THE HINDU ANALYSIS – 10 JUNE 2023

EDITORIAL 1: HOW LONG-TERM STRESS IMPACTS THE INTESTINE AND YOUR LIFE

CONTEXT

- The crossroads of mental health and gastroenterology got a lot more attention in May this year, with a study published in Cell journal, titled 'T**he enteric nervous system relays psychological stress to intestinal inflammation'.**

THE STUDY

- Mental health profoundly impacts inflammatory responses in the body. This is particularly apparent in **inflammatory bowel disease (IBD),** in which psychological stress is associated with exacerbated disease flares.
- It's an important study as for the first time we have a much clearer understanding of the possible underlying mechanisms of inflammatory response and the whole cascade which ultimately precipitates the disorder.
- This is good not only for researchers but also for clinicians, because the pathways have been quite well explained.

STRESS FRACTURE

- The study talks of stress pushing the adrenal gland to make **glucocorticoids**, a steroidal stress hormone.
- When stress is short-term, like before an exam, it may result in a loss of appetite and increased frequency of stools.
- When it's chronic, or experienced long term, over a few weeks to months to years, like in a toxic job or marriage or through childhood with the pressure to perform, it can result in i**nflammation of the gastrointestinal tract**, an example being inflammatory bowel disease (IBD).
- With chronic stress, the body is constantly producing glucocorticoids. Two mechanisms may kick in, : "

- **One** is mediated by **monocytes** (white blood cells in the immune system that kill invaders) and **TNF** (tumour necrosis factor, a protein made by white blood cells), both mediators of inflammation through **colony stimulating factor-1** (CSF-1, signalling pathways),". This results in physical changes to the intestine – damage to the intestinal mucous membrane due to the inflammation.
- "The **second** is associated with **neurotransmitter acetylcholine deficiency and dysmotility** (abnormal speed of intestinal movement due to improper functioning of the muscles in the area). This is mediated through another inflammatory mediator: **transforming growth factor** (TGF) beta 2,". This is the functional change in the gut.

TWO DISORDERS

- IBD is quite different from irritable bowel syndrome (IBS) that is also precipitated by stress, and seen a great deal in women. Unlike IBD though, IBS does not cause, and neither is it caused by an inflammatory response.
- IBD is caused by multiple factors, one of which is stress.
- IBD is immunologically mediated (relating to the immune system) and can be hereditary.
- **Ulcerative colitis** and **Crohn's disease** are two examples of IBD and bear the risk of colorectal cancer, while IBS is a part of a larger clutch of disorders of the gut-brain interaction (**DGBI**).

DUAL BRAINS

- What the study also does is to draw attention back to the way stress impacts the body, particularly the GI system.
- There are two brains: the big brain and the small brain (nerves in the intestine).
- The gut-brain axis is controlled by the **parasympathetic nervous system** (the vagus nerve that regulates internal organ functions like digestion), and the **sympathetic nervous system** located across the body.
- Both are connected with the enteric nervous system located in the gastrointestinal system (the small brain).

- The two brains 'talk' to each other (exchange information), hence stress occurring in the big brain can cause changes in the small brain (butterflies in the stomach before an exam).
- Physiologically, stress affects the hypothalamus-pituitary-adrenal (HPA) axis, activates the sympathetic nervous system, releases inflammatory cytokines and cortisol. This has an impact on both IBS and IBD.

WAY FORWARD

- We cannot eliminate stress; we can only evolve mechanisms of coping better with stress. Aerobic exercise and yoga play a big role in dissipating stress.
- Aerobic exercises release endorphins which not only boost mood, but also helps in coping better with pain. A regular yoga practice boosts brain-derived neurotrophic factor (BDNF) levels, important in learning and memory. Yoga also induces a relaxation response.

EDITORIAL 2: CYCLONE'S EFFECT ON MONSOON ONSET

CONTEXT

- Global warming's effects on cyclogenesis over the Pacific and North Indian Oceans, the warming over the North Indian Ocean and the late pre-monsoon cyclones and typhoons are another monkey wrench in the monsoons' dynamics – and in the predictions of the monsoon's onset and its evolution through the season.

THE IMPACT

- We are seeing cyclone formations in the pre-monsoon cyclone season, closer to the monsoon onset, arguably due to the influence of a **warmer Arctic Ocean** on the winds over the Arabian Sea.
- The monsoon is of course also affected by the **three tropical oceans** — Indian, Atlantic, and Pacific; the '**atmospheric bridge**' from the Arctic; and the **oceanic tunnel as well as the atmospheric bridge** from the Southern Ocean (a.k.a. the Antarctic Ocean).
- A '**bridge'** refers to two faraway regions interacting in the atmosphere while a '**tunnel'** refers to two remote oceanic regions connecting within the ocean.

IMPORTANCE OF A CYCLONE'S POSITION

- Some cyclones in the North Indian Ocean have had both positive and negative impacts on the onset of the monsoon. Since the circulation of winds around the cyclones is in the anticlockwise direction, the location of the cyclone is critical as far as the cyclone's impact on the transition of the monsoon trough is concerned.
- For example, if a cyclone lies further north in the Bay of Bengal, the back-winds blowing from the southwest to the northeast can pull the monsoon trough forward, and assist in the monsoon's onset as evident with **Cyclone Mocha** which developed in the first half of May and intensify briefly into a 'super cyclonic storm.
- One severe consequence of the anomalous anticyclones since March is that both the Arabian Sea and the Bay of Bengal have warmed by more than 1º C in the pre-monsoon season.

MAWAR, BIPARJOY, AND GUCHOL

- Cyclone Biparjoy is not interacting much with the monsoon trough at this time. However, its late birth as well as the late onset of the monsoon are both closely related to typhoons in the northwestern Pacific Ocean.
- On May 19, Typhoon Mawar was born and dissipated by June 3. Mawar qualified as a 'super typhoon' and is thus far the strongest typhoon to have taken shape in May. It is also the strongest cyclone of 2023 so far.
- Tropical storm Guchol is now active just to the east of the Philippines and is likely to continue northwest before veering off to the northeast. These powerful typhoons are thirsty beasts and demand moisture from far and wide.

SOUTHWESTERLY WINDS

- Cyclone Mawar pulled winds across the equator into the North Indian Ocean, setting up southwesterly winds over parts of the Arabian Sea and the Bay of Bengal.
- Southwesterly' means blowing from the southwest.
- Southwesterly winds over the Arabian Sea are welcome news: they bring large quantities of moisture onto the Indian subcontinent.
- On the other hand, southwesterly winds over the Bay of Bengal are bad news for the monsoon.
- The monsoon winds over the southern Bay of Bengal sweep in from the southwest and west, but they turn around and head northwest towards India from the southeast.

LITTLE CAR ON A HIGHWAY

- The strong southwesterly winds over the Bay of Bengal can be imagined to be a very large highway with heavy traffic heading from the southwest, over southern peninsular India and Sri Lanka, towards the South China Sea and the northwestern Pacific Ocean, feeding the monstrous typhoons there.
- The monsoon trough in the meantime is like a little car trying to cross this busy and wide highway from the Andaman Nicobar Islands to India across the Bay of Bengal.

CONCLUSION

- This complicated dance of global warming affecting cyclogenesis over the Pacific and North Indian Oceans, the warming over the North Indian Ocean and the late pre-monsoon cyclones and typhoons together is just another monkey wrench in the monsoons' dynamics — and in the predictions of the monsoon's onset and its evolution through the season. Once seen as a very reliable system, with its annual migration northwestward and the withdrawal southeastward, the monsoon trough is now being kicked around in the game of climate-change football.