

Prevalence, Risk factors, Diagnosis and adverse outcomes associated with GDM in mothers and offspring : *A Systematic Review*

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SUBMITTED BY

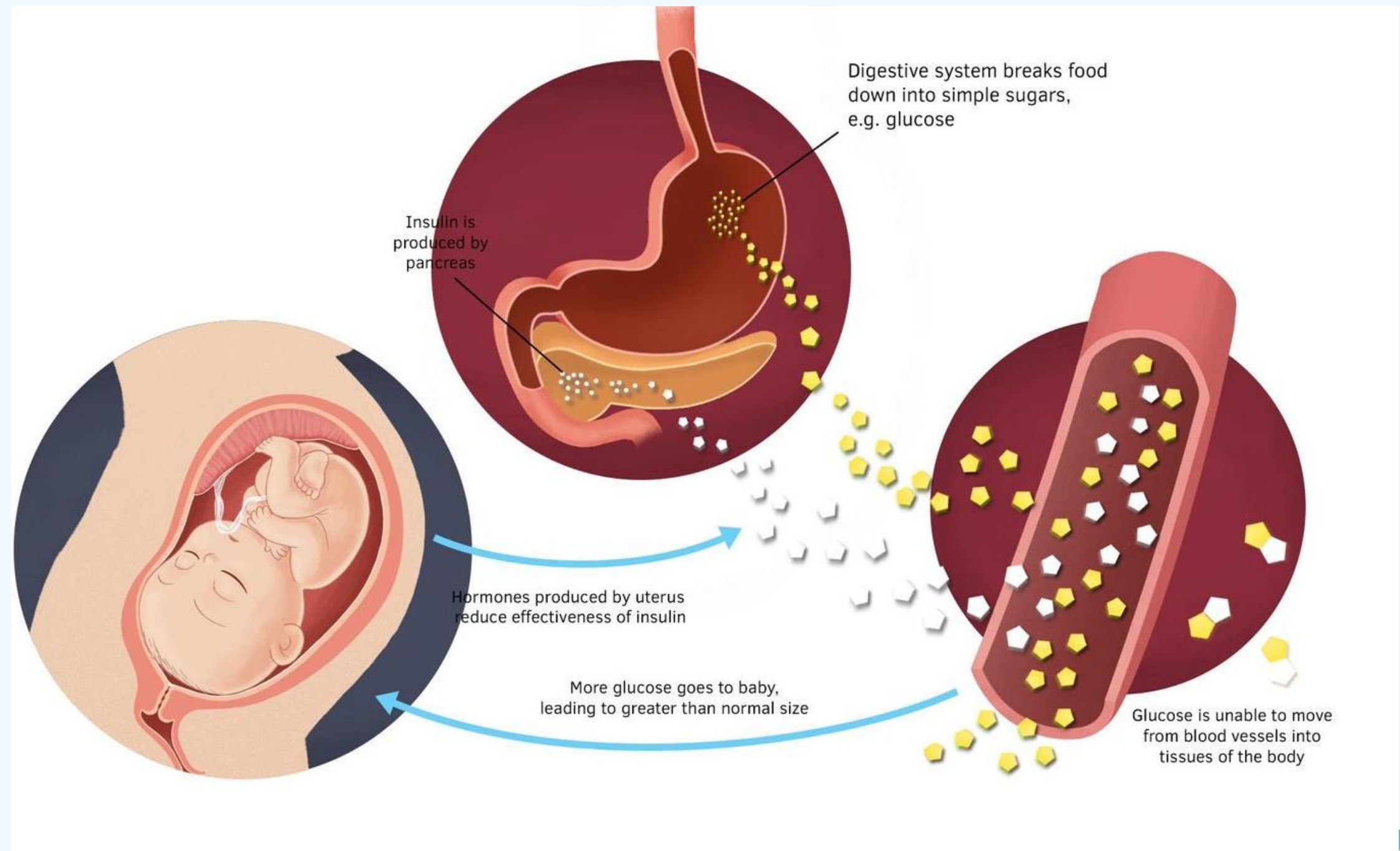
Rituparna Das

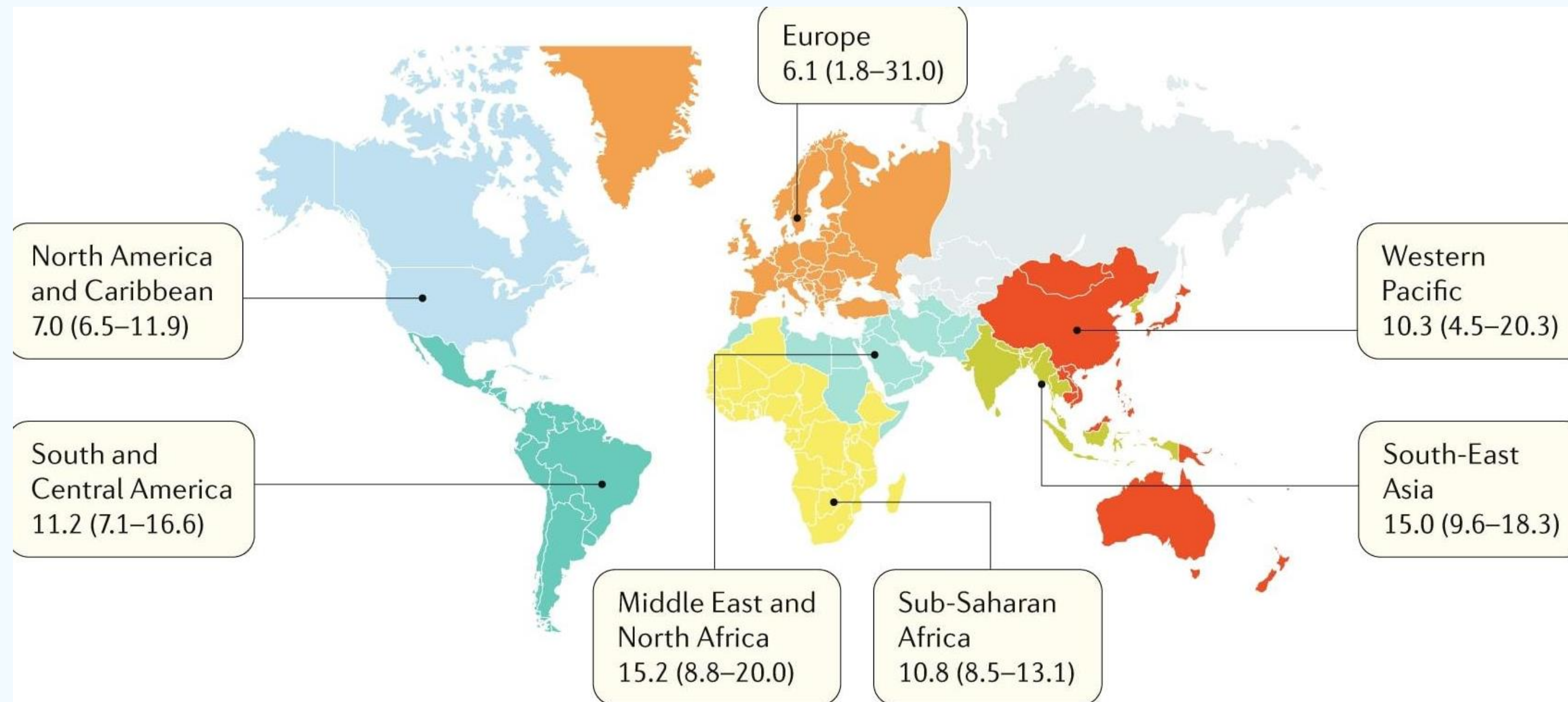
GUIDED BY

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WHAT IS GESTATIONAL DIABETES MELLITUS ?

Any degree of glucose intolerance with onset or recognition of pregnancy. GDM is characterized by pancreatic β -cell function that is insufficient to meet the body's insulin needs.





Source: McIntyre et. al, Gestational Diabetes Mellitus

According to International Diabetes Federation, approximately 223 million women aged between 20-79 years have known to suffer from Diabetes. This number is to be increased to 343 million by the year 2045. 20 million or 16% of live birth had hyperglycaemia in pregnancy. Out of these, 84% were due to GDM.



RESEARCH QUESTION

- TO ASSESS THE CURRENT PREVALENCE, AND THE RISK FACTORS ASSOCIATED WITH GDM IN LOW-AND-MIDDLE-INCOME COUNTRIES.

OBJECTIVES

- TO IDENTIFY THE ADVERSE PERINATAL/NEONATAL OUTCOMES AND NEONATAL OUTCOMES ASSOCIATED WITH GDM.
- 

Screening and Diagnosis of GDM

Criteria	Diagnosis
ADA (2014)	GDM defined when any of the following values are exceeded: Fasting ≥ 92 mg/dL (5.1 mmol/L) 1-h ≥ 180 mg/dL (10.0 mmol/L) 2-h ≥ 153 mg/dL (8.5 mmol/L)
IADPSG	GDM defined as at least one value meeting the threshold: Fasting plasma glucose ≥ 5.1 mmol/L 1-h plasma glucose ≥ 10.0 mmol/L 2-h plasma glucose ≥ 8.5 mmol/L
WHO	GDM defined as diabetes or impaired glucose tolerance. Diabetes defined as at least one value meeting the threshold: • Fasting plasma glucose ≥ 7.0 mmol/L • 2-h plasma glucose ≥ 11.1 mmol/L Impaired glucose tolerance defined as: • Fasting plasma glucose < 7.0 mmol/L • 2-h plasma glucose ≥ 7.9 mmol/L

METHODOLOGY

DATA SOURCES AND SEARCH STRATEGY

- The following electronic database were searched to locate the prevalence, risks, diagnosis with respect to GDM in mothers followed by its complications in the mother and offspring.
- Search strategy that contained key terms were GDM, Risk factors, Neonatal outcomes, maternal outcome, pre-eclampsia, macrosomia OR large for gestational age, Diabetes Mellitus, insulin, c-section, low-and-middle income countries.

INCLUSION AND EXCLUSION CRITERIA

- Observational, experimental studies
- Must be carried in low-and-middle income countries.
- Participants were classified as pregnant, or postpartum women of age ≥ 18 having GDM or were at risk counted.
- Off-springs born to mother who had GDM or were at risk were counted.
- Exclusion criteria included women with DM-type I or II
- Made no exceptions on ethnicity
- Letters, Abstracts, Editorials and comments were not used.
- Study which didn't reported any of the above objectives.

DATA COLLECTION AND EXTRACTION

- Screen the abstract of the articles generated by the search and identify the eligible studies based on the inclusion criteria.
- Full text was obtained and assessed if eligibility wasn't clear.
- Extracted data mentioned the following: the "first author's surname", "year of publication", "study design", "duration of the study", "participant's age", "gestational age".
- Data on prevalence percentage and the outcomes of interest with adjusted and or odds ratio were extracted.
- Data on short and long outcomes of GDM rate of "caesarean section", "still-birth", number of new born with "macrosomia" (birth weight >4 kg) and the preterm birth were obtained.

MATERNAL OUTCOMES

"Cesarean delivery"
"Pre-eclampsia"/" pregnancy induced hypertension"
Polyhydramnios
Post-partum hemorrhage
Vaginal candidiasis,
Abruptio placentae

NEONATAL OUTCOMES

Still birth
"Shoulder dystocia"
Jaundice, "Low birth weight"
Congenital malformation
"Small and Large for gestational age"
Macrosomia, "Intrauterine growth restriction"
"Respiratory distress syndrome"

ADVERSE MATERNAL AND NEONATAL OUTCOMES

RESULTS

A PRISMA (Preferred Reporting Items for Systematic Review and Meta-analyses) flowchart depicts the search results of a database and the final included studies.



CHARACTERISTICS OF INCLUDED STUDIES

Reference, country Study design	Participants Characteristics	Diagnostic method	Outcome	Statistical analysis
1 Nicolosi et al. (2020), Brazil Cohort	569 patients, control(229 and 340 (GDM and MGH) patient	100 g- OGTT, 75 g - OGTT was administere d	Association of maternal factors with “hyperglycemia in pregnancy” and its “perinatal outcomes”.	“HIP” was associated with the following: age≥ 25 years [1.81, 1.44-2.27], number of prenatal visits were less than 6 [1.33, 1.11-1.60]”, multiparity (pregnancy≥2) [1.82, 1/43-2.31]
2 Mohan et.al (2015), India Prospective observational	Pregnant women of gestational age of ≥ 24 weeks were included.	Subjects administered glucose challenge test, participants with “plasma glucose level ≥ 140 mg/dl were subjected to OGTT”.	“Prevalence” and “risk factors” of “GDM” were evaluated GDM hypertension: 28.1% Vaginal Candidiasis: 25% Abruptio placentae: 12.5%.	Significant difference was reported between two groups”. The distribution of various complications between two groups (p=0.01, $\chi^2=38$. (p= 0.001, $\chi^2=38.184$)

CHARACTERISTICS OF INCLUDED STUDIES (continued)

Reference, country Study design		Participants Characteristics	Diagnostic method	Outcome	Statistical analysis
3	Muche et al (2020) Northwest Ethiopia Prospective cohort	Pregnant women aged 18 or above, had single pregnancy of "20-23+6 weeks of gestation".	Two-hour 75 g OGTT" was performed at "24- 28 weeks" using a HemoCue.	Risk of adverse neonatal outcomes	207 women out of 684 that is(30.3%, 95% CI: 26.9, 33.6)" had at least one types of adverse "neonatal outcome".
4	Macaulay et.al (2017), Africa Cross-sectional study	Women with singleton pregnancies, aged ≥ 18 and ≤ 20 weeks pregnant were studied.	OGTT performed , participants administered 75 g glucose dissolved in 250 ml water, WHO 2013 criteria used.	Prevalence" of "GDM" amongst south African women, describe "GDM" associated risk factors and clinical management.	83% of women (145/174) had abnormal fasting glucose reading. "fasting plasma glucose test" had a "sensitivity" 83% (95% CI 77.0,88.5) and "specificity" 100% (95%CI 99.8,100) of diagnosing GDM

CHARACTERISTICS OF INCLUDED STUDIES (continued)

Reference, country Study design		Participants Characteristics	Diagnostic method	Outcome	Statistical analysis
5	Mwanri et al. (2014), Tanzania Cross-sectional study	Pregnant women aged ≥ 20 weeks" and 20 weeks of gestational age or more attending "ANC" during the survey period	WHO 1999 diagnostic criteria were used, Blood samples were collected at fasting at 2h after 75 g glucose load	Prevalence of GDM in "urban and rural Tanzania"	Women with previous "still birth" had a higher prevalence of "GDM" (95% CI= 1.5-5.4).
	6 Grunnet et. al (2020) Rural Tanzania Not specified	One group, n= 383 aged 18-40 years, was enrolled before pregnancy conceived during study period.	Based on fasting Blood glucose from OGTT, which was performed after 12- h of overnight fasting. (diagnosed according to the WHO 2013 criteria.	High prevalence of GDM among women in rural Tanzania	GDM diagnosis based on, fasting sample, (n=144), %(95%-CI) = 94.1 (94.0,94.2)

CHARACTERISTICS OF INCLUDED STUDIES (continued)

Reference, country Study design	Participants Characteristics	Diagnostic method	Outcome	Statistical analysis
7 Sudhasinghe et. al (2018) Srilanka Prospective cohort study	Women diagnosed with "GDM" were called for study, (n=194). And women with non-GDM were included.	Data until "one-year postpartum", "BP", "post-partum 75g OGTT and cholesterol"; "anthropometry" were obtained.	Long and short-term outcomes of GDM among South Asian women- A community based study.	At two months postpartum- one in 10 women (17/169) with GDM had Diabetes while one in three women (55/169) in GDM group had abnormal glucose tolerance. Outcomes at 2 months postpartum, of singleton deliveries: 4 still births, PIH (18.9%, 32/169), premature delivery in GDM group (15.4%, 26/169). At one year postpartum, one-fifth(11/59) in the women developed, abnormal glucose tolerance in the GDM group (28/59).

Risk factors associated with GDM

- The risk factors observed were, age ≥ 25 years, multiparity, no exercise/sedentary lifestyle, family history of DM, hypertension and pre-pregnancy.
- Obesity, no physical activity are the risk factors .

Prevalence associated with GDM

- A study conducted in Rural Tanzania, showed more prevalence in urban areas.
- another study in Northeast Tanzania showed a prevalence of 39%.
- In India, there were 32 participants among 201, diagnosed with GDM.
- One of the study by Macaulay et al, recorded a prevalence of 9.4%.
- Sudhasinghe et. al studied the diabetes as a risk factor at two-months postpartum and at 1 year postpartum.

Adverse outcomes associated with GDM

- Vaginal moniliasis, breast engorgement, birth weight ≥ 3.5 kg, premature baby, maternal IFT, PIH abnormal glucose intolerance , Vaginal candidiasis, abruptio placentae, c-section, macrosomia, Still birth , obesity and anemia, LBW showed significant outcomes.

DISCUSSION

- **Health systems are insufficiently compounded in low-and-middle income countries and research on GDM is not well documented.**
- **A review article concluded the incidence of outcomes such as c-section, PIH, Pre-eclampsia, Preterm labour, macrosomia, LGA, Stillbirth, Hypoglycaemia, and Shoulder dystocia. With USA being the highest in terms of caesarean section (30.0) [12] and LGA (35.0).**
- **On the other hand, Iranian study” reported a highest rate of “c-section” that is (87.1%), which shows the outcomes are much worse in the “low-and-middle-income countries**
- **Major long term outcome is Diabetes Mellitus has been included in this study, for which again obesity (88% in GDM patient), poor lifestyle are the risk factors.**
- **Studies showing an association of adverse outcomes and GDM in mothers raise a question whether it is due to the maternal factors or contributed by the socioeconomic factors**

TREATMENT

- **Insulin** has been the therapeutic agent of choice for controlling hyperglycemia in pregnant women. However, due to difficulty in medical administration, and potential for hypoglycemia
- **Glyburide** and **metformin** have been found to be safe, effective and economical for the treatment of gestational diabetes.

MANAGEMENT

- Allehadan et. al elaborated the diet characteristics such as low carbohydrate diets, mindful eating, non-energy restricted diet.
- The exercise characteristics ranged from aerobic exercise, resistance exercise, yoga, structured aerobic and resistance exercise



CONCLUSION

- Serious efforts should be made to improve the maternal and child health. As seen from the previous research, health systems are not properly framed, or even if framed not properly implemented in “low-and -middle income countries”.
- Maternal mortality has consequently reduced over the few years due to better facilities, reproductive health and socioeconomic factors. But still, a lot has to be changed in the coming years. Although communicable diseases such as HIV, malaria and diabetes contribute to the burden of maternal mortality, obstetric complications are one of these few conditions that need improvement.

RECOMMENDATIONS

- Properly managed using timely antenatal check-ups, monitoring of blood glucose levels, proper diet and exercise interventions.
- Further research on the long-term effects of GDM and how can it be managed in a “low-and-middle income” country should be documented in order for better health of mother as well as the child.

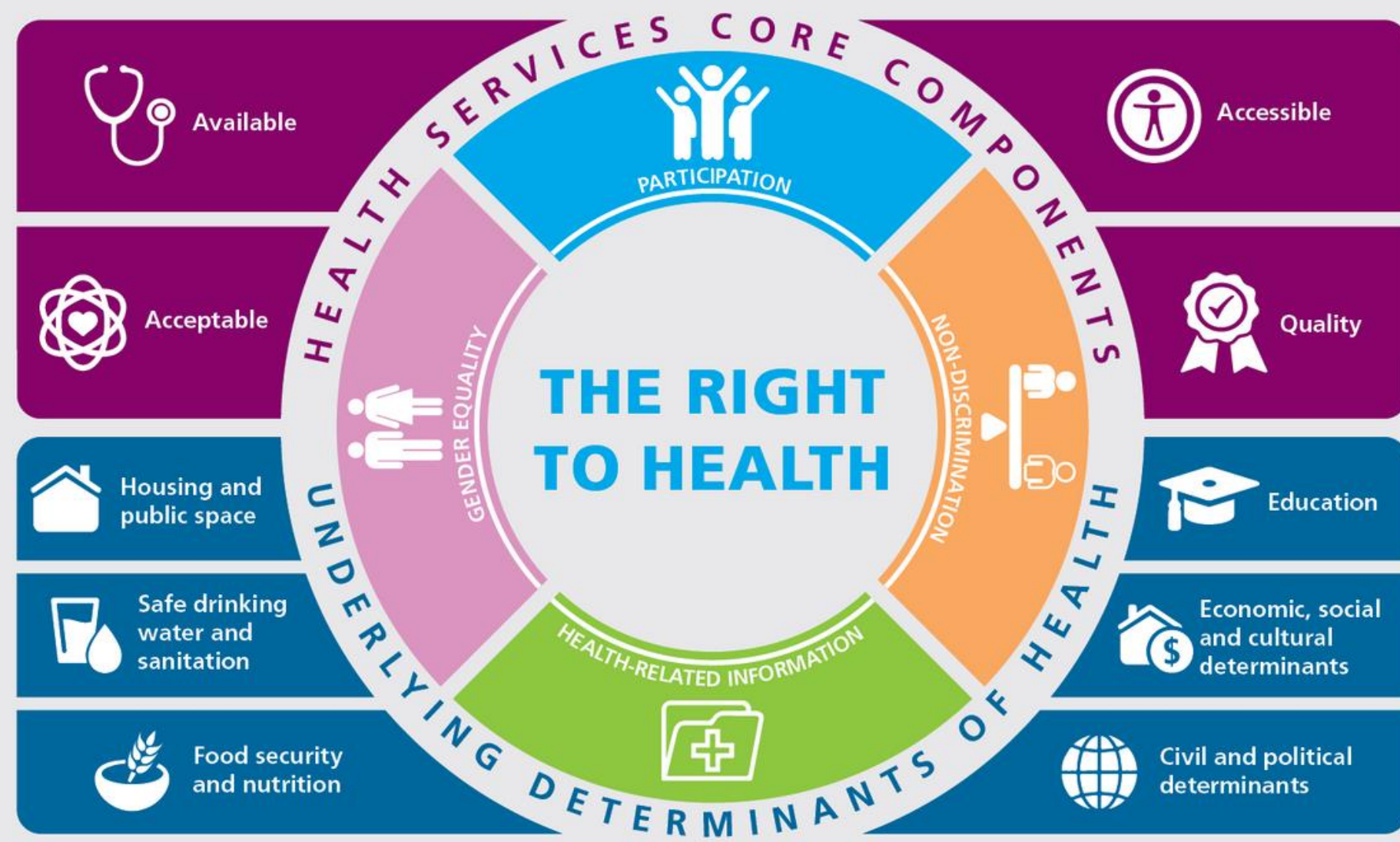


PART-II

INTRODUCTION TO GLOBAL HEALTH



THE RIGHT TO HEALTH



ABOUT THE COURSE

- Global Health has been defined as area of study, research and practice that prioritize improvement of health and enables equity in health for all across the globe.
- It has focused on the determinants and distribution of health in various regions of the world. It's requires an understanding of several aspects such as medicine, economics, sociology, medicine, epidemiology and demography.
- Learning platform: Coursera
- University: University of Copenhagen
- Efforts level: 21
- 7 Modules

OBJECTIVES

- **To gain an insight into what are the most important health challenges and how it has changed over time.**
- **To study the determinants of such changes and examine the future projections.**
- **To understand the successful international strategies and programs that promote human health.**
- **To learn about the global health governance structures.**

COURSE CONTENTS

1

DEFINING AND MEASURING GLOBAL HEALTH

2

INFECTIOUS DISEASES, LIKE MALARIA, HIV, DIARRHEAL DISEASES

3

NON-COMMUNICABLE DISEASES, LIKE DIABETES, AND MENTAL HEALTH

4

MATERNAL AND CHILD , SEXUAL AND REPRODUCTIVE HEALTH, MCHILD HEALTH AND CONTINUM OF CARE.

COURSE CONTENTS

5

**ENVIRONMENT, CLIMATE AND
MIGRATION**

6

**ACCESS TO NUTRITIOUS FOOD, CLEAN
WATER AND SANITATION**

7

**HEALTH SYSTEMS AND GLOBAL
HEALTH GOVERNANCE**



DATA SETS AND GRAPHS



PPTs AND THEORIES



CASE STUDY



QUIZ AND EXCECISE

METHODOLOGY



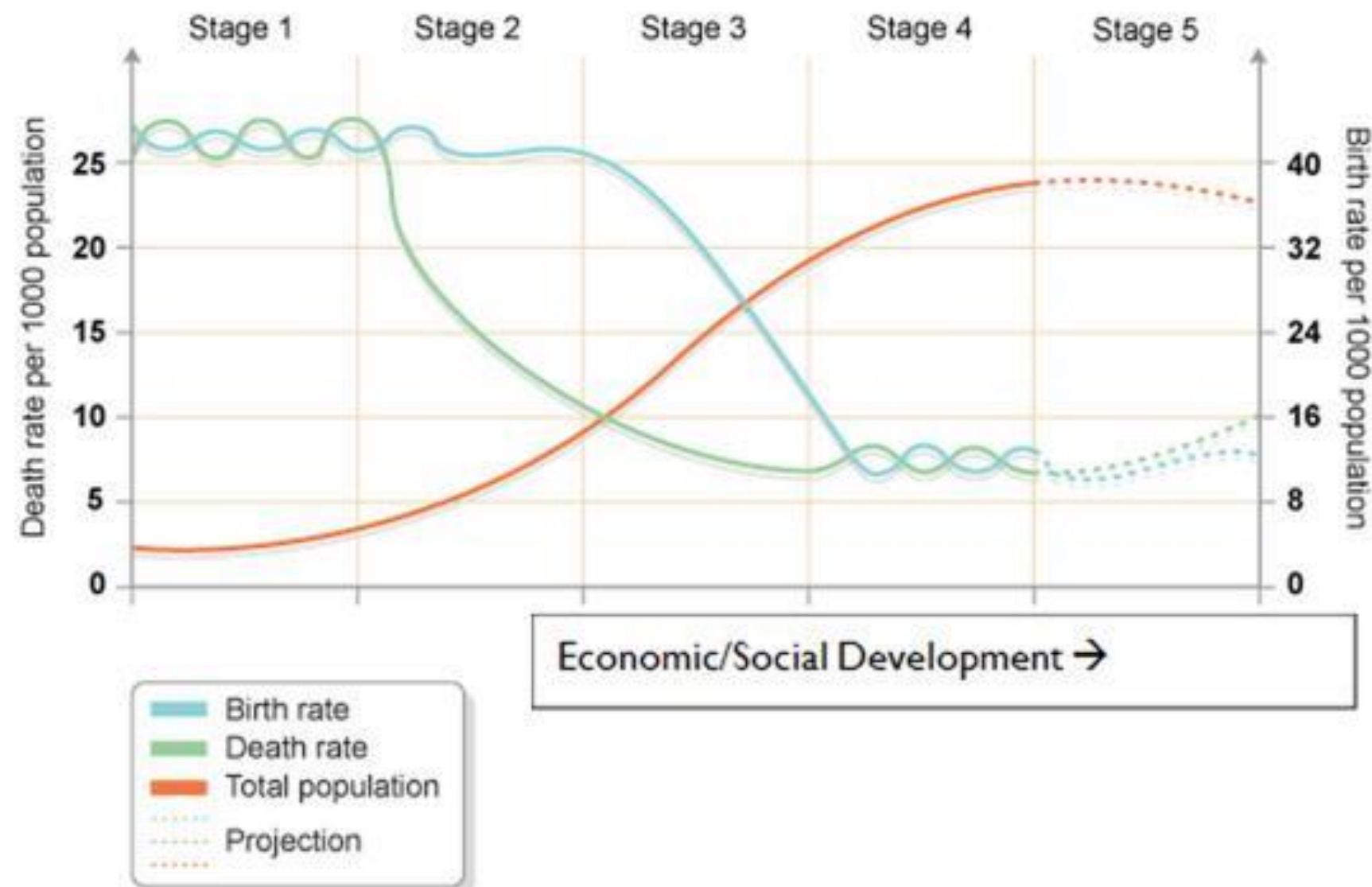
KEY LEARNINGS

DEFINING AND MEASURING GLOBAL HEALTH

- It is combination of local, national and international action governance to address all the issues such as a pandemic, climate change etc, irrespective of any geographical area.
- Revolutionary movement in 1990s, Political instability and rise of HIV and how governance changed people's life .

MEASURING GLOBAL HEALTH

- Demographic transition
- Epidemiological trend
- change in trrends like life expectancy, fertility rates.

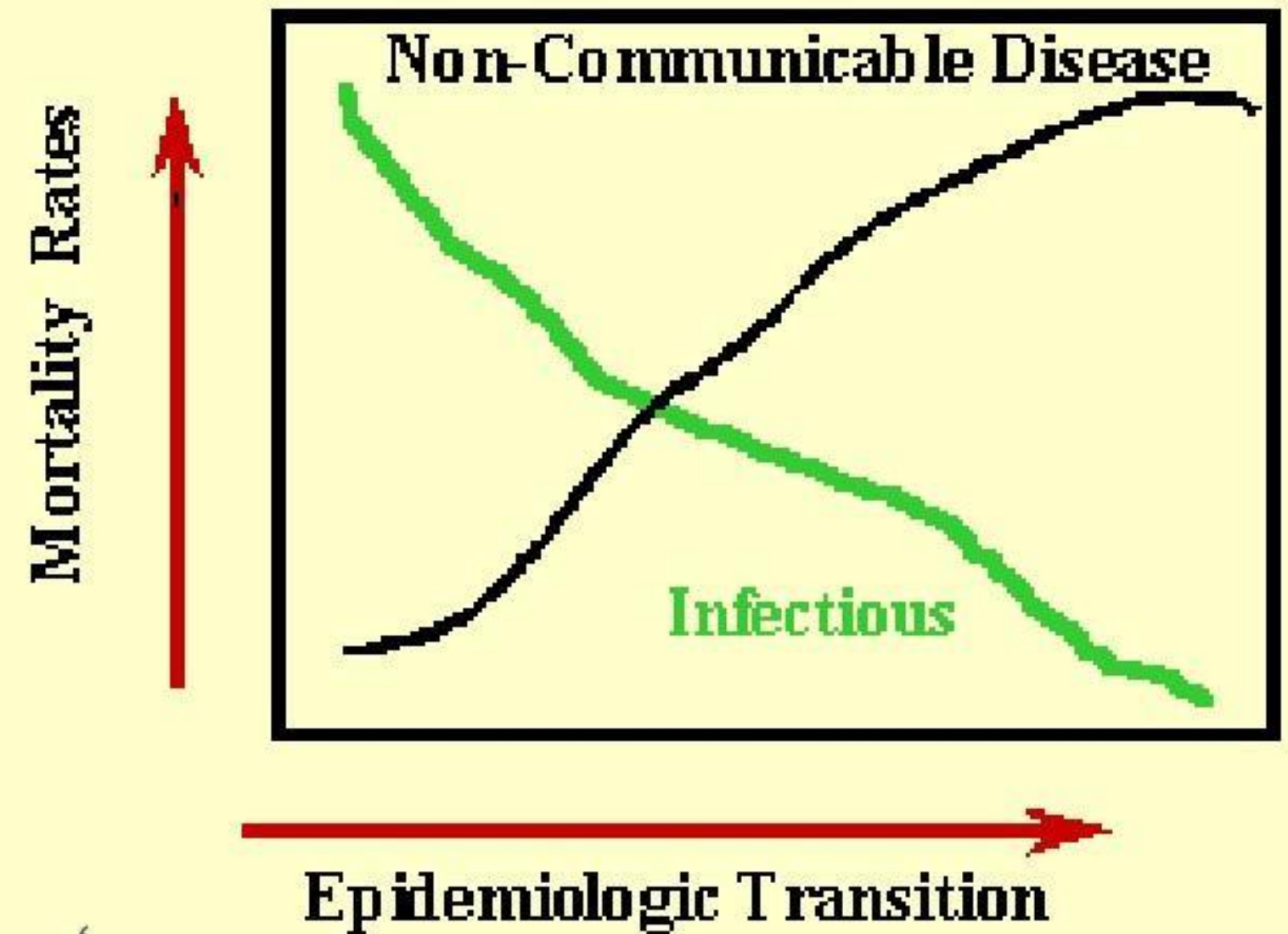


(a)

DEMOGRAPHIC TRANSITION MODEL

(b)

EPIDEMIOLOGICAL TRANSITION MODEL



• DALY- DISABILITY ADJUSTED LIFE YEARS: HEALTH GAP MEASURE

YLL (Life lost due to early death) + YLD (Life lost to disease or disability

- **Risk factors associated with NCDs.**
- **Comorbidities (Tuberculosis; AIDS) and (Tuberculosis; Diabetes)**
- **Determinants (socioeconomic status, education, urbanization, and geographical area.**

• INFECTIOUS DISEASES

HIV

- Symptoms
- Treatment
- Prevention
- Management

DIARRHEAL DISEASES

- 3rd most leading cause of mortality in children.
- Unsafe water, poor sanitation, and hygiene are the causes.
- No antiviral drugs available, treated using ORS and rehydration.

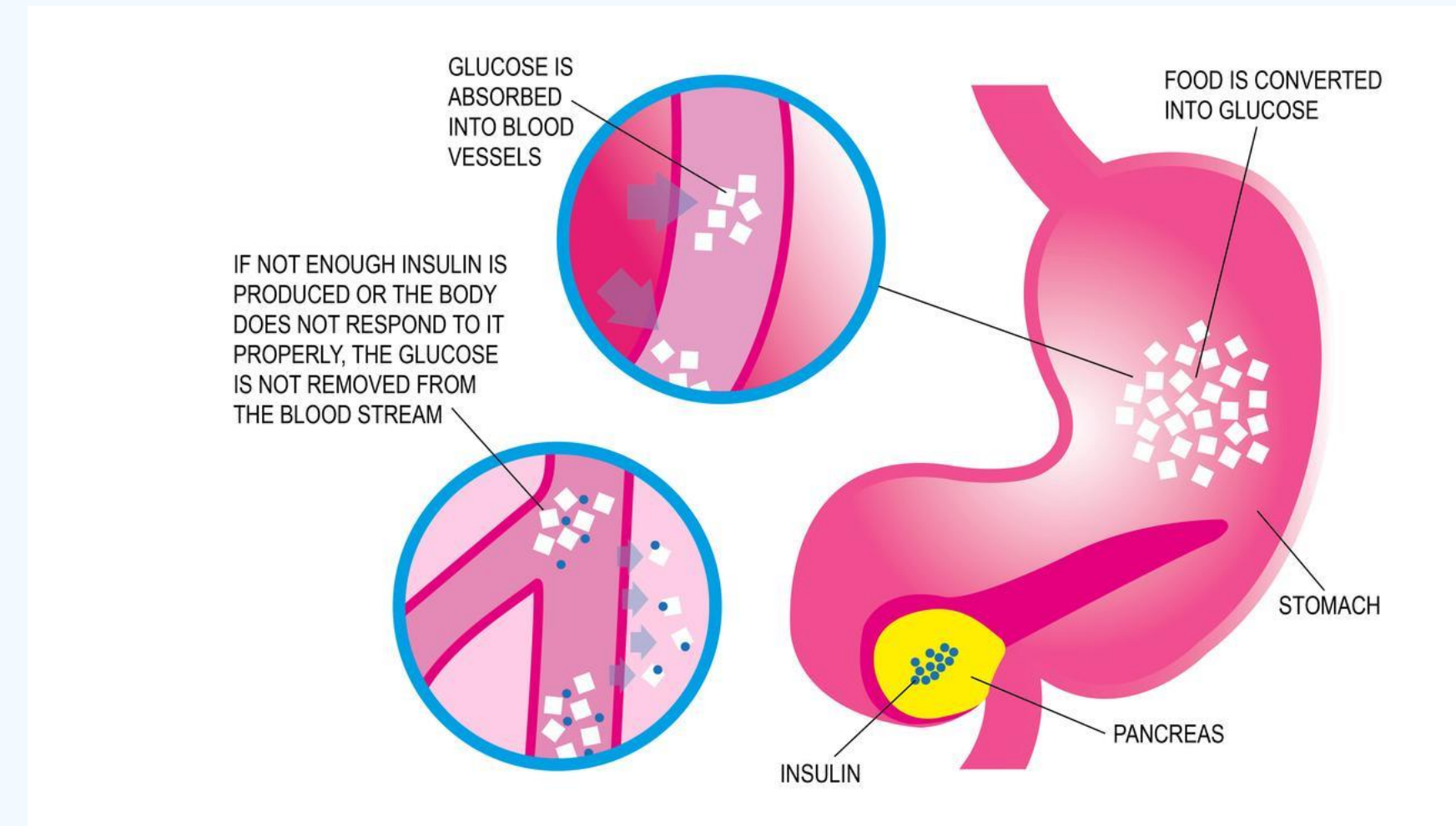
MALARIA

- .Symptoms
- Treatment
- caued by Anopheles (Plasmodium sp.)

NON-INFECTIOUS DISEASES

DISEASES LIKE DIABETES, CARDIOVASCULAR DISEASES SHARE COMMON MITIGATION, RISK FACTORS AND PREVENTION.

- Risk factors associated- tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol.
- Diabetes causes severe complications like retinopathy, end-stage renal disease, heart attacks, strokes and amputation.
- Mental health is the most neglected issue and a global burden of disease resulting into mental disorders such as depression, anxiety, bipolar disorders etc.
- The reason being high unemployment, potential use of alcohol is increasing suicide rates. The data has reported that only 10% with mental disorders receive adequate treatment.
- How pesticides are the leading causes of suicides (WHO) and the way Srilanka comabated it.

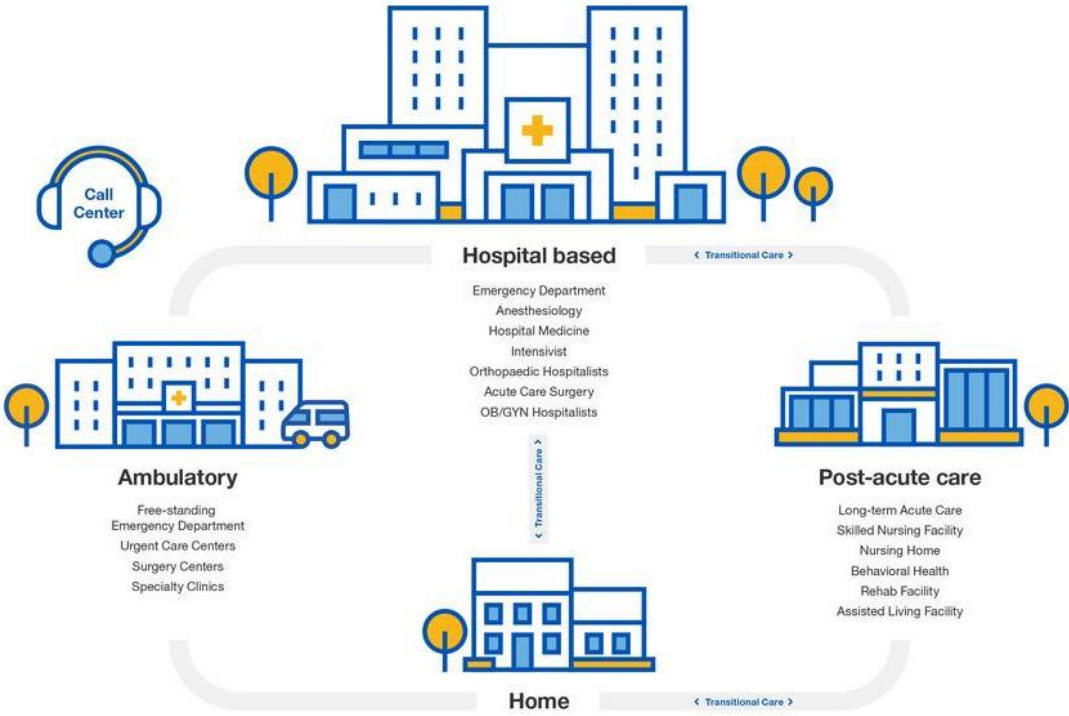


SEXUAL AND REPRODUCTIVE HEALTH

- Use of modern conception, family planning, right to reproductive health, maternal mortality, transmission of STDs,
- Abortion stigma has been thoroughly addressed. With the adoption of Sustainable development 2015, sexual reproductive health and rights has been included which was not earlier considered an agenda for Millennium Development Goals.

ROLE OF UNFPA

- to ensure every pregnancy is wanted and safe, and that the potential of every young person is fulfilled.
- UNFPA ensures that people can do family planning, and that's why contraceptives are the need of a family.
- promotes different types of contraceptives based on the medical condition of a women.



CONTINUUM OF CARE

CHILD HEALTH

MHEALTH- USING PHONES

- It includes the collection of clinical health data to increase accuracy and timeliness, direct provision of care to populations to those who are deprived of by telemedicine.
- The aim is to use the low-tech mobile phone technology to link pregnant women to the health system through pregnancy, childbirth and postpartum period. Women are basically registered at the first antenatal care visit with a date, a phone number, and gestational age.
- A specially designed software creates an individual pregnancy timeline for each woman and automatically sends text messages to the registered phone numbers. The messages focus on health educations, skilled delivery attendants, as well as appointment reminders for next antenatal care visit.

ENVIRONMENTAL HEALTH AND CLIMATE CHANGE, MIGRATION

- Air quality pose a great risk to human health. Of all the risk factors identified,
- indoor household pollution from solid fuels is a global burden added by burden caused by outdoor air pollution.
- Often children and women are most exposed to it. The increased use of vehicles, burning plastics and fuel, affects mostly in urban areas.
- Some of the interventions include solid waste disposal, waste water management, provision of safe water, sanitation, noise.
- Migration and Health in a Scandinavian Context: Migration is not only a geographical movement from one place to another but also a socioeconomic, psychological and environmental life event.
- Migration risk factors and health; pre-and-post migration factors

FOOD NUTRITION, SANITATION AND CLEAN WATER

- Determinant of poverty
- Undernutrition lead to malnutrition
- Micronutrient and macronutrient supplementation.
- Poor quality water, insufficient access to water, lack of appropriate sanitation and poor personal hygiene, such factors greatly increased intestinal worm infections, skin and eye diseases and a number of other water and hygiene related problems.
- Increasing the access to appropriate water and sanitation is regarded a human right.
- With 89% of the world population having access to safe drinking water.
- vector-borne disease; malaria, filariasis
- Hepatitis A and E viruses and bacteria or cholera that causes typhoid fever. Skin diseases such as scabies and trachoma; infectious eye and skin disease

HEALTH SYSTEMS AND GLOBAL HEALTH GOVERNANCE

- It has given an outline as to how WHO works with UN agencies (UNFPA, UNDP, UNICEF) in global level, and those global policies are turned into actionable programs at regional level. At country level, much of work is focused on planning, monitoring and evaluating the public health programmes.
- Universal health coverage
- According to WHO World Health Report, in order to meet millennium development goals for health countries would on average need to spend a little more than 60 U.S dollars per capita per year. The strategies to increase the efficiency:
- raising collection using tax system, implement sin taxes.
- Global Health Governance: The foundation of World Health Organization in 1948 has led to the division of shared governments of the response to health challenges, finding issues, aggregating on common approaches, bringing political attention, raising necessary funding, adequate workforce capacity. For example- eradication of small pox



Let's aim at
Affordable Health Care
for everyone at
World Health Day



HEALTH FOR ALL



THANKYOU