Reducing the Impact of Heat Waves on Urban Poor: Baseline results from a cluster randomized trial in Karachi, Pakistan

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Partners

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- Aga Khan University, Pakistan (Drs. Nadeemullah Khan, Uzma Khan)
- Aman Foundation, Pakistan (Mr. Zaheer Chand, Dr. Sadia Quraishy)
- Alliance for Health Policy and Systems Research, World Health Organization (Dr. Abdul Ghaffar)

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Current Research

- There is significant gap in public health research on extreme heat, especially from countries with the highest risk.
- All population based estimates for public health interventions have been primarily observational data.
- A recent systematic review on the impact of heat adaptation strategies on heat related mortality found a total of 30 articles, of which 29 were from high income countries.
- The single RCT evaluated the impact of homecare on hospital admissions amongst elderly

Challenges to conducting research in heatwaves.

1. There is no universally acceptable definition of exposure - extreme heat and heatwaves.[12,13]
2. Lack of clearly defined health consequences of heat exposure makes it difficult to ascertain true health burden of heatwaves.
3. Specific heat-related illnesses such as heat stroke, heat exhaustion, and heat syncope are often difficult to reliably capture in areas where fever and sepsis are common causes of death.

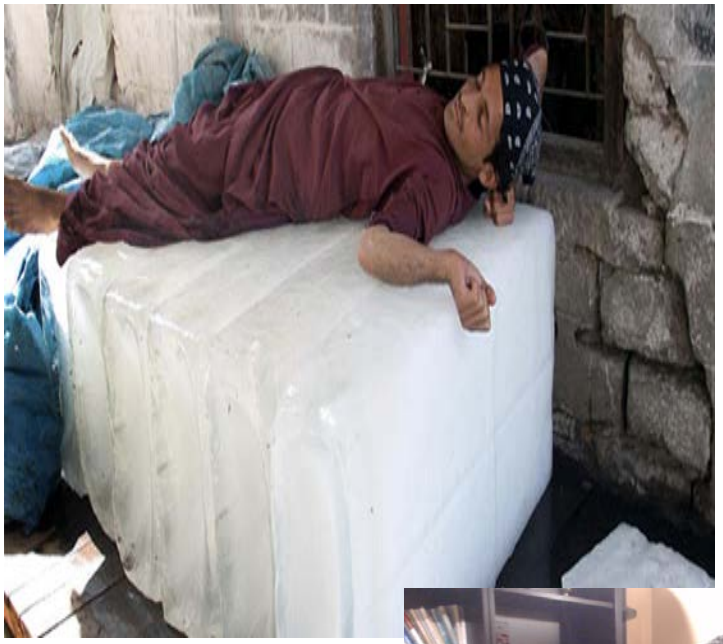
Karachi Population: 24 Million

- State of Maryland
- State of Delaware
- State of Pennsylvania
- Washington DC
- Half of State of New Jersey

Karachi Area: 1426 sq miles

Delaware Area: 2489 sq miles


115
EDHI



Objective/Specific Aims

- **1: To** develop evidence based care strategies for management of people with exposure to extreme heat (EH) in both households and emergency departments in low income settings such as Pakistan (Heat Emergency Education and Training Bundle)
- **2: To** implement Heat Emergency Education and Training *(HEAT)* bundle in Karachi and measure its impact on a composite outcome comprising of emergency department admissions, hospital admissions and all-cause mortality
- **3: To** determine the impact of HEAT implementation on the knowledge and care practices in households and emergency departments.

Methodology

- Community
  - Design: Pre and Post as well as Cluster Randomized Trial design
  - 16 clusters of 1000 population
  - Setting: Korangi, Karachi, Pakistan
- Hospitals
  - Pre and Post design
  - 4 hospitals serving the study area (but als areas)

Study Design - Community Component

- Phase 1: Baseline data
  - May-Jul, 2017, baseline community surveillance
- Phase 2: Community Awareness Interventions/Activities (Jan-Apr 2018)
  - Community mobilization: Targeting community leaders, schools, mosques – Each CHW conducted 2 health education sessions a day in March/April, 2018 at homes in the community
  - SMS with health messages; and linked to call center for any questions
  - Pamphlets/flyers were distributed
- Phase 3: Post-Intervention data collection (May-Sep 2018)
  - KAP survey (before and after)
  - Hospital admissions and deaths in the community (before and
  - Recall of SMS messages

Study Design – Hospital Arm

- What is the setting of our study?
  - Four major hospitals in/close to the Korangi District
- Our intervention
  - Development of heat emergency management protocol
  - Training of emergency physicians and nurses through a one and half day workshop
  - Placement of protocols in emergency department resuscitation areas
- What are we measuring
  - Pre and post test of knowledge of physicians and nurses
  - Number of admissions with suspected heat emergency to the emergency department and to the hospital
  - Number of deaths due to suspected heat emergencies
  - Review of quality indicators for suspected heat emerg

Methodology II

Pre-Intervention Phase (5/17-7/17)

- Baseline Data Collection (ED Surveillance/ Community Surveillance & Provider Interviews)
- Development of HEEET Tool Box (3 groups of 4-6 experts both from high and low income countries using Delphi technique)

Intervention (1/18-4/18)

- Community: Community Awareness through mobilization activities followed by SMS messages
  (Cluster Randomized trial)
- Hospital Care: Training of ED staff & availability of basic supplies.
  (4 ED – 2 in intervention and 2 in control arm)

Post-Intervention Data Collection (5/18

- Community Surveillance and Community Interviews
- ED Surveillance for mortality
  emergencies/ Provider intervie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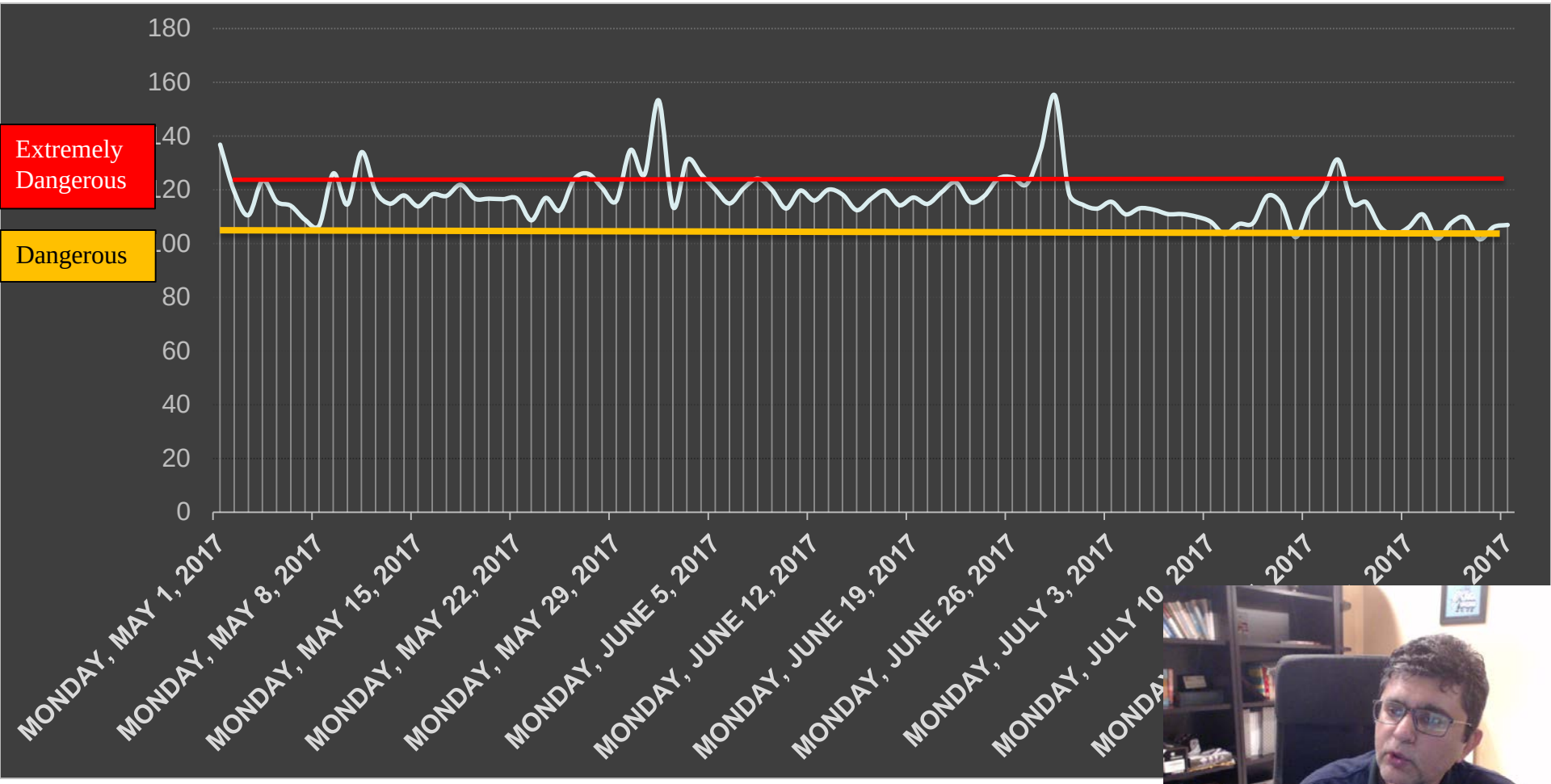
MEDICINE

Temperature (Heat Index) during the baseline period



Baseline data – Community/Household characteristics

Number of households	2712
Population covered	16973
Avg HH size (# of people/house)	6.3
Avg number of rooms/house	1.8
Tap water available	54.10%
Uninterrupted water supply	27.70%
Electric power available	89%

Baseline data – Hospitals (10 weeks)

	Total ED visits	Total Admissions	Total DOA/ED deaths	Total patients suspected of heat illness
JPMC	106813	16489	1208	1419
Chiniot	16336	2972	52	325
Korangi	59390	1088	469	1534
Indus	40058	2314	182	915
Total	**222597**	**22863**	**1911**	

HEALTH EFFECTS OF **HEAT ILLNESS ON THE BODY**

An increase in heat-related health problems is common during heat waves. Common symptoms of heat-related illnesses are:

- Dehydration
- Nausea
- Fatigue
- Confusion or anxiety
- Exhaustion
- Dizziness
- Heavy sweating
- Muscle cramps or aches
- Faster and weaker pulse
- loss of conscious or fainting

Heat-related illnesses are preventable and treatable, but can become fatal if symptoms are not addressed in a timely way. Heat stroke is a serious condition where the body temperature raises to dangerous levels, and it can lead to death.

WHAT TO DO IN CASE OF EMERGENCY

Move the person to a cooler place

Remove excessive clothing

Immerse victim in a cool bath

Contact hospital in case of breathing problems

In case of vomiting or unconsciousness, do not give anything to eat or drink

IN CASE OF AN EMERGENCY

Aman Clinic, Morirro Hall, Ibrahim Hyderi, Karachi

Aman Telehealth
9123 or
021-111-11-923
for Heat Health Advice

Aman Ambulance 1021
for Medical Emergency Service

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HEAT EMERGENCY
AWARENESS TREATMENT

JOHNS HOPKINS

RISK FACTORS FOR HEAT-RELATED ILLNESSES

1. Age – infants, young children and elderly people (65 or older)
2. Those who are physically ill, especially with heart disease or high blood pressure, COPD
3. Dehydration because of reduced food and fluid uptake, intestinal problems or diarrhea
4. Overweight/ Underweight
5. Fatigue, sleep deprivation, long-term high-level exercise and wearing heavy clothing
6. Athletes
7. Outdoor workers
8. People suffering from mental illness

SYMPTOMS OF HEAT STROKE

- No sweating
- Dry, hot red skin
- Dizziness and head ache
- Vomiting
- Unconsciousness
- Pinpoint pupils

PREVENTATIVE MEASURES

Keep cool by frequent showers, sponging and foot baths

Keep your home cool

Wet-towel on head and neck (Outdoor)

Limit Outdoor activities to cooler times of the day

Increase and monitor water intake

Avoid strenuous physical activities and too much exposure to heat

DIETARY MODIFICATIONS

Eat regular, light meals

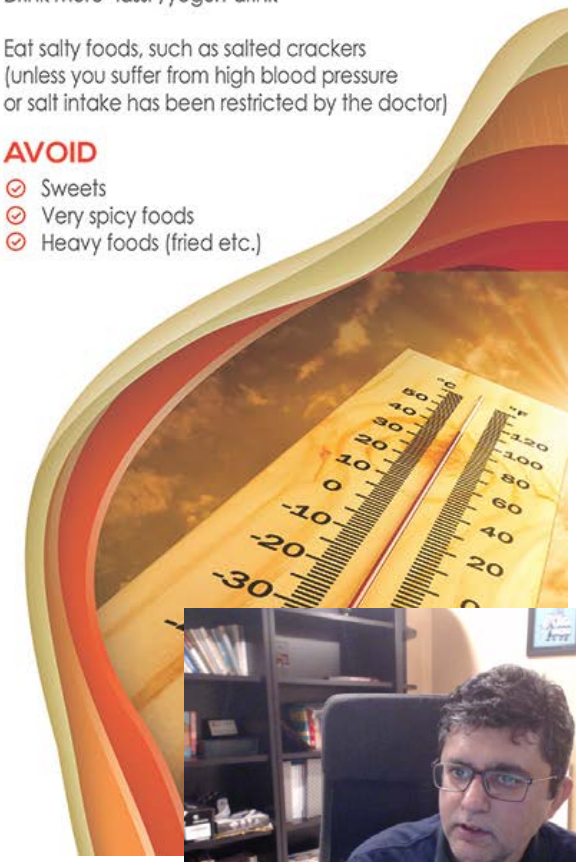
Increase consumption of vegetables and fruits with high water content (e.g., cucumbers, water melon, oranges, etc.)

Drink more 'lassi'/yogurt drink

Eat salty foods, such as salted crackers (unless you suffer from high blood pressure or salt intake has been restricted by the doctor)

AVOID

- Sweets
- Very spicy foods
- Heavy foods (fried etc.)



HEAT EMERGENCY AWARENESS AND TREATMENT (HEAT) ALGORITHM

TRIAGE

History, Temp (with mercury thermometer oral or axillary), BP, Pulse, Respiratory Rate, Oxygen Saturation and AVPU**

HEAT STROKE

1. Association with excessively hot environment or physical exertion in a hot environment
2. Elevated body temperature
3. Central nervous system dysfunction (delusions, altered mental status, convulsions, coma)*
4. Patient should meet all of the above criteria OR as per clinical judgment

HEAT EXHAUSTION

1. Association with excessively hot environment or physical exertion in a hot environment
2. Signs and symptoms of volume and/or salt depletion (for e.g. cool clammy skin, excessive sweating, delayed capillary refill tachycardia, hypotension, sunken eyes, nausea and headache)
3. Patient should meet both criteria OR as per clinical judgment

Presentation consistent with Heat Emergencies

YES

NO → CONSIDER ALTERNATIVE CAUSES OF HYPERTHERMIA

1. Meningitis
2. Encephalitis
3. Malignant hyperthermia
4. Alcohol
5. Cerebral Malaria
6. Cerebral stroke/ hemorrhage,
7. Septic/ metabolic encephalopathy
8. Seizures
9. Hyperthyroidism
10. Drug/poison ingestion
11. Neuroleptic Malignant Syndrome

1. Access and Manage Airway, Breathing and Circulation
2. Remove clothing (as per cultural circumstances for Male/Female),
3. IV access, place on monitor, check fingerstick random blood glucose test
4. Send BUN/Cr. Serum Electrolytes

If needed following additional test can be ordered as per patient's condition and physician's discretion; CBC, LFTs, VBG/ABG, CPK, EKG, Troponin I & Coagulations, Urine analysis, CXR

STEPS:

1. Provide active cooling measures when body temperature is greater than or equal to 39°C (102.2°F) with a goal of temperature reduction to 38°C (100.4°F) within 30 minutes
2. Wet the patient's clothes if cannot disrobe or wet when clothes are in place and place the patient in front of pedestal fan
3. Apply ice packs to axilla, groin and neck when water in not available.

1. Administer 500 - 1000 cc bolus of Normal Saline as per assessment of the patient
2. Place Foley's catheter as per physician discretion to ensure urine output of 0.5 cc/kg/hr

MONITOR:

1. Temp every 15 min (do not induce hypothermia)
2. Vitals every 30 min
3. Volume status (auscultation chest and JVP)
4. Repeat Electrolytes, BUN/Creatinine and other tests as per clinical status

NOTES

-The absence of neurologic symptoms is used to differentiate heat exhaustion from heat stroke
-For seizures: Follow usual protocol to treat the condition which starts with benzodiazepines
-Avoid continuous use of acetaminophen in case of heat illnesses
**AVPU – Alert, Voice, Pain, Unresponsive (method of testing mental status)
-If not improving then additional treatment methods must be considered

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Next Steps

- Analysis of endline data
- Dissemination of findings


EAT