 9.5% and 8.5% records could be found with lung examination and respiratory rate. This appeared to be a systematic deficit as it was recorded poorly in organophosphate patients, for whom the lungs and respiratory examinations are indicated and guide treatment. In organophosphate poisoned patients respiratory rate was recorded in 10.9% patients and lung examinations also in 10.9%. Carbamate patients had a similar low recording of 9.25% for both respiratory rate and lung examinations. The low recording rates may be just poor record keeping or reflect limited understanding of the importance of these signs and the implications for prognosis and treatment.

There is significant gap between the treatment protocol assessment on the beliefs of what doctors believed, what they were practicing and the assessment of actual clinical practice. The poor recording habits may have effected the data collection about actual clinical practice.

The gap between the skills and planned treatments may be due to lack updated knowledge. It is also possible that those doctors who participated in the treatment protocol assessment were high performers and not representative of the group as whole.

Multiple logistic regression models were generated to find out the relation between hospitals resources, staff and medication and patients who were transferred. Initial examinations and initial treatments can be considered as “causes” of transfer. When examinations are done on admission, the possibility of identifying symptomatic patients is high. Therefore the patients who had recorded pupil size and conscious levels have higher odds of transfer than patients who are without those examinations. Similarly the likelihood of receiving initial treatments depends on the symptoms. Symptomatic patients are more likely to receive examination than patients who appear well. Symptomatic patients receive antidotes and other treatments more than less symptomatic patients. Patients who had an intravenous line inserted, received atropine, and received intravenous fluids. Patient received only intravenous fluids are less likely to be transferred than other patients. Patients who show less toxic symptoms may be observed and monitored in the rural hospital rather than transferring to secondary care.

The hospital resources can be used as a marker to show the level of patient care hence affecting the transfer rates. Availability of ambu-ventilation facilities and NG tubes may have an indirect affect on the air way protection and safe gastric decontamination. Although hospital doctors do not keep patients giving Ambu-ventilation, the availability of it as an option for emergency may delay the transferring.

Availability of NG tubes may be useful in giving safe gastric decontamination. On the other hand, hospitals having NG tubes may be having more staff and other facilities which can influence the transfer decision.

Antidotes and other medications have significant affect on transferring. Fuller's earth, diazepam IV, adrenaline, pralidoxime and IV dextrose show a significant relationship with transfer rates. When the doctors and other staff pay more attention to the patient treatment, there may be appropriate stocks. This was mentioned by few doctors during the qualitative interviews (See the theme- utilization of hospital resources in qualitative results). It might be the reason for these markers to be significantly effective in transferring although a clear direct relationship is not visible.
None of the hospital staff except sanitary labourers showed significant affect for transferring poisoned patients to primary care. Although the number of medical officers and nurses showed an effect when considered alone, after adjusting with other factors they do not show a significant effect.

During the qualitative phase about attitudes of treating poisoned patients, 15 interviews were completed. The participants were volunteer doctors and many of them expressed there personal views and experiences regarding treating poisoning patients. Talseth et al[17] explains the experiences of doctors when treating patients with suicidal thoughts. But majority of Sri Lankan patients do not have a real intention of dying and high percentages of cases not early planned [21]. Therefore participants paid little attention from psychiatric point of view. The responses from participants were mainly about how they clinically manage the patients and themes were revealed to understand different attitudes related to different behaviours during the process and issues relating to differences.

Based of the principles of qualitative research methods, the participated doctors may be representing the group whom pay more attention not only to the assigned duty but also to the environment which always create influences. But during the 15 interviews, repetition of same ideas and views (saturation) were observed. It may be due to inclusion of participants from relatively small area with similar characteristics. It is necessary to conduct a qualitative research in a wider area of the country to see whether there are different views on treating poisoned patients in primary care hospitals

Conclusions:

This study looked at 40 hospitals and 1025 poisoned patient admissions. Very few patients died in peripheral hospitals and a large percentage of patients were transferred (67%). The large percentage of transfer was associated with more symptomatic poisoning.

The poisons which females ingested were less toxic and easily available in household or nearby. Men more frequently used pesticides which are comparatively more toxic.

Gender was not a factor in transfer rates. 51.8 % and 48.2% percentages of males and female transferred.

The Type of poison influenced the transfer rate. Patients who ingested paraquat, oleander and organophosphorous compounds were more likely to be sent to secondary hospitals. The available knowledge about toxicity influenced the transfer decision.

Antidote availability was not appropriate except atropine that was used to treat mainly organophosphates and carbamates and oleander. Other antidotes for many poison types were not available. In absence of pharmacists, maintaining appropriate stocks of antidotes may not be a priority.

During the interviews about treating specific poison types, the percentage of participants who mentioned about administering particular antidote was small. There is a national guideline for poisoned patient treatments, which was available in all 40 hospitals. But there is a clear question, whether the hospitals medical staff uses it appropriately? There was a mismatch between both recommendations from gold standard text and doctors' practice when compared with recorded practice from patient notes.

When there were no other medications like adrenaline, IV fluids and dextrose, the transfer rate is high. And also the unavailability of nasogastric tube also had a significant effect on transferring. In clinical situation, it does not mean that nasogastric tube alone effect to the transfer rate. But the unavailability of one instrument or equipment affects the total procedure and the patient outcome.

Unavailability of equipments like ECG machines can increase the number of transfers. The experience from North Central Province of rural Sri Lanka, suggests that there is no benefit of distributing equipments without proper training on staff and without ongoing maintaining procedures.

There were seven hospitals out of 40 without Medical Officers. Although Registered Medical Officers are working in these hospitals, there was no significance difference in transfer number. When there are no appropriate antidotes, resources to further treatments, resuscitation facilities and monitoring facilities, the treatment options are limited even for qualified medical officers.

The transfer decisions were based on many factors not a single one. And also most of the factors were inter-connected. Availability of medications and laboratory facilities directly depend on the availability of staff categories like pharmacists/and Medical Officers.

The initial examinations for poisoned patients are limited to recording conscious level, blood pressure, pulse rate and pupils for organophosphate compounds and carbamates. Measuring respiratory rate, Lung investigations were done on very low percentage of patients (9.5%). Lack of practicing these simple examining procedures which do not require special equipments, concluded that the training of medical and nursing staff on updated poisoned patient treatment method is required.

The treatments provided by Peripheral hospitals for poisoned patients are limited to basic treatments such as inserting IV line, Administering IV fluids, gastric decontamination and administering Atropine for organophosphate compounds and carbamates.

Other basic treatments like activated charcoal, Fuller's earth for paraquat and pralidoxim for organophosphates which could be practiced were not done frequently. Same as the lack of above antidotes, the early transferring of more patients can also be a reason for this situation.

The calculated workload for three main categories of staff (doctors, Nurses, attendants) which affect poisoned patient treatments shows that the less number of doctors and nurses/attendants result higher transfer percentage.

This association was significant. And also the number of nurses and attendants showed same. Higher the number of staff, the workload for individual becomes less and it reduces the transfer rates by cutting down unnecessary transfers.

The qualitative findings reveal that most of the peripheral hospital doctors are under stress due to the influence of patient relatives. This situation effects the attitude and treatment decisions.

The lack of communication about updated treatments and knowledge, lack of feed back from secondary care hospitals and central administrative bodies regarding poisoned patient treatments generate a feeling of professionally isolated in peripheral hospitals doctors. It affects the attitude negatively.

During the qualitative interviews, doctors from peripheral hospitals expressed their views and beliefs about treating self harm patients in there hospitals. According to the themes from qualitative analysis, lack of resources, poor relationship with community, lack of updated knowledge, inability to perform as a team, less confidence or lack of skills and absence of proper feed back from referral hospitals affect the attitude of a primary care doctor poisoned patient treatments.

Solutions and recommendations:

The lack of antidotes in peripheral hospitals is a problem. Introducing a minimum list of antidotes to be stored in a peripheral hospital would be useful to overcome this issue.

Continuous educational interventions about treatment guidelines and updates about different treatments for different poison types will be helpful in enhancing the quality of treatments.

And also, it is an important task to evaluate the usage of current guidelines and make necessary updates to make it more useful.

Unavailability of one instrument or equipment may affect the total procedure. Therefore it is important to make emergency medical kits, which should be available as one unit.

According to the results, none of the primary hospital has good laboratory service. With the facility to measure vital signs resulted from poisoning, the number of un-necessary transfers can be reduced. As the transport costs more than half of the cost for treating poisoning patients, it would be economical and convenient to introduce user friendly test kits to peripheral hospitals. (Unpublished data – Institute of Policy Studies- Estimating cost for treating poisoning patients in Sri Lanka)

The experience from North Central Province of rural Sri Lanka, suggests that there is no benefit of distributing instruments without proper training on staff and without ongoing maintaining procedures. A guideline about distributing medical instruments to primary care hospitals should be introduced. And also a procedure to assure a continuous supply of spare parts and other accessories should also be implemented.

There should be programs to enhance the relationship and understanding between primary care hospital staff and the community. More community participation for hospital activities and more community based activities from health authorities would be helpful.

Primary care doctors should be encouraged on a bilateral communication with secondary referral hospitals. Active participation from central administrative bodies would be a help in this task.

Primary care doctors who work as institutional heads should be trained or educated about modern human resource management concepts. It would be helpful for all hospital workers perform as a team.

Reference:

1. Van der Hoek, W., and Flemming Konradsen, *Analysis of 8000 hospital admissions for acute poisoning in rural area of Sri Lanka.* Journal of Toxicology: Clinical Toxicology, 2006. **44**(3).

2. D Gunnell, D.H.a.V.M., *Medical Management of deliberate drug overdose: A Neglected area for suicide prevention?* Emergency Medicine Journal, 2004. **21**: p. 35-38.

3. Eddleston, M., *Paterns and peoblems of deliberate self-poisoning in the developing world.* Q J Medicine, 2000. **93**: p. 715-731.

4. Michael Eddleston, M.H.R.S.a.K.H., *Deliderate self harm in Sri Lanka: an overlokked tragedy in the developing world.* BMJ, 1998. **317**: p. 133-135.

5. M Eddleston, C.A.A., W P Meyer, G Perera, A M Kularathna, S Attapattu, M H R Sheriff and D A Warrel, *Epidemic of self-poisoning with seeds of the yellow oleander tree (Thevetia peruviana) in Nothern Sri Lanka.* Tropical Medicine and International Health, 1999. **4**(4): p. 266-273.

6. Michael Eddleston, L.K., Nick Buckley, Ravindra Fernando, Gerard Hutchinson, Geoff Isbister, Flemming Konradsen, Douglas Murray, Juan CArlos, Nimal Senanayaka, Reavi Sheriff, Surjit Singh, S B Siwah, Lidwien Smit, *Pestiside Poisoning in developing world - a minimum pesticide list.* Lancet, 2002. **360**: p. 1163-67.

7. Darren Roberts, A.K., Nick A Buckley, Gamini Manuweera, M H Rezvi Sheriff & Michael Eddleston *Influence of pesticide regulation on acute poisoning deaths in Sri Lanka.* WHO Bulletine 2003. **81**(10).

8. Michael Eddleston, K.S., M Senthilkumaran, K Reginald, Lukshman Karalliedde, Lalith Senarathna, Dhammika de Silva, MH Rezvi Sheriff, Nick A Buckley & David Gunnell, *Patterns of hospital transfer for self-poisoned patients in rural Sri Lanka: implications for estimating the incidence of self-poisoning in the developing world.* WHO Bulletine, 2006. **84**(4): p. 257-336.

9. Toxicologists., A.A.o.C.T.a.E.A.o.P.C.a.C., *Position Statement: Single dose activated charcoal.* Journal of Toxicology: Clinical Toxicology, 1997b. **35**: p. 721-741.

10. Toxicologists., A.A.o.C.T.a.E.A.o.P.C.a.C., *Position Statement: Gastric Lavage.* Journal of Toxicology: Clinical Toxicology, 1997b. **35**: p. 711-719.

11. Jeyarathnam, J., *Acute Pesticide Poisoning: A Major Global Health Problem.* World Health Statistics Quarterly, 1990. **43**(3): p. 139-44.

12. Eddlestion, M., *Early Management after self-poisoning with an organophosphorus or carbamate pesticide - a treatment protocol for junior doctors.* Critical Care, 2004. **8**: p. 391 - 397.

13. Jose M Bertolote, A.F., Alexander Butchart, Nida Besbelli, *Suicide, Suicide attempts and pesticides: a major hidden public health problem.* Bull of World health Organisation, 2006. **84**(4).

14. W Van Der Hoek, F.K., K Athukorala and T Wanigasekara, *Pesticide Poisoning: A major Health Problem in Sri Lanka.* Social Science in Medicine, 1998. **46**(4-5): p. 495 - 504.

15. CH. Srinivas Rao, V.V., T Surender, Michael Eddleston and Nick A Buckley, *Pesticide Poisoning in South India: opportunities for prevention and improved medical management.* Tropical Medicine and International Health, 2005. **10**(6): p. 581-588.

16. Talseth, T.S.H.a.A.-G., *Dealing with suicidal patients - a challenging task: a qualitative study of young phsicians' experiences.* BMC Medical Education, 2006. **6** (44).

17. Eddlestion, M., *Patterns and problems of deliberate self-poisoning in the developing world.* Q J Med, 2000. **93**: p. 715-731.

18. Pope C, Z.S., *Qualitative Research in Health Care*. 2000: BMJ Books. 114-116.

19. Michael Eddleston, D.G., Ayanthi Karunarathna, Dhammika De Silva, M H Rezvy Sheriff and Nick A Buckley, *Epidemiology of intentional self-poisoning in rural Sri Lanka.* British Journal of Psychaitry, 2005. **187**: p. 583-584.

20. Eddleston, M., Ayanthi Karunaratne, Manjula Weerakoon, Subashini Kumarasinghe, Majula Rajapakshe, M.H. Rezvi Sheriff, Nick A. Buckley, and David Gunnell., *"Choice of poison for Intentional self-poisoning in Rural Sri Lanka.* Journal of Toxicology: Clinical Toxicology, 2006. **44**(3).

Appendix A: Hospital Data Collection Form

A cross-sectional study to identify variation between Sri Lankan rural hospitals in their treatment of acute poisoning patients:

Data collection from:

Section 01: Hospital Details

Hospital demographic data	Distance from referral centre
Hospital Code	Beds
Hospital Name	Serving population
Hospital Category	Annual Admissions
Availability of Ambulance	Availability of Telephone

Section 02: Staff

Number
Number of Mos
Number of RMOs
Nurses
Pharmacist
Dispenser
Attendant

Medical record Officer
Microscopic
MLT
Ambulance Drivers
Labourer
Sanitary labourer
Public Health Midwives
Public Health Field Officer

Section 03: Medication

Activated Charcoal =

Fullers Earth =

Atropine- small vial =

Atropine- big vial =

Pralidoxime =

IV diazepam =

Methylene Blue =

NaHCO3 =

IV fluids =

-N/S =

-Hartman =

-Dextrose =

Adrenaline =

Ethanol 40 % IV =

Methionine =

Section 04: Resuscitation facilities and Equipments

Sphygmanometer

IV cannula

NG tubes

Oral Airways

ET tubes

Intubation facilities

Ambu-Bags

Ambu-Ventilation

Larrhyngoscope

Ventilator

Sucker

Oxygen

ECG

ECG-Comment

Cardiac Monitor

Investigation -UFR

Investigation -FBC

Investigation-Electrolytes

Investigation -Liver function

Investigation – Blood glucose

Appendix B1: Standard case scenario sheet

Case Scenario

Please use the following case scenarios to answer the given questions. The answers should be based on the available facilities and practice in your hospital.

Case 01: Organophosphate Poisoning

A man, 56 years old present to your hospital 02 hour after ingesting 100 ml of Dimethoate (Organophosphate). He had taken alcohol before ingesting poison.

The initial examinations
Pulse 60 bpm, BP 100/60 mmHg, Pin point pupils, No fasciculations, lungs – rhonchi

Case 02: MCPA Poisoning:

A 44 years old male presented after ingesting unknown amount of "M-60" before 2 hours. He was under influence of alcohol.

- abnormal behaviour, confused, disoriented
- HR 80/min, BP 120/80 mmHg
- Cough +; mild SOB +

Case 03: Paraquat Poisoning:

28 years old male presents to your hospital with a history of ingestion of paraquat herbicide full bottle 3h ago following fight with wife (financial problems).
On admission the patient got odynophagia, nausea, vomiting, generalised tingling under the skin.

Case 04: Oleander poisoning:

18 years old girl presented after ingestion of oleander seeds. She is vomiting and complains of abdominal pain.
On examination, pulse 60 bpm- irregular, BP 100/70 mmHg.

:Thank you for taking your time to discuss this,

Appendix B2: Questionnaire – Organophosphate poisoning

Data collection form 01:

Organophosphate Poisoning:

Use the case scenarios (01) given in a separate sheet to give answers for these questions.

Hospital code: **Study ID:**

---

(01).

I. Would you wash the patient before commence treatments? Why?

II. Would you order gastrointestinal decontamination for this patient? when?

III. What would be your method? (forced emesis, Gastric Lavage-with tube, Gastric lavage with NG tube)

IV. What are the factors you consider for this decision? (Amount ingested, time, level of consciousness, risk of aspiration)

V. Would you take any precautions? Why?

VI. What are the precautions? (Airway)

VII. would you give activated charcoal to this patient?

VIII. If yes, How? (Multiple doses, Single dose)

IX. Who would perform the decontamination? (doctor, Nurse, attendant, Attendant with bystander)

(02).

I. What would be your initial treatments? (ABC, IV access, IV drips, Charcoal, Atropine, PAM, oxygen)

II. Based on what you decide it? (Amount ingested, time present, BP, pulse, clinical features of OP poisoning– pupil size, lungs, and secretions-, Level of consciousness, bowel sounds)

III. What are the other important steps you take to ensure the airway protection? (left lateral position, NG tube, Girdle Airway, intubation)

IV. When would you consider intubating this patient? (Consecutive drop of BP, No response to treatments, symptoms of respiratory failure, after respiratory arrest, to protect airway)

V. What are the factors you consider for the decision? (Level of consciousness, availability of monitoring, availability of equipments)

VI. Would you give Oxygen for this patient? how?

(03)

I. In your initial treatment, how would you give atropine? Give reason for your answer? (bolus only, Bolus and continue with infusion, Infusion only)
(clinical practice, only small vial available, limited stock of atropine, other reason……)

II. How you decide the dose? (Pupils, heart rate, lungs, secretions, BP secretions, Bowel sounds, Temperature)

III. Would you give him pralidoxime?

IV. What is the dose?

V. What do you consider for this decision? (Amount ingested, time, level of consciousness, type of op)

(04)

I. What would be other treatments do you give for this patient? (antiemetics, Diuretics, Dextrose)

II. What parameters do you use to guide on going treatment? (pupil size, lungs, Heart rate, BP, temperature, fasciculations, Bowel sounds, urine retention/output)

III. Would you transfer this patient? When? (Just after admission, just after initial treatments, do not transfer)

IV. What are the factors you consider? Symptomatic poisoning, Amount ingested, availability of monitoring, time of admission, Age, availability of transport, lack of monitoring in this hospital, distance, influence from relatives)

V. How do you transfer this patient? (With a doctor, with Nurse, with Attendant, with ambulance workers)

Comments:

Appendix B3: Questionnaire – MCPA poisoning

Data collection form 02:

MCPA Poisoning:

Use the case scenarios (02) given in a separate sheet to give answers for these questions.

Hospital code: **Study ID:**

---

(01).

I. Would you wash this patient before commencing treatments?

II. Would you order gastrointestinal decontamination for this patient? When?

III. What would be your method? (Forced Emesis, Gastric Lavage-with tube, gastric lavage with NG tube)

IV. What are the factors you consider for this decision? (Amount, Time, Airway, risk of aspiration)

V. Would you take any precautions before GI decontamination? Why?

VI. If yes what? (Airway, Oxygen, Intubation)

VII. would you give activated charcoal to this patient?

VIII. If yes, How? (Multiple doses, Single dose)

IX. Who would perform the decontamination?(doctor, Nurse, attendant. Attendant with relatives)

(02).

I. What would be your initial treatments? (ABC, IV access, IV drips, charcoal, Oxygen)

II. Based on what you decide it? (Amount ingested, time present, BP, pulse, Level of consciousness, bowl sounds)

III. What are the other important steps you take to ensure the airway protection? (left lateral position, Gurdle airway, Intubation)

IV. When would you consider intubating this patient? (Consecutive drop of BP, No response to treatments, symptoms of respiratory failure, after respiratory arrest, to protect airway)

V. What are the factors you consider for the decision? (Level of consciousness, availability of monitoring, availability of equipments)

VI. When Would you give Oxygen for this patient? how?

(03)

I. What would be other treatments do you give for this patient? (NaHCO3, Antiemetics. Diuretics, IV fluids, Dextrose)

II. What parameters do you use to guide on going treatment? (Urine output, Urine colour, BP, Pulse, bowel sounds, respiratory rate, secretions)

III. Would you transfer this patient? When?

IV. What are the factors you consider? (Symptomatic poisoning, Possibility of complications, Type of pesticide, availability of transport, distance, influence by relatives, lack of monitoring in this hospital)

V. How do you transfer this patient? (With a doctor, with Nurse, with Attendant, with ambulance people)

Comments:

Appendix B4: Questionnaire – Paraquat poisoning

Data collection form 03:

Paraquat Poisoning:

Use the case scenarios (03) given in a separate sheet to give answers for these questions.

Hospital code: **Study ID:**

---

(01)

I. Would you wash the patient before commence treatments? Why?

II. Would you order gastrointestinal decontamination for this patient? when?

III. What would be your method? ? (Forced Emesis, Gastric Lavage-with tube, gastric lavage with NG tube)

IV. What are the factors you consider for this decision? (Amount, Time, Airway, being ingested paraquat)

V. Would you take any precautions? (Airway, Oxygen, BP, Pulse, GCS –level of consciousness)

VI. would you give activated charcoal/fullers earth to this patient?

VII. If yes, How? (Ac Multiple doses, Ac Single dose, FE with mannitol, FE with water)

VIII. Who would perform the decontamination? (Doctor, Nurse, attendant, attendant bystander)

(02)

I. What would be your initial treatments? (ABC, IV access, IV drips….)

II. Based on what you decide it? (Amount ingested, time present, BP, pulse, Level of consciousness)

III. What are the other important steps you take to ensure the airway protection? (left lateral position, Airway, Intubation)

IV. When would you consider intubating this patient?

V. What are the factors you consider for the decision? (level of consciousness, respiration, availability of monitoring……..)

VI. Would you give Oxygen for this patient? when?

(03)

I. What would be other treatments do you give for this patient?
(NaHCO3, antiemetics, Diuretics, local anaesthesia for ulcers)

II. What parameters do you use to guide on going treatment? (Respiration, Level of consciousness, Urine output, BP, Pulse, presence of ulcers)

III. When do you transfer this patient? (Just after admission, just after initial treatments, after presence of symptoms (oral ulcers etc, do not transfer)

IV. What are the factors you consider? (Symptomatic poisoning, Possibility of complications, being ingested of PQ, availability of transport, distance, influence by relatives)

V. How do you transfer this patient? (With a doctor, with Nurse, with Attendant, with ambulance workers)

Comments:

Appendix B5: Questionnaire – Oleander poisoning

Data collection form 04:

Oleander Poisoning:

Use the case scenarios (04) given in a separate sheet to give answers for these questions.

Hospital code: **Study ID:**

---

(01)

I. Would you order gastrointestinal decontamination for this patient?

II. What would be your method? (forced emesis, Gastric Lavage-with tube, Gastric lavage with NG tube)

III. What are the factors you consider for this decision? (number of seeds, time, level of consciousness, presence of arrhythmias, age)

IV. Would you take any precautions? (Airway)

V. would you give activated charcoal to this patient?

VI. If yes, How? (Multiple doses, Single dose)

VII. Who would perform the decontamination? (doctor, Nurse, attendant, Attendant with bystander)

(02)

I. What would be your initial treatments? (ABC, IV access, IV drips, Charcoal, Atropine, Isoprenaline, Salbutamol)

II. Based on what you decide it? (Number of seeds ingested, time present, BP, pulse, presence of arrhythmias, Level of consciousness)

III. Would you give Oxygen for this patient?

(03)

I. What would be other treatments do you give for this patient? (antiemetics, Diuretics, Dextrose)

II. What parameters do you use to guide on going treatment? (presence of arrythmias, Pulse, BP, vomiting, Abdominal pain, Chest pain)

III. Would you Transfer this patient? When? (Just after admission, just after initial treatments, after presence of arrhythmias, do not transfer)

IV. What are the factors you consider? (Symptomatic poisoning, Number of seeds, availability of monitoring, time of admission, Age, availability of transport, distance, influence from bystanders, lack of monitoring in this hospitals)

V. How do you transfer this patient? (With a doctor, with Nurse, with Attendant, with ambulance workers)

Comments:

Appendix C: Questionnaire Guide for Qualitative Interviews

A cross-sectional study to identify variation between Sri Lankan rural hospitals in their treatment of acute poisoning patients

Phase II: **Qualitative study to explore the attitude of Medical and Nursing staff towards treating acute poisoning patients**

Interview Guide

The following questions and areas will be covered during in-depth interviews with participants. The sequence of questions will be based on the details supplied by individual participants. And also the interview guides is revised after each interview and add new questions or update existing questions.

-What is your experience of treating poisoning patients?
-How do you define the severity of a poisoning patient? – Please explain in more detail;
-Is the severity assessment different from other emergency conditions (snake bites)? If so, in what ways – can you explain please?
-What are your experiences with suicidal attempts / self harm with poisonous substances?
-How do you select the appropriate treatment for a poisoning patient treatment?
-What do you think are important factors influencing a good prognosis?
-How would you describe your current practice?
-What makes good practice, in your views?
-Have you received any special training or education regarding poisoning treatments? -Has this been useful? How?
-If not received, why not and do you think it would be useful?
-Do you think that you should receive more training or education?
-What do you think about working in a rural hospital?
-According to your view, how appropriate to treat poisoned patients in rural hospitals?
-Do you think that more facilities would improve the situation? Why? How?
-Do you believe that there should be more research to enhance treatments? Why? How?
-What do you think about toxicology research? With regard to what?
-Do you think that research activities would improve current treatments and practises?
-How important the health teams work in poisoning treatments? Why? How? Please explain

-What do you think about role of administrators on this topic?

-How is a good central administration effects patient management in your hospital?

-Do you have contacts or communication with other nearby hospitals?

-Is this helpful?

Appendix D: Complete Analysis Results for Qualitative Phase

Qualitative analysis

Treating poisoned patients, especially people who took poisonous substances for deliberate self harm represents difficult clinical situation. Ongoing procedures and potentially unstable clinical unlike in other medical emergency situations, poisoned patients may be aggressive, alcoholic, violent, depressed or mentally ill. This situation effects the treatments and medical officer decision making on the patient. Therefore the attitude can be different from treating other patients and the related issues may be identical to poisoned patient treatments in primary setting.

The qualitative analysis involved the exploration of the attitude, issues and beliefs of treating poisoned patients revealed by the rural hospital medical officers. A number of themes and sub themes were revealed from the analysis. These themes can be used to explain some of the variations of patient's treatments and outcomes observed in quantitative findings.

During the quantitative phase, it is found out that the treatments to poisoned patients were different between hospitals even when there were no significant differences of resources. And also the larger hospitals with more staff and facilities transfer higher percentage of facilities than small hospitals. The reasons could not be explained using the quantitative data. The following themes, sub themes and extracts from interviews would help to understand the attitude of rural hospital doctors on patient treatments and the issues related to different attitudes.

Main themes can be categorized as themes related to attitude and themes related to associate issue.

Themes related to different Attitudes:

01. Patient severity assessment /on admission assessment
02. Institutional efforts
03. relationship and influence from other staff
04. Hunt for updates
05. social/cultural values

Themes related to associated issues

06. Security and respect in the community
07. Lack of confidence/skills
08. Inability to practice proper methods

Different Attitudes:

Patient severity assessment:

Patient severity assessment is the first contact of doctors with patients. It affects the clinical decision and treatment plan for the patient. Based on different factors, individual doctors approach to assess the patient in different ways of thinking. They have shown different attitudes which effected the patient treatments and transfer decisions. Participants reported mainly positive attitude on severity assessment. But there were few ideas which seem to have a negative impact. Those ideas could be divided in to sub themes.

Working experience and knowledge:

Many participants expressed their views and belief based on previous working experience and knowledge gained. The previous experience has makes them pay more attention.

"*When I work in X hospital (big hospital), although there were few poisoned patients, most of them were transferred from peripheral hospitals. I used to check the patient notes to get patient history and assessed the severity. But here, I am the first one to see them. Therefore it is necessary to take more time and do it properly*." [Dr: 02]

His positive attitude based on the previous experience.
"*Some patients come after ingesting alcohol, some patients after splitting in the body. But really ingested patients can be identified. There are far few psychiatric patients. Others support when we want to start treatments, because they do not want to die. Then we can identify them and to more precautions.*"[Dr: 04]

These pre-occupied ideas come with experience and they try to generalize the common situations which they have seen to other situations.
More radically, one doctor expressed that the lack of experience and skills of peripheral doctors causes more transfers and they have less interest in treating.

Discipline from training:
Most of the doctors mentioned about medical ethics and physicians duties while stressing that self poisoned patients should not be treated separately. Sometimes, this may represent an artificial situation to some extent. But the discipline from the training has a major role in having a positive attitude.

Self harm from professional view:
Deliberate self poisoning is common emergency condition in peripheral hospitals. Based on their experiences, few doctors mentioned that they do not consider most of those events as suicidal attempts.

'*If we just think bit ahead of treatments, they – patients – should have reasons to self poison. Sometimes it can be troubled mental situation or can be family or economical problem. As we don't see it, we should not try to separate them as from rest of the patients. We are here to treat them; other problem should be addressed separately"* [Dr02)

Hence, they were more likely to see the poisoned patients in a medical professional view which can result a positive attitude towards treatments and assessments.

Confidence and Responsibility:

Poisoned patients can become clinically unstable depending on the amount ingested and elapse time from treatments. Hence poisoning is a difficult clinical situation to handle. The confidence over handling it effects the way of reacting to situation.

"*In my peripheral unit, we can take immediate action for poisoned patients. Actually for other emergency conditions we transfer more patients. We have basic facilities to improve the condition of poisoned patient. We should do that. Because, if transfer without treatment, the patient may die on the way*" [Dr01]

He encourages doctors to take the risk of treating poisoned patients in their hospital, rather than transferring to secondary care without stabilizing the patient. But some of the senior doctors had a different view on this.

"I am the doctor and I should responsible for my patients. Therefore if I start treatments for a poisoned patient, I do not leave until the patient condition is stable. I do not like even my colleagues to touch that patient." [Dr04]

Such attitude may be good institutionally, although it seems good in individual level.

Comparative thinking with other medical emergencies:

It was important to know whether doctors consider self poisoning as another medical emergency like myocardial infarction or snake bite. During the interviews, most of the doctors report poisoning was not considered as different from other emergencies.

"We do not consider poisoning as different. It is another emergency condition and we attend it in our capacity" [Dr08]

Sometimes poisoning was considered separately and taken extra care.

"*For other emergency conditions like myocardial infarction and snake bites, we have to do extra investigations to start treatments – like ECG. But in poisoning cases, there is a possibility of stabilizing the patient without further investigations"* [Dr01]

According to this idea, poisoned patients receive extra care than other patients. The comparative thinking about poisoning gives a positive attitude. But regarding some particular poison types like paraquat, which is highly toxic, none of them wanted to take a risk.

Institutional efforts:

Utilization of resources:

As highlighted in the quantitative results section, most of the peripheral hospitals experience lack of resources, antidotes and other equipments. Some doctors explained the steps they have taken to maximize the use of available resources which was related to a positive attitude.

"I started a small unit to keep our only oxygen cylinder, sucker machine and other emergency medicine. Actually it is part of my office. But now, when a patient comes, specially poisoned no need to run here and there to collect everything. Everything in unit and you can take the patient in after decontamination" [Dr02]

Position according to seniority:

In the medical hierarchy, seniority is related to more decisive posts in hospitals. Seniors and institutional heads have an authority over other doctors which affect their attitude. There were incidences; the senior colleagues don't want others to do extra work. A junior doctor explained this situation;

"*In my first week here, I intubated a poisoned patient and suck out secretions and transferred to Anuradhapura hospital with a nurse. In charge was not happy and ask me not to make it regular as without nurses he cannot run the hospital. His suggestion was to transfer with an attendant without intubations. If so, the patient probably dies on the way"* [Dr06]

Relationship and influence from other staff:

The number of members in each category of staff is limited in peripheral hospitals. Therefore it is important to work as a team. It could be observed that the team work is practiced in most of the hospitals. As the leader of the team, doctor can influence the attitude of other hospital staff and others can influence the attitude of doctor too.

Feedback from staff:

When there is a good feed back for either side, the team work seemed to be good. And it was revealed from the interviews that more the good feed back doctors get from hospital staff, higher the positive attitude towards poisoned patient treatments.

"*If the minor staff sees more patients become better after my treatments, then they decide I am a good doctor. That's how they think. Sometimes they just praise or criticize doctors with villagers. It makes life difficult for a doctor"* [Dr05]

Feeling of one team:

When the doctor could bring all staff to one aim or vision about treating poisoned patients, the attitude towards poisoned patients treatments were good. Each staff member had given a feeling of responsibility.

"*Here, nobody just wait and see when a poisoned patient comes. Everybody attend. Even the dispenser helps to bring the sucker or oxygen. Actually I created this situation"*[Dr02]

When a practice like this imposed, it is clear that the doctor is keen on giving the best for patients.

Hunt for updates:

Lack of updated knowledge is one of the barriers for peripheral hospitals doctors. During the interviews, they mentioned about their interest on getting new knowledge.

Interest in new knowledge:

A national guideline on treating poisoned patients is available in all hospitals. Although it is used as a guide, they expressed the interest on receiving details about new poison types and recently discovered treatments or procedures. Specially, there was more interest about gastric decontamination.

"*It is better if there is a way to receive details about new treatment methods and guidelines. I only have this (copy of national guideline). But this is also not the latest version"* [Dr07]

Feeling of left over:

In the absence of new information and knowledge, there is a feeling of left over from the main stream.

"There are no ways for us to learn about new poison types and treatment. Actually the pattern of poisoning has changed from our university years. The poison types we learnt about cannot be seen these days. And if there is a workshop or training, I cannot go because I am the only doctor here. How can I close the hospital? We are like frogs in a well" [Dr10]

Most of the participated doctors mention that they feel negative about it. These negative thoughts may affect the attitude of treating poisoned patients.

Learning from experiences:

The experience of participants in the rural set up was different. The more experienced doctors mentioned that they are more confident on poisoned treatments because of the experience with poisoned patients for few years.

"*When I came here from secondary hospital, I was afraid even to hear pesticide poisoning cases like paraquat. I did not know what to do, how to face the situation. Because all the people expect me to do something. But now I feel ok and can manage the situation"* [Dr05]

Social cultural values:

The social values of individual patient can be influencing factors for patient treatments. This situation is more relevant to poisoned patients. There were few different ideas from doctors on the social values which showed an effect on the poisoned patient treatments.

"*I think treating and saving poisoned patient is more productive to the society. Because most of the poisoned patients are young and can be fully recovered when treated properly. But a patient with myocardial infarction cannot be normal again*" [Dr01]

But it wasn't always positive; there were few negative values also.

Patient/doctor relationship:

Poisoned patients may present to hospitals in an aggressive state. When their clinical situation is deteriorating, this aggressive nature is a problem for treatments. There should be a good relationship between the doctor and patients.

Male patients are admitted after ingesting poison together with alcohol. The general feeling on alcoholic patients are not good, hence this common situation affects to poisoned patients too.

Influence from society:

When work in a peripheral hospital, doctors have contacts with the village. The hospitals doctor position is well respected. In return, it is necessary to show good attitude towards patients. As poisoning has become one of the common emergencies, the attitude on poisoned patient also should be good.

RELATED ISSUES:

Social status and respect in community:

Security and interaction in community is one of the main factors influence the attitude of primary care doctors. Primary care hospitals doctors have more relationship with the community. The feeling of losing respect or social status prevents them from taking even a minimum risk of treating poisoned patients.

Interaction with relatives/bystander of patient:

Some times there were problem reported. The relatives of poisoned patients can become a problem and doctors feel stressed.

"You will see, they come in large number and stay around. Although they listen to me, nurses cannot control them. With 50 people around, it is not possible to observe a patient. They always want to see something doing to patient, not just waiting and observing"[Dr08]

This experience reveals that influences from relatives' causes unnecessary transfers adding more cost to hospital budget.

"If the bystanders and relatives are problematic, I transfer the patient although it is not really indicated. There are other patients to look after" **[Dr01]**

Communication and feed back from secondary hospital:

The communication with secondary care hospital had been one way most of the times. My doctor mentioned;

"*When we transfer a patient, the doctor in secondary hospital admission desk asks, why it is so late to bring this patient here. Actually the patient or relatives hear it, probably they think that we are doing badly*"[Dr 06)

Such a situation creates unhealthy relationship between two units and generates a negative attitude. The feeling of non-recognition may affect the treatments and transfer rates.

Workplace issues related to personal life:

Facilities in peripheral hospitals are not in a good condition. Sometimes accommodation, water and transport are problems. Depending on the person, this situation effects the hospitals works hence the poisoned patient treatments, especially at night.

"I have no quarters inside the hospital. So I rent a house about 01 km away. But after 8-9 at night, whatever the emergency, it is very difficult me to come to the hospital. There are wild elephants coming to area after dark. I cannot drive to hospital and also I cannot leave my kid and wife alone" Dr08]

Lack of confidence/skills:

Several doctors highlighted that the lack of skill is more problematic in peripheral set up. In the absence of basic skills, more patients are either treated inappropriately or transferred without clear indications.

"*I think the skills of peripheral hospital doctors are not enough to stabilize the condition of an ill poisoned patient. That's why there are so many transfers. For am example, if someone is not confidence on making airway safe, then there is no option other than transferring. It is the attitude"* [Dr04]

Work experience:

The normal procedure is to appoint doctors who recently completed medical training to peripheral hospitals. This procedure may have some negative effects on attitude.

"This is the most important patient care centre, the primary centre. Therefore inexperienced doctors should not be appointed to these places. My idea is that a doctor should complete at least two years in secondary care hospitals before come to peripherals" [Dr05]

Working skills:

There were few ideas, mainly from a senior doctor. He believed that peripheral hospital doctors do not have adequate skills and it causes different issues.

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Working skills should be gained under supervision. And also, some doctors mentioned about some compulsory areas in emergency treatment which is useful for poisoned patient managements.

"*Every doctor work in peripheral hospitals should be given anesthetics training. If you cannot secure air way when patient cannot breathe properly, there is no point of staying in a primary hospital"* [Dr10]

Inability to practice proper methods:

Sometimes external factors which are out of control from individuals doctor, affect the attitude. Al most all the participants explains such situations. Those experiences are common in these low resource primary care hospitals.

Lack of resources (medication and equipment):

When it is needed to administer one particular medicine or antidote, if it is not available, most of the doctors said that all their effort up to that point is going to waste. After repeating few such incidences, they may not show much interest to go for particular treatments. If can result increased transfer rate.

Sometimes we have to think twice before giving atropine (an Antidote). Because all we have is few vials, if use it for moderate or less ill patient, what we do when a very ill patient comes? [Dr02]

Lack of staff:

Lack of staff can effect in two ways. When there is no adequate staff, they feel stress and feeling of burden with works. As it is not for short time, gradually their positive attitude can be changed. Although this is common for all conditions, treating poisoned patients is a stressful situation itself.

"*Although we want to observe some poisoned patients without sending for secondary care. But there are no nurses to observe. I cannot sit here and observe patients because out patients are waiting in a queue till I come. Then we have no other option, simply transfer*" [Dr01]

Freedom to practice:

Freedom to practice the proper ways or recommended guideline is disturbed the interferences from outsiders. One of the common experiences was when they want to observe less symptomatic poisoned patients as it was recommended in many guidelines, an influence from a staff member, a colleague or from a community leader or politician forced them to transfer the patient.