

The background image shows an industrial facility with several tall smokestacks. Thick, dark smoke is being emitted from the stacks, rising into a sky that is bright and hazy, suggesting a sunrise or sunset. The foreground is filled with a dense field of tall, thin plants, possibly reeds or grasses, which are slightly out of focus. The overall color palette is dominated by warm yellows and oranges from the sky, contrasted with the dark greys and blues of the smoke and the industrial structures.

Hazardous Environmental Exposure & Maternal Health

Capstone

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Preview

- Introduction
- Environmental Exposure of Pregnant Bedouin Women
- Pollution
- Environmental Pollutants and Maternal Health
- Gestational Diabetes Mellitus
- Hypertensive Disorders in Pregnancy
- Literature Search
- Literature Review
- Discussion
- The Lancet Article (video)
- Policy Recommendations

Introduction

Evidence for adverse health effects due to hazardous environmental pollutants became well established

→ 12.6 million death globally attributed to the **environment** in 2012, representing 26% of total deaths (WHO, 2016)

→ 9 million premature deaths caused by **pollution**, 16% of global deaths (Landrigan et al., 2017)

Pregnant women are vulnerable group regarding health and their unborn children

"Pollution is the largest environmental cause of disease and premature death in the world today." (Landrigan et al., 2017)



Environmental Exposures of Pregnant Bedouin Women in the South of Israel

Group of researchers from Ben Gurion University in cooperation with Soroka University Medical Center (Beer-Sheva) published several papers

Some findings:

- NO₂ exposure associated with minor malformations
- Hazardous household exposure associated with major malformations
- Ambient air pollution can affect cell proliferation in umbilical cord blood
- Aluminum exposure associated with malformations
- Arsenic exposure associated with preterm deliveries and lower birth weight.

→ **During research a link to maternal pathologies was observed as well**

Pollution



Pollution

Chemicals, biological agents or metals

Produced by transportation, industries, mechanized agriculture, mining, electricity generation, waste, geographical conditions (sand, dust), heating and cooking with biomass (wood, coal, straw, dung)

e.g. carbonmonoxide/-dioxide (CO_x), nitrogen dioxide (NO_2), particulate matter(PM), lead, arsenic, cadmium

Environmental Pollutants and Maternal Health

Focus on two main pathology groups (Gestational Diabetes Mellitus and Hypertensive Disorders in Pregnancy)

Several studies found significant associations, however literature not always consistent

Pathogenesis stays unclear until today, hypothesis includes oxidative stress

Gestational Diabetes Mellitus (GDM)

Carbohydrate intolerance – insulin resistance - resulting in high blood sugar, with onset or first recognition during pregnancy

Associations between increased plasma glucose level and adverse fetal and maternal outcomes are well established

Possible long-term effects, 2 in 3 women with GDM develop diabetes type 2 later in life

Hypertensive Disorders (HD) in Pregnancy

Gestational hypertension, chronic hypertension, preeclampsia and eclampsia

Prevalence globally: 10%

Main symptoms: high blood pressure
+ proteinuria → diagnosis of preeclampsia
→ can lead to the severe form of an eclampsia (seizures)

Pregnancy induced HD are associated with increased risk for chronic hypertension, endothelial dysfunctions and renal disease later in life

Literature Search

Databases: pubmed,
cochrane and google
scholar

→ 18 studies and one
meta-analysis were
selected and discussed



Ambient Air Pollution and HDs in Pregnancy

1 meta-analysis, 6 studies:

Literature not consistent regarding ambient air pollution and maternal pathologies

2 of 6 studies challenge hypothesis

Meta-analysis and 4 studies support association between AAP and hypertensive disorders in pregnancy

Ambient Air Pollution and GDM

3 articles

All 3 found associations

1 found differences in odd ratios regarding pregnancy trimester

1 found only significant evidence for women in the youngest age stratum (<20 years)

Indoor Air Pollution and HD in Pregnancy

4 studies, conducted in low – and middle - income countries

Associations between indoor air pollution and increased blood pressure and hypertensive disorders in pregnancy were found

Limitations (self-reported symptoms, missing exposure measurement, time of outcome measurement)



Indoor Air Pollution and Anemia in Pregnancy

1 cross-sectional study

The studied cohort's prevalence of anemia was very high: 90.5%

Results showed a higher relative risk for anemia in pregnancy for women using biomass fuel

Metals and HD in Pregnancy

2 studies, in USA and in DR Congo

Associations between metals and HD in pregnancy were found

Especially regarding arsenic and lead

Metals and Gestational Diabetes Mellitus

2 studies, USA and China

Results showed association between metals and GDM

Especially with arsenic, cadmium and chromium

Discussion

Literature shows evidence of an association of different hazardous environment exposures and maternal morbidities

→ Adds to the growing body of evidence and awareness regarding the possible damaging health effects of environmental pollutants



Discussion

Literature not always consistent, for example regarding Ambient Air Pollution and Hypertensive Disorders:

2 out of 6 studies did not find significant results

Discussion - Challenges

Methodology:

- Measurement of exposure (estimations based on satellite or monitors, personal monitor)
- Measurement of outcome (when? (trimester, postpartum), definition, self-reported symptoms)
- Possible confounder (how much time person spends at home, air conditioning)

Discussion

Environmental pollution and their effect on the health is a question of wealth

Intriguing difference between high-income and low – or middle income countries (LMIC), unequal distribution

→ Almost 90% of death occur in LMIC, with South-East Asia and (WHO, 2016)

related to air pollution, nearly 2 out of 3 in Western Pacific regions

Discussion

Sustainable Development Goals (SDGs) from the United Nations Development Programme

→ Many of 17 points related to environmental health

The international **Paris agreement on Climate Change** from the United Nations Framework Convention

→ Every member of agreement commits to reduce greenhouse gases like NO_2 , O_3 and PM_{10}

The Lancet Article

Recently published article, video and factsheet regarding environmental pollution and health

→ Shows the relevance of topic

→ It is possible to reduce pollution; many high-income countries could prove this in the last decades and could show that prevention of pollution can be highly cost-effective

The Lancet Article



The Lancet Article

The video:

<https://youtu.be/9jOpNF2uc2M>

Policy Recommendations

- Increase national and international efforts to reduce pollution
- Change laws and increase regulations polluting industries
- Invest in public transportation, bike lanes, walkability and relocate infrastructure of roads
- Support start-ups, new innovations and the clean-tech industry
- Support research on environmental pollution and health

Policy Recommendations

- Funding of new jobs through creation of sustainable cities, green technologies
- Educate public through different media but especially in all school levels
- Educate health professionals, e.g. public health professional, doctors, nurses, midwives
- Educate women in the reproductive age, educate pregnant women and parents
- Know-how, resource and technology support from high-income countries and the United Nations to LMIC

THANK YOU

Questions

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