THE IMPACT OF PRENATAL LEAD EXPOSURE ON COGNITIVE & PHYSICAL HEALTH OUTCOMES AMONG INFANTS AND CHILDREN IN BANGLADESH

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OBJECTIVES

By the end of the presentation:

1. *Understand* the negative effects of prenatal lead exposure on infants and children in Bangladesh
2. *Recognize* the significance of the prevalence of lead exposure in the country of Bangladesh
3. *Understand* why Physical Therapists in Bangladesh should be aware of the implications of lead exposure on infantile and childhood development

BANGLADESH

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LEAD EXPOSURE SUSCEPTIBILITY

- Lack of environmental regulations[1-2]
- Malnutrition[1-2]
- Micronutrient deficiencies[1-2]

PRENATAL LEAD EXPOSURE IN BANGLADESH

- Working Place[3]
- Industrial or Urban Areas[3]
- Air pollution[3]
- Consumption of lead polluted water and food[3]

HARMFUL IMPACTS OF LEAD

- Harmful Impacts of Lead Include
  - Lower Neurodevelopment Scores[2]
  - Disrupt normal cellular processes & weaken immune defense[3]
  - Deplete essential nutrients from body[3]
  - GI Cancer[3]
  - Long-term exposure: MS, PD, AD, MD, CA[3]
  - Stunting in children[4]

Polluted River in Bangladesh

PURPOSE

This systematic review will analyze the effects of prenatal lead exposure on the cognitive and physical development of infants and children in Bangladesh.

METHODS

- Search Engines:
  - Springer Link
  - ProQuest
  - PubMed
  - ScienceDirect

- Search limits:
  - Peer-reviewed (*all* databases)
  - Dates: January 2011- September 2022 (*all* databases)
  - Articles (Springer Link, *only*)
  - Research articles (ScienceDirect, *only*)

METHODS

- Search terms:

("prenatal" OR "pregnant" OR "antenatal" OR “fetal”)

AND

("children" OR "infants")

AND

("lead exposure" OR "lead toxicity")

AND

"Bangladesh"

METHODS

- Study Designs: Prospective Cohort Studies, *only*
- Inclusion Criteria:

Type: Lead exposure

Time of lead exposure: During fetal development

Setting: Bangladesh

Age outcomes are assessed: Birth to age 12

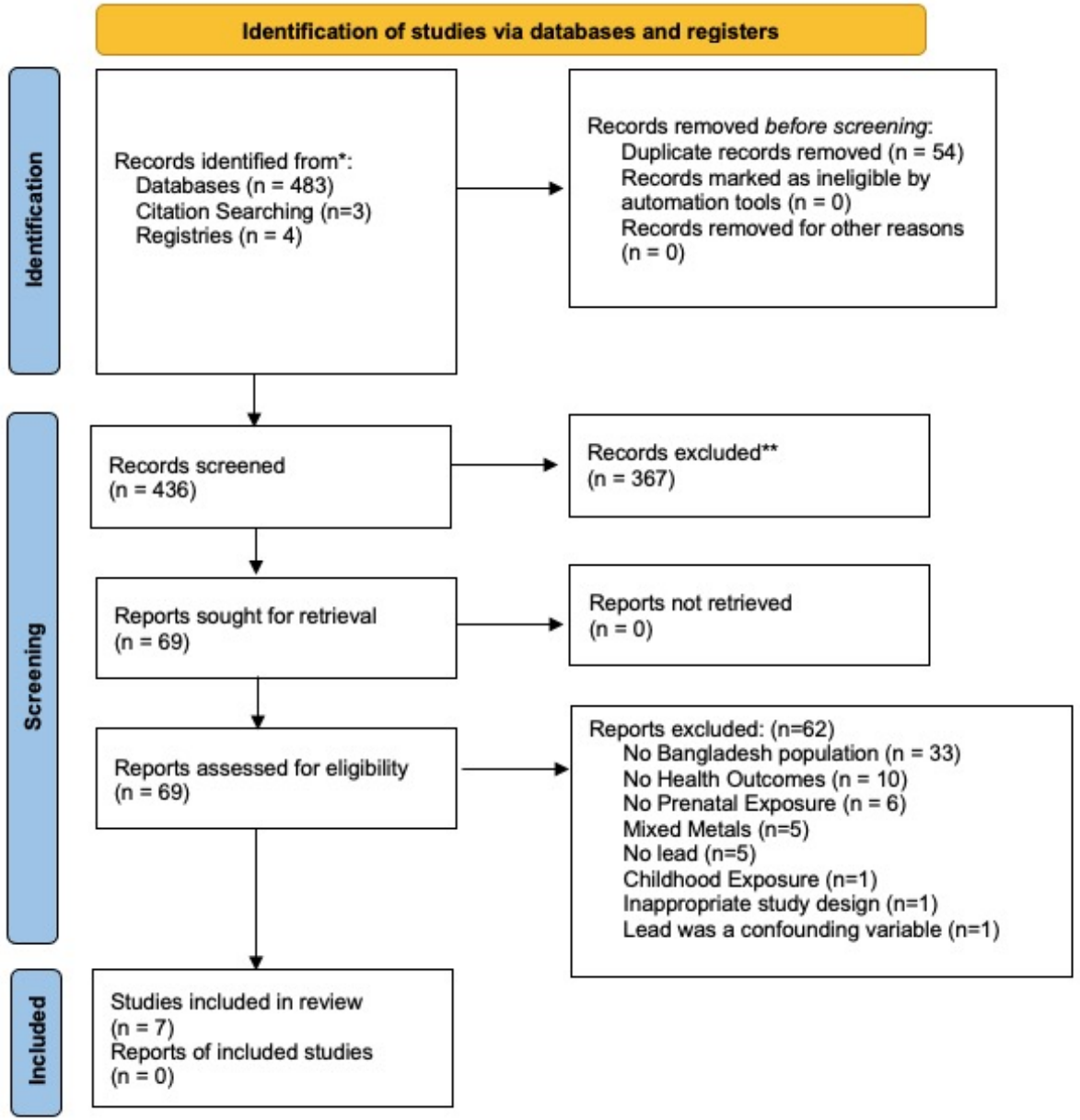
Health Outcomes: Stunting & cognitive scores

METHODS

- Evidence Appraisal:

Studies were independently evaluated for methodological quality by two blinded reviewers using the *Scottish Intercollegiate Guidelines Network (SIGN): Cohort Studies Tool.*

RESULTS



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).

**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

RESULTS

- Acceptable (+) to high quality (++) evidence[2,4-9]
- Total N: 12,617 mothers and 8,874 infants/children[2,4-9]
- Locations of studies:[2,4-9]
  - Matlab (2)
  - Sirajdikhan and Pabna (5)
- Mean age at time of assessment: birth to age 5[2,4-9]

RESULTS

Assessment Measures	Number of Studies
Mothers' urinary lead levels at delivery[4]	1
Infant/child fingerstick blood[2,5-7]	4
Birth umbilical cord lead levels[2,6,8-9]	4

RESULTS

Primary Outcome Measure	Number of studies
Birth weight[2,4,6-7,9]	5
Birth height[2,4,6]	3
Infantile weight and height[4]	1
Childhood height and weight[4,5]	2
Stunting[2,5,6]	3
Bayley Scales of Infant Development (BSID): Motor and Cognitive[2,7-9]	4
Head circumference[7-9]	3
Kidney volume[5]	1

STATISTICALLY SIGNIFICANT RESULTS

- *Negative associations* between blood lead concentration and BSID cognitive scores[7]
- *Each one unit increase* in natural log cord blood lead in presence of stunting was associated with a 2.1 unit decrease in cognitive scores[2]
- *Associations* between stunting at 4.5 years and blood lead at 14 & 30 weeks gestation[5]
- *Inverse associations* between prenatal lead exposure in late gestation & kidney volume in pre-school aged females[5]

CONCLUSION

- High Quality Evidence Supports:
  - Association between prenatal lead exposure and:
    - Stunting
    - Lower Cognitive Scores
- Stunting exacerbates negative effects of lead

LIMITATIONS

- Inconsistent methods of measuring lead exposure and outcomes
- Recruitment from two primary cohorts
- Lack of Stratification for Confounding Variables
  - i.e. Maternal education, socioeconomic status, post rainy-season birth, maternal chewing tobacco, maternal nutrition, etc.

FUTURE RESEARCH

- Further research is needed to…
  - *Measure* the impact of maternal factors on prenatal lead exposure
  - *Identify* any further impacts that lead exposure has on the mother and child
  - *Identify* the age at which lead exposure, either during the development of the fetus or the infant, affects stunting and cognition the most

CLINICAL RELEVANCE

- Physical Therapists in Bangladesh should…
  - *Be aware* of potential impacts of lead exposure
  - *Administer* cognitive and physical screening to children
  - *Provide* community-based education on lead exposure and prevention during pregnancy

PABNA, BANGLADESH

PHOTO PERMISSION GRANTED

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Any Questions?