IMPLEMENTATION OF AN INTEGRATED MULTISPECIALTY POISON-CONTROL CENTRE IN BANGALORE, INDIA: RESULTS OF A PILOT IMPLEMENTATION

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Nearly 200,000 deaths are caused by unintentional poisonings annually.

LMIC: pesticides, kerosene, household chemicals, carbon monoxide

High-income countries: prescription drugs, carbon monoxide, personal-care and cleaning products.
Poisoning can also arise from environmental contamination
- lead poisoning from e-waste
- mercury poisoning from goldmining
- industrial emissions

Occupational exposures to heavy metals, pesticides, solvents, paints, cleaning substances, vapors, gases.
POISONING & EQUITY

- Globally, the highest mortality rates from unintentional poisonings occur in children under 5 years of age and adults over 55 years.
- The mortality rate is also 50% higher in men than in women.
- Higher levels of exposure in men may occur in occupational settings.
MAJOR OBSTACLES TO PREVENTION

- Large number of chemicals available on the market – many not tested for toxicity nor are covered by comprehensive regulations.
- Lack of effective safer alternatives and little incentives to use them.
- More than half of WHO Member States do not have a poison information centre.
GLOBAL POISON CENTERS (JUNE 2016)
Mortality from unintentional poisoning

Pesticides, kerosene, household chemicals and carbon monoxide are common sources of fatal poisoning

Each circle/bar represents a country. The dotted grey line indicates the regional average, and the dashed grey line indicates the global average. Click on a region name to display the distribution by country (within that region) as a bar graph.

Mortality rate from unintentional poisoning (per 100 000 population), by WHO region, 2012

Distribution by country (in selected WHO region) mouse-over the y-axis to sort

© World Health Organization 2016 | Source : Global Health Observatory (http://www.who.int/gho)
No matter where you are in the U.S., you have a poison center. Some
US POISON CONTROL CENTERS

- In 2016, nearly 3 million encounters were logged by NPDS
- 2,200,000 human exposures, 56,000 animal exposures, 663,000 information calls
- US poison centers (PCs) also made over 2,600,000 follow-up calls
US POISON CONTROL CENTERS

- The top 6 substance classes in human exposures:
  - Analgesics (12%)
  - Cosmetics/personal care products (8%)
  - Household cleaning substances (8%)
  - Sedative-hypnotics/antipsychotics (6%)
  - Antidepressants (4%)
  - Alcohols (3%)
POISONING DEATHS (TOTAL=1,173)

- Sedative hypnotics/antipsychotics: 384
- Cardiovascular Drugs: 371
- Acetaminophen: 277
- Opioids: 220
- Antidepressants: 209
- Stimulants & Street Drugs: 206
- Alcohols: 157
- Fumes/Gases/Vapors: 73
- NSAIDs: 52
- ASA: 51

AAPCC National Poison Data System
Published: Dec 2016
Background

Poisoning accounts for 30% of suicides in India and accidental and environmental exposures to poisons are frequent.

The most common poisonings in India:
- Insecticides
- Rodenticides
- Snakebites
- Alcohols
- Sedative hypnotics
- Opioids
- Pain relievers
In India in 2017, a few poison information centres exist, but there is no regional integrated poison control and information centre that can be readily accessed by people in the community, where poisonings occur.

We describe the implementation of a multispecialty model for an integrated regional poison-control centre in the city of Bangalore, Karnataka.
METHODS

- We developed a model for a poison control centre that includes multi-specialies
  - Emergency medicine
  - Critical care
  - Pharmacology
  - Pediatrics
  - Psychiatry
  - Preventive medicine
  - Laboratory diagnostics

- The centre provides referral and management advice for poisonings, drug information, psychosocial care with suicide prevention, forensic medicine, and poison education for the general public.
**METHODS**

- Patients are initially treated and stabilized at peripheral hospitals or spoke hospitals and then transferred by paramedics to a toxicology centre of excellence, or hub hospital, for poisoning consultation, intensive care management, enhanced elimination measures, and antidote therapy.
Computerized software treatment modules have been developed for the most common poisonings for use by health-care providers in other hospitals in Bangalore.

**Patient management**

- **References**
  - Micromedex
  - Textbooks and online references

- **Guidelines**
  - Internally written treatment protocols
In 2016, a toxicology centre of excellence was established at the MS Ramaiah Memorial Hospital and Medical College, a major metropolitan hospital in Bangalore, and linked with five peripheral hospitals in Karnataka.

The central hub hospital provides all-hours, low-cost comprehensive poisoning information software and treatment protocols, forensic toxicology testing, reference laboratory analysis, Hazmat decontamination, intensive care management, and an antidote depot for peripheral hospitals.
POISON CENTER FOR INDIA
BASED ON A US MODEL

Potential Service Region

- City of Bangalore
- 10 million served
- Potential State-wide outreach to over 60 million people
- Poison Center in partnership w/ suicide prevention center
From the findings from this pilot phase, we have added more software modules to include treatment of the most commonly encountered poisons.

In response to the high rate of intentional poisonings, a suicide prevention and referral centre is being developed located in the same building as the poison control centre.
GLOBAL SUICIDES

- According to the World Health Organization, every year more than 800,000 people take their own life and many more attempt suicide.
- Suicide is the second leading cause of death among 15–29 year-olds globally and 75% of global suicides occur in low- and middle-income countries.
SUICIDES IN INDIA

- It is estimated that as many as 200,000 Asian Indians take their own lives annually.
- Up until 2014, suicide was illegal in India and survivors would face fines and jail terms up to one year.
▪ A decade of police records (2006-2016) was retrospectively reviewed from the Registrar General of India database for suicide demographics, rate, incidence, geographic location, and methods.

▪ All data reviewed were confidential with no personal identifiers.
Over the past decade, the number of suicides in India increased over 15% (131,666 in 2015 from 113,667 in 2005).

The overall male to female ratio of suicide victims was 68:32.

Young adults age 18-30 years and people 30-45 years of age were the prime groups for suicide.
The highest incidence of suicide was reported in the Indian states of Maharashtra, Tamil Nadu, West Bengal, Karnataka and Telangana, respectively, accounting for 51% of the country’s suicides.

Of the 50 megacities, Chennai, Bengaluru, Delhi, and Mumbai accounted for 35% of cases.
Circumstances of suicide were attributed to:

- Family causes (21.7%)
- Chronic illness (18%)
- Marriage-related (5.1%)
- Love affairs (3.2%)
- Drug abuse/addiction (2.8%)
- Bankruptcy/indebtedness (1.8%)
- School examination failure (1.8%).
Methods of committing suicide included:

- Hanging (39.5%)
- Poisoning (28%)
- Fire/self immolation (7.5%)
- Drowning (5.7%)
- Lying under moving vehicles/trains (3%)
- Jumping from buildings/vehicles (2.5%)
- Self-inflicted injury or firearms (1%)
- Suicide in India is a major and multifaceted public health problem. Given the high incidence of suicides in India, targeted suicide screening and preventative programs are urgently needed.

- To address the high rate of poisonings, one necessary component is the establishment of integrated regional poison control and suicide prevention centers.
LEVEL I TOXICOLOGY CENTERS
Data and Surveillance

- Poison Centers become the repository for the majority of poisonings in the region
  - Clinical surveillance (or Syndromic Surveillance) systematic collection, analysis, and interpretation of health data about a clinical syndrome that has a significant impact on public health, which is then used to drive decisions about health policy and health education.

- Software-driven Surveillance of National Poisoning Database System (NPDS)
CHEMICAL WARFARE • NERVE AGENTS

PART ONE: THE G SERIES

Mass poisonings

The G series nerve agents are so named because they were all first synthesised in Germany. They are all extremely toxic volatile liquids, classified as weapons of mass destruction by the U.N., and their production & stockpiling is outlawed.

**Tabun (GA)**
- Smell & appearance: Clear, colourless liquid, though strong tabun has a brown appearance. Pure tabun is odourless, but it often has a faint fruity odour due to impurities.
- Synthesised: 1936
- Lethality: 
  - Median lethal dose: 400 mg/kg
  - Median lethal concentration: 0.1 mg/m³
- Effects on nerve:
  - ACh: Inhibit breakdown of acetylcholine

**Sarin (GB)**
- Smell & appearance: A clear, colourless liquid, lustrous and odourless in its pure form. It's a volatile liquid, like the nerve gas gaseous vapour generated is heavier than air.
- Synthesised: 1938
- Lethality:
  - Median lethal dose: 4000 mg/kg
  - Median lethal concentration: 0.01 mg/m³
- Effects on nerve:
  - ACh: Inhibit breakdown of acetylcholine

**Soman (GD)**
- Smell & appearance: Soman is a clear, colourless, tasteless liquid. Its odour is faint when pure, but when impure it has a yellowish green colour and a strong, unpleasant smell.
- Synthesised: 1944
- Lethality:
  - Median lethal dose: 1700 mg/kg
  - Median lethal concentration: 0.1 mg/m³
- Effects on nerve:
  - ACh: Inhibit breakdown of acetylcholine

**Cyclosarin (GF)**
- Smell & appearance:
  - Cyclosarin is a clear, colourless liquid with a sweet, musty smell. Sometimes likened to peaches, it evaporates around 70 times slower than steam, and is also flammable.
- Synthesised: 1949
- Lethality:
  - Median lethal dose: 350 mg/kg
  - Median lethal concentration: 0.05 mg/m³
- Effects on nerve:
  - ACh: Inhibit breakdown of acetylcholine

**Effects of nerve agents:**
- Acetylcholinesterase inhibition
- Convulsions & convulsions in the stomach
- Excessive nausea, fear, salivation & vomiting
- Paralysis, speech problems & breathlessness
- Respiratory arrest & loss of blood circulation
- Convulsions & loss of blood circulation
- Convulsions & death

**Syria’s chemical weapons**

The White House said for the first time that it has some evidence that Syria has used chemical weapons in its civil war. A look at Syria’s chemical weapons facilities:

- Production sites
- Storage sites
- Missile production
- Launch sites
- Isopropanol alcohol (rubbing alcohol) or isopropylamine, a non-lethal chemical

**Sarin and its effects**
- Colorless, odorless, dispersed as droplets or mist, runny nose, lung congestion, tightness in chest, dimming of vision, drooling, excessive perspiration, nausea, muscle tremors, coma, death

Source: Center for Nonproliferation Studies, U.S. Defense Department, GlobalSecurity.org

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People: to ensure healthy lives, knowledge, and the inclusion of women and children.

Dignity: to end poverty and fight inequality.

Planet: to protect our ecosystems for all societies and our children.

Justice: to promote safe and peaceful societies, and strong institutions.

Prosperity: to grow a strong, inclusive, & transformative economy.

Partnership: to catalyse global solidarity for sustainable development.
MORTALITY DUE TO UNINTENTIONAL POISONING

By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

SDG Target 3.9

Safe storage, labelling and restricting access to hazardous chemicals and drugs, adequate information about product hazards, personal protection and limiting the use of medications to doses prescribed by health-care professionals all contribute to preventing unintentional poisonings. Other approaches include ensuring the availability and use of less-toxic and less-hazardous alternatives where possible, and, in occupational settings, the implementation of engineering controls and training.
Thank you!

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**Declaration of interests**
We declare no competing interests.