

A Rustle in the Paddy Field Snakebite as an

Occupational Disease of Poor Rural Workers in Asia

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Extent of the Snakebite Problem

- Should we be worried about snakebite?
 - Approximately 2.5 to 5 million venomous snakebites occur globally every year
 - More than 100,000 people die from snakebite every year
 - Some experts estimate up to 200,000 deaths/yr
 - In India alone >45,000 die annually
 - About 400,000 people require amputations following snakebite annually
- Snakebite is the most neglected of all neglected tropical diseases









World Health Organisation

- Several years ago WHO finally agreed to add snakebite to it's list of Neglected Tropical Diseases
 - A few years later it removed it from the list, demoting it other tropical diseases of lesser importance

Why?

- Because powerful lobby groups with money wanted to ensure resources for their issues were not diluted
- They pointed to the relatively patchy data on snakebite

Hope on the horizon

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In 9 days time the full WHO Assembly will devote time to considering the snakebite problem, with many countries, led by Costa Rica, promoting this debate

March Star





Who is at risk of snakebite?

- Almost everyone
- Particular risk groups include
 - **Rural workers**
 - Poor people especially in the rural tropics
 - Remote area workers (mining, petroleum etc industries)
 - People working with snakes/venoms
 - Military personnel
- Snakebite is, overwhelmingly, an occupational disease







Snakebite as an Occupational Disease

Some comparisons

- Asbestos-related diseases cause ~ 100,000 deaths/yr globally
- Work-related accidents and diseases cause ~ 2.3 million deaths/yr





May account for equivalent of 5% of all work-related deaths





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Snakebite as a Poverty Trap

- Snakebite in a poor rural community
 - The person bitten most often is a productive worker, supporting their family & community
 - The patient will often need to seek medical care remote from their home/work
 - Economic costs
 - Cost of transport to hospital
 - Cost of lost earning capacity/time
 - Cost of relatives accompanying to provide in-hospital care
 - Cost of lost earning capacity/time for relatives
 - Example
 - In Myanmar commonly total cost exceeds total family income for 1 year!
 - This condemns family to years of poverty





Tackling the Snakebite Problem

Prevention

- Arguably the most cost effective response
 - **Community education**
 - Make clear the potentially severe consequences of snakebite
 - Death or permanent injury
 - **Economic cost**
 - Avoid risky behaviour
 - Reduce likelihood of snake encounters
 - Reduce attractants for snakes in areas people frequent
 - Training on how to respond if snakes are found in areas people frequent
 - Identify, train and support local "champions" of prevention strategies



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Tackling the Snakebite Problem

Prevention

- Education of specific at-risk groups
 - Make clear the potentially severe consequences of snakebite
 - Death or permanent injury
 - Economic cost
 - Use of appropriate PPD
 - Avoid risky behaviour
 - Reduce likelihood of snake encounters
 - Reduce attractants for snakes in work areas
 - Training on how to respond if snakes are found in work areas
 - Identify, train and support local "champions" of prevention strategies within the workforce
 - May include training on snake removal



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Tackling the Snakebite Problem

• Treatment

- Ensure health staff at all levels are trained in snakebite management
 - Efficient provision of effective care
- Provide appropriate resources where most needed
 - Antivenom etc at smaller hospitals to allow short bite-toneedle time
 - Appropriately trained staff
- Ensure antivenom is
 - Appropriate for snake fauna
 - Both safe and effective
 - Affordable



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Tackling the Snakebite Problem

- The realities of snakebite
 - Health resources are often poor or non-existent in areas of most need
 - Rural communities have little trust in health systems and so use traditional healers
 - TDs provide useless or dangerous treatment and delay reaching definitive care
 - Antivenom is often unavailable, or of poor quality, or is too expensive
 - Corruption allows distribution of inappropriate antivenoms
 - Health staff often untrained in snakebite and afraid to use antivenom even when available





Tackling the Snakebite Problem

- Define the extent of the problem
 - Statistics on snakebite and other forms of envenoming are often lacking
 - Hospital data accounts for only a small fraction of the actual disease burden for snakebite
 - The Indian million death study dramatically illustrates this
 - There is an urgent need to accurately document the true disease burden
 - Delineating the problem will allow appropriate resource allocation







Tackling the Snakebite Problem

- What about foreign workers sent to snakebite-prone areas?
 - Need to define the nature of the risk
 - Local snake fauna
 - Likely mechanisms of bites develop prevention strategies
 - Available health resources locally if a worker is bitten
 - Develop a clear clinical response pathway before deployment of personnel and provide required resources (antivenom etc)
- How to achieve this?
 - Engage a clinical toxinology expert





An Example Myanmar

Myanmar (Burma)

- A poor, backward, SE Asian nation of ~ 55 M people, covering diverse ethnic groups
- A vibrant venomous snake fauna, notably
 - Vipers: Russell's viper, green pit vipers
 - Elapids: cobras, kraits, king cobras, sea snakes
 - An historic snakebite problem
 - Snakebite has been amongst the top 10 causes of death
 - Officially at least 14,000 cases & >1,000 deaths/yr
 - Estimate of ~ 80,000 cases & >2,000 deaths/yr
 - Snakebite causes >70% of all cases of AKI and these have ~ 30+% mortality rate
 - Myanmar has long produced it's own antivenom
 - Recent problems with production resulted in importation of Indian AV

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Monocellate cobra - Naja kaouthia





- What clinical problems does snakebite cause?
 - Current information suggests
 - Russell's viper coagulopathy, kidney failure, skin damage, shock, Sheehan's syndrome (anterior pituitary haemorrhage)
 - Cobras neurotoxic paralysis and/or skin damage
 - Green pit vipers coagulopathy, skin damage
 - Potential diagnostic confusion with Russell's viper bite
 - Kraits neurotoxic paralysis, possibly systemic myolysis













- What are the current issues affecting outcome for snakebite patients?
 - Inadequate training of health staff in snakebite management
 - Inappropriate resourcing of peripheral levels of the health system
 - Can cause loss of community confidence, increased bite-toneedle time
 - Inability to produce enough antivenom locally
 - Flow on effect is increasing use of Indian antivenom which is far less effective



- We were approached by the Myanmar government to help solve their snakebite problem, starting with antivenom production
- We have successfully applied for Australian Government (DFAT) funding to tackle the snakebite problem in Myanmar
 - Foreign aid funding granted in late 2014, running through till 2018 (~\$4 million)
 - Project managed through the University of Adelaide
 - Project executive
 - Dr. Chen Au Peh (RAH renal physician)
 - Prof. Julian White AM (WCH clinical toxinologist)
 - Dr. Afzal Mahmood (UniAdelaide public health physician)



The Project in outline

- The Project central aim is to improve outcomes for snakebite patients throughout Myanmar
- Our approach is holistic
- There are 3 Project focus areas
 - Improve the quantity and quality and sustainability of Burmese antivenom production and to achieve full selfsufficiency
 - Improve the distribution and availability of antivenom to all those in need
 - Improve the management of snakebite from the village level through to major hospitals





Improving antivenom production

- We noted 3 problem areas, each of which we are tackling Horse mortality expressed as % of total herd in that month
 - Poor snake husbandry & venom production
 - Poor horse husbandry & plasma production 19.7





Month



Myanmar Snakebite Project

Improving clinical training and response

- We identified several issues all of which we are tackling
 - Lack of sufficient training and resources
 - Lack of antivenom availability
 - Poor record keeping strategies

<text><image/><image/></text>	Status Specific occurs Status Specific occurs Status Specific occurs Status Status<	<section-header></section-header>	Some Common Dangerous Venomous Snakes of Myanmar. Note: Some Common Dangerous Venomous Snakes of Myanmar. Some Common Dangerous Venomous Snakes of Myanmar. Note: Some Common Dangerous Venomous Snakes of Myanmar. Some Common Dangerous Venomous Venomo
		- Persisting incoagulable blood at 6 hrs post AV airway/respiration if indicated	
 Evidence of shock Clotting assessment (20WBCT ~ record results & time of assessment) 	for 12 hours, then A hours for for 12 hours, for details on giving AV &	OR Significant haemorrhage OR Cardiovascular deterioration OR Cardiovascular deterioration Repeat IM adrenaline 5 minutely if regulred	13: Do you need to give antivenom (or more antivenom) now? 22: Has your patient been immunised against tetanus? If not ensure they are immunised AFTER coagulopathy
4.0 Antivenom (ASV) use at your hospital (refer to the management algorithms on following pages)	remaining 12 hours] then hourly for 12 hours 5 redosing - Check bite site for infection, necrosis - Treat shock (refer to	Give 8 viols (80ml) MPF Viper AV - Consider other therapies such as nebulised salbutamol (or nebulised adrena-	14: If antivenom is needed now, which type and how many has resolved.
Please record the following details:	YES NO +Ensure tetanus immune status is up to date (local guidelines)	line if upper alrway obstruction) for wheeze/bronchospasm, hydrocortisone	vials?
Reason for administration (indications for using antivenom; record the presence OR absence of the following) Severe local swelling Spontaneous bleeding Rapid extension of swelling	START TREATMENT	and antihistamines (for unicaria) - if no recovery, abandon AV use	Other important things to record in the case notes during the patient's stay in hospital: • What happened to the patient (final outcome)? (discharged well, died, "signed and left", transferred to another
Renal angle tenderness Non clotting blood Tender lymphadenopathy	The determine day a Skyl 5 Is the sinske a krait? SNAKE BITE	SUMMARY INFORMATION	hospital, transferred to another unit in the same hospital such as Renal Unit or Intensive Care Unit, etc)
Heavy proteinuria Neurotoxicity Oliguria/anuria Shock Type of antivenom (ASV) (was it MPF or Indian or Thai and which type of each)?	-8 vials BPL/MPF Viper AV -No currently available AV (ASV).	FIRST AID, EMERGENCY CARE, SIGNS OF PARALYSIS, PERFORMING 20WBCT	 If they develop renal failure, record when and details of treatments used and outcome. (type of dialysis used, start and finish times, number of treatments etc)
How many vials were given at your hospital?	details on giving AV & redosing		 If they develop local necrosis and or infection, record extent, if fasciotomy or amputation is required, and final out-
 Time of administration? Any complications developing during or after administration of antivenom (include how this was treated) 	Treat shock (refer to local Is the snake a green snake? YES AMONTOR kidney function (unne montor kidney function (unne	- Clean bite site - Check airway, breaching, DEVELOPING BLOOD CLOTTING TEST - Rapid extension of local swelling	come. If they develop other medical problems, record type of problem, how diagnosis made, what treatments used and
 Allergic or anaphylactic reaction (Defined as an event occurring < 4hrs post administration of AV and in- 	NO If deteriorates may indicate	Place cloth pad over circulation NEUROTOXICITY -collect about 3 ml • Tender lymphadenopathy bite site and apply a • Protect alrway & ventilate - Bilateral ptosia venous blood and place - Developing paralysis (bildered)	final outcome.
volving 1 or more of the following: urticaria, bronchospasm, swelling of the oral mucosa or tongue, laryngeal oedema, or hypotension.)	OBSERVE PATIENT FOR 24 HRS - Check clotting time § 2 hourly for 12 OBSERVE PATIENT FOR 24 HRS - If significant bleeding consider	firm bandage to produce moderate volume resuscitate + eyelidat to be the strubel that has been opening mouth, prosruding tongue.	 For all blood test results, record these as a table, sequentially, so that you and your colleagues can quickly notice any trends/changes that may indicate a need for a revision of treatment strategies.
 Febrile reaction (Defined as an event occurring < 60 minutes post AV administration involving 1 or more of the 	hrs, then 4 hourly for remaining 12 hrs - Check for neurotoxicity § ½ hourly first - Sheck for neurotoxicity § ½ hourly first - Check for neurotoxicity for neurotoxicity § ½ hourly first - Check for neurotoxicity for neurotoxicity for neurotoxicity for neurotoxicity for neurotoxicit	pressure consider inotropes if - Partial or washed only with water increased salivation & dmailing.	Key Project partners:
following: fever, tachycardia or hypotension AND NOT INVOLVING urticaria, bronchospasm, swelling of the oral mucosa or tongue, or laryngeal oedema.)	Check for neurotoxicity § Check bite site for infection, necrosis the patient develops paralysis, protect Manage as for bites by other types of snake BUT IF IN DOUBT OBSERVE FOR 24 HRS	- Keep bitten limb still shocked complete ophthal- with a splint - Control haemorrhage + moplegia -allow to stand undis Respiratory distress (paralysis)	Republic of the Union of Myanmar
5.0 Record any other treatments used in the acute admission period such as:	Ensure tetanus immune status is up airway, maintain adequate respiration Check clotting time 6 2 hourly for 12 hrs.	Keep patient still, carry them to care if provide dotting factors other cranial turbed for 20 mins, then -Non clotting blood ceck for presence of a -Spontaneous systemic bleeding	SYDNEY
Fluids (type & volume) Diuretics (type & dose)	to date (oxygen, intubate & ventilate if then 4 hourly for remaining 12 hrs - Check for neurotoxicity ½ hourly first 12	possible for significant bleeding +General muscle blood clot (absent clot = +Shock	မြည်ထောင်စု သမ္မတ မြန်မာနိုင်ငံတော် 🥮 🖤 MDELAIDE 🐨
 Other medications (Antibiotics, steroids, antihistamines etc.; type & dose) 	Alogorithm copyright © Prof. Julian White Check bite site for infection, necrosis hours, then hourly for 12 hours §	killed, bring it with adequate dose of AV has - Respiratory tipping/inverting - Heavy proteinuria (3+).	Australian Government Government of South Australia
 Physical interventions (intubation, ventilation, resuscitation etc.) 	2015 may be reproduced for clinical purposes without permission date - Ensure tetanus immune status is up to - Check bite site for infection, necrosis - Ensure tetanus immune status is up to - Ensure tetanus immune status is up to	the patient been given www.kness/distness container	Department of Foreign Affairs and Trade
	ensure tetanus infinune status is up to date	Alogorithm copyright © Prof. Julian White 2015 ~ may be reproduced for clinical purposes without permission	- HAND







In Summary

- Snakebite is a significant occupational disease
- For local workers (farmers etc) a multipronged approach is needed
- For companies using imported workers
 - Engage clinical toxinology experts to assist in determining
 - **Risk profile**
 - Prevention strategies including PPD
 - Training requirements and delivery
 - Care plans to best manage any cases that may arise
 - Health resource needs locally including antivenom

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Questions?