

TARGET PRELIMS 2023

BOOKLET-2

SCIENCE AND TECHNOLOGY-2

HEALTH, DISEASES

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Levelup IAS

2. NATIONAL FAMILY HEALTH SURVEY – 4 (NFHS)

- **Details: About NFHS**
 - The NFHS is a large-scale, multi-round survey, conducted in a representative sample of households throughout India. First survey was done in 1992-94 and since then 5 rounds have been conducted.
- **Who conducts this survey?**
 - **International Institute for Population Sciences (IIPS)**, Mumbai, is the National Nodal Agency.
 - MoHFW has decided to conduct integrated NFHS with a periodicity of three years in lieu of different surveys from 2015-16 onwards to meet the evolving requirements for frequent, timely and appropriate **data** at the National, State and District level.
- **NFHS-5:** Basic indicators are similar to NFHS-4, however some **new focal areas** have been added including death registration, pre-school education, expanded domain of child immunization, components of micro-nutrients to children, menstrual hygiene, frequency of alcohol and tobacco use, additional component of NCDs, expanding age ranges for measuring hypertension and diabetes among all aged 15 years and above, which will give requisite input for strengthening existing programs and evolving new policy intervention

- **Key Highlights** (After the release of phase-II findings in Nov 2021)

- **The Total Fertility Rate (TFR)** (an average number of children per women) has further declined from 2.2 to 2.0 at the national level (Only six states, Bihar (3), Meghalaya (2.9) Manipur, Jharkhand, and Uttar Pradesh - have a TFR above two.

- **TFR in Urban Areas:** 1.6
- **TFR in Rural Areas:** 2.1

- **Share of under-15 population** in the country has declined from 28.6% in 2015-16 to 26.5% in 2019-21.

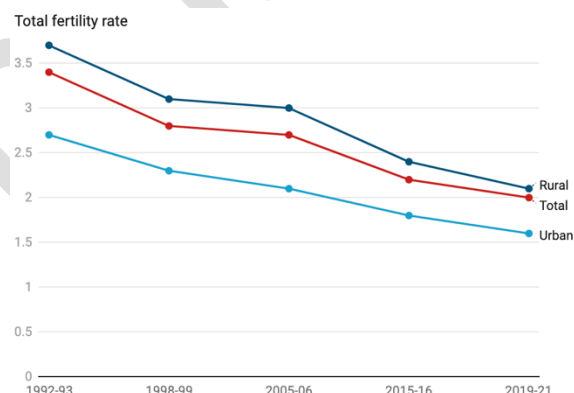
- **Sex Ratio** (number of females/1000 males), in the total population has risen from 991 (NFHS-4) to 1020 (NFHS-5, 2019-21). This is the first-time proportion of women exceeded men since the beginning of NFHS in 1992.

- **Sex Ratio at birth** - female children per 1000 male children born in last five years - have grown from 919 in 2015-16 to 929 in 2019-21 (NFHS-5)

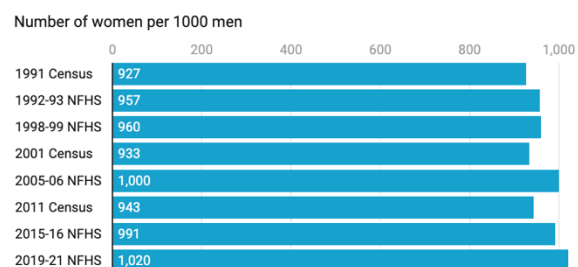
- **Overall Contraceptive Prevalence Rate (CPR)** has increased substantially from 54% to 67% at all-India level and in almost all Phase-II states/Uts with the exception of Punjab. Use of modern methods of contraceptive has also increased in all states/Uts.

- **Unmet need of family planning** has witnessed a significant decline from 13% to 9% at all India level and in most of the Phase-II states. It has come down to less than 10% in all the states except Jharkhand (12%), Arunachal Pradesh (13%), and Uttar Pradesh (13%).

- **Obesity** has increased by 4% in both men and women in last five years. No state recorded a decrease in percentage of both men and women, who are overweight or obese.



Women outnumber men for the first time in India



▫ **Children related:**

- » **Full Immunization drive** among children aged 12-23 months has recorded substantial improvement from 62% to 76% at all India level.
- » **Child Nutrition Indicators** show slight improvement at all India levels.
 - **Stunting** (declined from 38% to 36%)
 - **Wasting** (declined from 21% to 19%)
 - **Underweight** (declined from 36% to 32%)
 - **Overweight** (increased from 2.1% to 3.4%)
 - **Infant Mortality Rate** (per 1000 live births) has reduced to 35.2 (from 40.7 in NFHS-4).
 - **Under five mortality Rate** (per 1000 live births) has reduced to **41.9** (from 49.7 NFHS-4)
- » **The incidence of Anaemia in under-5 children (from 58.6 to 67%), women (53.1% to 57%) and men (22.7% to 25%) has worsened in all states of India (20%-40% is considered moderate)**
 - **Kerala** (at 39.4%) is the only state at moderate level. Else all other states are in **severe category** (above 40%).
- » **Exclusive breastfeeding** to children under the age of 6 months has shown an improvement in all-India level from 55% in 2015-16 to 64% in 2019-21. All the phase-II states/Uts are showing considerable progress.

▫ **Mother's Health:**

- » Increase from 51% to 58% of women receiving the recommended **four or more ANC visits** by health providers at all-India level.
- » **Institutional deliveries** have increased to 88.6% (from 78.9% in NFHS-4)
- » **Substantial increase in C-section deliveries** from 17.2% (in NFHS-4) to **21.5%** in NFHS-5.
 - This increase is due to misuse of technology by private players where around 50% of the deliveries are by C-section.

▫ **Women's empowerment indicators** portray considerable improvement at all India level and across all the phase-II states.

- » **Women operating bank accounts** has increased to **79%** (from 53% earlier).
- » Women **owning a house/land** alone or jointly has risen to 43.3% in NFHS-5.
- » Women using hygienic methods during menstruation has jumped to **77%** (compared to 57% earlier).

▫ **Improved Sanitation and Clean Cooking Fuel**

Share of households/population (%)

■ 2015-16 ■ 2019-21

Population living in households that use an improved sanitation facility

48.5

70.2

Households using clean fuel for cooking

43.8

58.6

3. REPORTS

1) 'HEALTHY STATES, PROGRESSIVE INDIA' – A REPORT BY NITI AAYOG

- Introduction

- » It is a comprehensive health index report which ranks states and UTs innovatively on their year on year incremental change in health outcomes, as well as their overall performance with each other.
- » The report has been prepared by NITI Aayog with technical assistance from WB, and consultation with MoH&FW.
- » States and UTs have been ranked in 3 categories namely Larger states, smaller states, and Union Territories (UTs) to ensure **comparison among similar entities**.
- » The health index is a weighted composite index based on 24 indicators grouped under **three domains**, with each domain assigned weights based on its importance and higher scores for outcome indicators.
 - Health Outcomes (70%);
 - Governance and Information (12%);
 - Key inputs and processes (18%),

- **Significance** - An annual systematic tool; regular assessment of health sector; nudge badly performing states to do well; helps to move towards SDG goals.

4. SCHEMES/PROGRAMS/INITIATIVES

1) AYUSHMAN BHARAT – PRADHAN MANTRI JAN ARYOGYA YOJNA (AB-PMJAY)

- About AB-PMJAY (Pradhan Mantri Jan Arogya Yojana)

- **Ministry:** MoH&FW
- AB-PMJAY is an **entitlement based scheme** that aims to provide health insurance cover of upto **5 lakh rupees per family** to **over 10 crore poor families** (about 50 crore population) for **secondary and tertiary care hospitalization**. There is **no cap on the size of the family or age of the beneficiary**.
 - **All pre-existing conditions** are also covered from day 1 of implementation of PM-JAY in respective states/UT.
- It is the world's largest government funded health care program.
- **The eligible poor families** are decided on the basis of **SECC, 2011 data** and include poor, deprived rural families and occupational category of urban worker's families (Roughly 8.03 crore rural families and 2.33 crore urban families (11 occupational criteria))
 - In addition the beneficiary of RSBY are also included.
 - Further, there is no capping on number of family members or age of members -> this ensures that senior citizens and girl children also get good health services.
- The scheme provides **cashless and paperless** access to services for the beneficiary at the point of service. Eligible people can avail the benefits at both government and listed (empanelled) private hospitals.
 - **In case of hospitalization**, members of the beneficiary families **don't need to pay anything** under the scheme, provided one goes to a government or an empanelled private hospital.
- It is a **centrally sponsored scheme**, so, there is a state component too (**60:40**).
- It is a **portable** scheme, which means beneficiary can avail benefits in any of the states that is implementing the scheme.
- It subsumes Rashtriya Swastha Bima Yojana and the Senior Citizen Health Insurance Scheme (SCHIS).
- **Adhaar** card is **not mandatory** - identity to avail benefit can be established through ration card or election ID card.
 - A **dedicated PM-JAY family identification number** will be allotted to eligible families. Additionally e-card is also given to beneficiary at the time of hospitalization.
- The **National Health Agency (NHA)**, the apex body implementing the AB-PMJAY, has launched a website (mera.pmjay.gov.in) and a helpline number (14555)

- This body will coordinate and improve the scheme over time, through investment in a robust IT infrastructure.
- **Grievance Redressal** in case of complaints or denial of service
 - A well-defined three tier complaint and grievance redressal mechanism will be in place. This include constitution of various committees, use of electronic and mobile platforms and an All-India helpline number 14555 as well as social media.

2) AYUSHMAN BHARAT – DIGITAL HEALTH MISSION (AB-DHM)

- Details

- » The missions aim to create a **complete Digital Health Ecosystem** which will connect the digital health solutions of hospitals across the country with each other.
 - This digital ecosystem will enable a **host of other facilities** like Digital Consultation; Consent of Patients in letting medical practitioners access their records, etc. This will ensure that all medical records are stored digitally and are thus not lost. They would be accessible through app or web-portal.
 - All this will help in improving the quality, access, and affordability of health services by making the service delivery "quicker, less expensive, and more robust".
- » **Unique Health ID:**
 - Any person wanting to be part of ABDHM will get a **health ID**, which is a **randomly generated 14-digit number**. It will be used for **three purposes** - Unique Identification; Authentication; and Threading of the beneficiary's health records, only with their informed consent, across multiple systems and stakeholders.
 - **Facilities:**
 - You can access your digital records right from admission through treatment and discharge.
 - You can access and link your personal health records with your health ID to create a longitudinal health history.
- » **NDHM Sandbox**
 - The NHA have also launched a NDHM Sandbox which is a digital architecture that allows private players to be part of the National Digital Health Ecosystem as health information providers or health information users.
- » **Privacy:**
 - Citizen's consent is vital for all access.
 - Users can delete or exit the services anytime he wants.
- » **Upcoming features:**
 - Future features will enable access to verified doctors across the country.
 - The beneficiary can also create health ID for her child, a digital health records right from birth.
 - She can add a nominee to access her health ID and view or help manage the personal health records.
 - Also, there will be much inclusive access with the health ID available to people who don't have phones, using assisted methods.

- Why can't Adhaar be used as Digital ID:

- » The Adhaar Act and Supreme Court verdict restrict the use of Adhaar ID for welfare schemes promoting government subsidies.
- **Significance:** (ease of living; optimal treatment; reduce re-testing; increased accountability; easy identification of specialists, doctors, labs; Big Data, Data Mining and Artificial intelligence based solution etc.

3) PM AYUSHMAN BHARAT HEALTH INFRASTRUCTURE MISSION (PMAB-HIM)

- PMABHIM, announced in the Budget 2021-22, is the **largest pan-India Health Infrastructure Scheme** which aims to strengthen the PAN-India health infrastructure.
- It is a centrally sponsored scheme with a **budgetary outlay of Rs 64,180 crore** for the FY 2021-22 to 2025-26 and will **improve health care facilities from village to national level in this period**.
- There are **three major aspects** of the ABHIM - Augmenting Healthcare facilities for treatment; Setting up of integrated public health labs for diagnosis of diseases; and Expansion of existing research institutions that study pandemics.

4) IMMUNIZATION PROGRAM IN INDIA/ VACCINATION – INTENSIFIED MISSION INDRADHANUSH 4.0 (IMI)

- **Introduction**
 - » Immunization programs are critical components of government's commitment of Universal Health Coverage. It is integral to India's efforts of reducing the burden of vaccine preventable diseases and achieving universal care for children.
- **Various Initiatives**
 - » The government had launched **Expanded Program for Immunization** in 1978 which was further replaced by **Universal Immunization Program (UIP)** in 1985. It is the largest Immunization Program in the world, with the annual coverage of 2.6 crore infants and 2.9 crore pregnant women. Through this India has achieved groundbreaking success in eradicating/ eliminating life threatening vaccine preventable diseases like small pox, Polio, Maternal Neonatal Tetanus etc.
 - But despite a lot of efforts and improvements, the immunization coverage had been slow to increase with a coverage of **62%** according to NFHS-4 released in 2015-16.
- **Key Factors behind low Immunization Coverage**
 - » **Rapid and Unplanned urbanization**
 - » **Large migrating and isolated population** is difficult to cover
 - Difficult terrains, areas under LWE etc. are also difficult to cover.
 - » **Lack of awareness** among uninformed masses and unaware population leads to low demand of immunization
- **Other problems with vaccination system in India**
 - » **Inequality in vaccine administration** - Socio-economic status-based vaccine disparity with the disadvantaged and underserved groups being left out.

- » **Vaccine Hesitancy: Rumor Mongering/ Misinformation among some population** also prevents full coverage.
- **Negative Impact of COVID-19 on routine vaccination**
- **Various Efforts to deal with above challenges:**
 - » MoH&FW have employed an effective approach - such as involving the community, seeking the support from other ministries and partner agencies, establishing an organized surveillance system, and employing mass campaign management strategies to reach every unreached child for vaccination.
 - » **Mission Indradhanush** was launched by the MoH&FW in 2014. It is a strategic endeavor under UIP with an aim to target under-served, vulnerable and inaccessible populations.
 - It covers **8 vaccines** (Diphtheria, Whooping Cough, Tetanus, Polio, Measles, Childhood TB, Hepatitis B and Meningitis) across the country, **2 vaccines** (Pneumonia and Hemophilus influenza type B) in selected states and **2 vaccines** (Rotavirus Diarrhea and Japanese Encephalitis) in selected districts.
 - **MI** contributed to an increase of 6.7% in full immunization coverage after the first two phases of Mission Indradhanush.
 - » **Intensified Mission Indradhanush (IMI)** was launched in Oct 2017 - to achieve a coverage of 90% with focus towards districts and urban areas with persistently low levels.
 - » **In Dec 2019**, Government has launched **Intensified Mission Indradhanush 2.0 (IMI 2.0)** to be implemented between Dec 2019 - March 2020 to deliver program that is informed by the lessons learnt from the previous phases and seeks to escalate efforts to achieve the goal of attaining a 90% national immunization coverage across the country.
 - » **Intensified Mission Indradhanush 3.0** aimed to reach those children and pregnant women who have been missed out of the routine immunization program. The first phase ran from 22nd Feb 2021 for 15 days.
 - » As of Feb 2022, **10 phases of Mission Indradhanush** have been completed covering 701 districts across the country.
 - » **Intensified Mission Indradhanush 4.0** (Launched in Feb 2022)
 - Three rounds of IMI 4.0 was planned to catchup on the gaps that might have emerged due to COVID-19 pandemic. The activity will be conducted in 416 districts across 33 states/Uts.
 - These districts were identified based on vaccination coverage as per the latest National Family Health Survey-5 report, Health Management Information System (HMIS) data and burden of vaccine preventable diseases.
 - The districts suggested by were included.
 - Unlike the past, each round was conducted for seven days, including RI days, Sundays, and public holidays.

5) BCG VACCINE – 100 YEARS AND COUNTING

- **Details about BCG vaccine (bacilli Calmette-Guerin)**
 - » BCG was developed by **two Frenchmen**, Albert Calmette and Camille Guerin.
 - It is a **live attenuated strain** derived from an isolate of Mycobacterium bovis and has been used widely across the world as a vaccine for tuberculosis. Currently, it is the **only licensed vaccine**

available for the prevention of TB. It is the world's most widely used vaccine with about 120 million doses every year.

» **Interesting Fact:** Works well in some geographical locations and not so well in others. Generally, the farther a country is from equator, the higher is the efficacy. Therefore, it has high efficacy in UK, Norway, Sweden, and Denmark; and little or no efficacy in countries on or near the equator like India, Kenya, and Malawi, where the burden of TB is higher. These regions also have higher prevalence of environmental mycobacteria.

- However, in children BCG provides strong protection against severe forms of TB. This protective effect appears to wane with age and is far more variable in adolescents and adults, ranging from 0-80%.
- A large clinical trial between 1968-1983 by ICMR's National Institute for Research in TB in Chengalpattu district of TN, indicated that BCG offered no protection against pulmonary TB in adults, and a low level of protection (27%) in children.

- **Other uses of BCG**

- BCG also protect against respiratory and bacterial infections of the newborns, and other mycobacterial diseases like leprosy and Buruli's ulcer.
- It is also used as an immunotherapy agent in cancer of the urinary bladder and malignant melanoma.

- **BCG in India**

- BCG vaccinations were first conducted in India in 1948 and it became part of the National TB control program in 1962.
- It remains a part of basket of vaccines included under the **Universal Immunization Program**.

- **Other TB vaccines:**

- Over the last ten years, 14 new Vaccines have been developed for TB and are in clinical trials. Of particular interest is a Phase-3 clinical trial by the ICMR, of two vaccines:
 - **A Recombinant BCG called VPM 1002**
 - Currently, IAVI is partnering with study sponsor Serum Institute of India Pvt. Ltd. (SIPL) and Vakzine Projekt Management GmbH (VPM), a German development consulting firm for the biopharmaceutical industry and a subsidiary of SIPL, to conduct the **"priMe Study"**. "priME is a multicenter, double-blind, randomized, active controlled Phase-III study to evaluate the efficacy and safety of the vaccine candidate in comparison to BCG.
 - **VPM1002 is a recombinant BCG and include a gene from *Listeria monocytogenes***, that codes for the production of a protein called listeriolysin O. This protein ensures better availability of TB antigens so that the immune system can mount what may be more effective response.
 - **Mycobacterium Indicus Pranii (MIP)** - It was identified and developed into a vaccine in India.
 - MIP is a non-pathogenic mycobacterial species.
 - The name is based on the site of isolation of the bacterial species from India (indicus), discovery by Pran Talwar (*pranii*) and characterization at the National Institute of Immunology, India (pranii).

5. MATERNAL HEALTH – SCHEMES

A) NATIONAL HEALTH MISSION 2013

- With respect to mother's health, the NHM includes following initiatives:
 - Reproductive Maternal Neonatal Child and Adolescent Health (RMNCH+A) Program

- **Janani Suraksha Yojna (JSY)** to promote institutional delivery which is expected to reduce neo-natal and maternal mortality.

B) JANANI SURAKSHA YOJANA (2005 SCHEME)

- **The JSY** is a safe motherhood intervention launched in 2005 as part of the NRHM to improve maternal and neonatal health by promotion of institutional deliveries (childbirth in hospitals).
- It is a 100% centrally sponsored scheme which integrates cash assistance with delivery and post-delivery care
- **Key Features**
 - » Financial assistance under JSY is available to all pregnant women in states that have low institutional delivery rates namely, UP, UK, Bihar, Jharkhand, MP, Chhattisgarh, Orissa, Assam, Rajasthan & J&K (categorized as low performing states).
 - » In remaining states (where institutional delivery are satisfactory, pregnant women from BPL/SC/ST households only are entitled for JSY benefits.
 - » It is implemented through ASHA, the accredited social health activists, acting as an effective link between the Government and poor pregnant women under the scheme.

C) JANANI SHISHU SURAKSHA KARYAKRAM

- The program launched in 2011 entitles all pregnant women delivering in public health institutions to absolutely free and no expense delivery including Caesarean section.
 - The program stipulates free drugs, diagnostics, blood and diet, besides free transport from home to institution, between facilities in case of a referral and drop back home.
 - Similar entitlement has been put in place for all sick infants accessing public health institutions for treatment.

D) MATERNITY BENEFIT SCHEME (MBS) / PRADHAN MANTRI MATRITVA VANDANA YOJANA (PMMVY)

- **Details of the Scheme:**
 - Under PMMVY a 'cash incentive of Rs 5,000 is provided directly to the bank account of the pregnant or lactating mothers for the first living child of the family.
 - It is aimed at improving health seeking behavior, arresting MMR, ensuring proper nutrition and offsetting wage loss.
 - The scheme is being implemented from 1st Jan 2017.
- **Target Women**
 - Eligible PW&LM, excluding women in regular employment who are in receipt of similar benefits under any law for the time being.
- **Other key provisions of the scheme:**
 - Center: State Share: 60: 40

- The benefit of Rs 5000 to PW&LM in three installments for the birth of first live child by MWCD and remaining incentives as per the approved norms towards maternity benefit under existing programs after institutional deliveries so that on an average women would receive Rs 6,000.
 - Conditional cash transfer scheme would be in DBT mode.
- **Limitation of the Scheme**
 - **Only for first child:**
 - **Amount too small:**
 - **Several conditions attached**
 - **Subsuming of Janani Suraksha Yojana:** JSY which is a cash based incentive of Rs 14,00 for institutional deliveries, has been subsumed under this scheme. JSY is an older scheme started for a different purpose and should not be confused with maternity benefits for wage compensation.

E) STATE GOVERNMENTS RUNNING THEIR EFFECTIVE SCHEMES (TN AND ODISHA)

- **Dr. Muthulakshmi Reddy Maternity Benefit Scheme** in TN provides for financial assistance of Rs 18,000 per child for the **first two children**.
- **MAMATA Scheme** of **Odisha** provides **Rs 5,000** for first two children.
 - These two schemes are working reasonably well due to their wider coverage and simpler process.
 - In 2020-21, MAMATA showcased a 57% increase in women who received all installments, and PMMVY showcased a decrease.

F) SUMAN (SAFE MOTHERHOOD ASSURANCE / SURAKSHIT MATRITVA AASHWASAN) INITIATIVE

- Launched by MoH&FW in 2019
- The initiative is aimed at zero preventable maternal and new born deaths.
- It brings all the services, which are currently being provided to pregnant woman, under one umbrella from ante-natal registration upto delivery to strengthen the services to prevent maternal deaths.
- It will also strengthen the system of grievance redressal and ensure greater accountability and transparency.
 - It is a center's initiative that will ensure fully responsive and accountable health system.
- Suman would be implemented in a phased wise manner throughout the country.

6. NUTRITION

1) VARIOUS INITIATIVES TO FIGHT MALNUTRITION IN THE COUNTRY

- The government is implementing several schemes and programs under the Umbrella ICDS Scheme as direct target interventions to address the problems of malnutrition in the country.
- Initiatives like **PDS, Mid-Day Meal Scheme**.
 - In **Sep 2021**, the Mid day meal scheme has been renamed to PM POSHAN.
 - Under this not only Children of class 1 to 8 (around 11.8 crore) will be covered, but also around 24 lakh students receiving pre-primary education at government and government aided schools will also be brought under the ambit of the scheme from next year. This is in line with NEP which had recommended that the pre-school education should be formalized.

- **Poshan Abhiyan** (POSHAN -> PM's overarching scheme for holistic nutrition) (earlier known as **National Nutrition Mission**) is being implemented since 2017. It is aimed at reducing malnutrition in the country in a phased manner, through a **lifecycle approach**. It focuses on **children, pregnant women, and lactating mothers**.
 - » It has an aim to build a people's movement (Jan Andolan) around malnutrition.
 - » For implementation of **POSHAN Abhiyan** the four-point strategy/pillars of the mission are:
 - Inter-sectoral convergence for better service delivery
 - Use of Technology (ICT) for real time growth monitoring and tracking of children
 - Intensified health and nutrition for the first 1000 days
 - Jan Andolan
 - » **Target** was to bring down the **stunting of the children** in the age group of 0-6 years to **25%** by the year **2022**.
- **Mission Poshan 2.0**
 - » COVID-19 had worsened the situation and therefore, it was important to multiply our efforts towards **Poshan 2.0** with full vigour.
 - It is an umbrella program that encompasses ICDS (Anganwadi Services, Poshan Abhiyan, Scheme for Adolescent Girls, National Creche Scheme). It was announced in Union Budget 2021-22 and **has merged** supplemental nutrition programs and the POSHAN Abhiyan to tap the synergies.
 - Under this, malnutrition hotspots and aspirational districts will get extra attention.
- Steps to promote AYUSH systems for prevention of malnutrition and related diseases.
- A program to support development of **Poshan Vatikas** at Anganwadis centres to meet dietary diversity gap leveraging traditional knowledge in nutritional practices.
- **NFSA, 2013** which provides for coverage of upto 75% of the rural population and upto 50% of the urban population for receiving highly subsidized food grains under TPDS.
- **Pradhan Mantri Garib Kalyan Anna Yojna (PMGKAY)**: Initially, introduced as part of COVID-19 package in April 2020, the scheme provides more than 80 crore ration card holders with five Kg each of rice or wheat a month free of cost, in addition to five kg which they are eligible for on a subsidized basis under NFSA.

2) MICRONUTRIENTS VS MACRO NUTRIENTS

A) MICRONUTRIENTS

- These are the **vitamins and minerals** that our bodies need each day in order to properly function. Unlike macronutrients they are needed in small amounts.
 - **Vitamins** can be classified into **13 major types**: Vitamins A, B-Complex (Thiamine, riboflavin (Vitamin B2), niacin, pantothenic acid, biotin, vitamin-B-6, Vitamin B12, and folate), C, D, E and K.
 - They are organic compounds. They can be classified into two categories:
 - i. **Fat Soluble**
 - A,D, E and K
 - Important role in overall health by promoting healthy bones, skin, eyesight, lungs and digestive systems.
 - ii. **Water Soluble**
 - B-Complex and C
 - Not stored in fat (like fat soluble vitamins), so daily consumption is important.

- They boost metabolism, act as powerful antioxidant and assist in the formation of collagen helping in healing wounds.
- **Minerals** can be further classified as **major minerals** and **trace minerals**.
 - The six major minerals include sodium, potassium, chloride, calcium, phosphorus and magnesium. They are required in large amounts in body as compared to trace minerals. They are important for maintaining proper fluid balance and electrolytes (sodium and potassium) as well as help in supporting bones, hair, skin and nail health.
 - Trace minerals are required in smaller quantities, but are as important as major minerals. The **nine trace** minerals include copper, zinc, iron, iodine, manganese, molybdenum, cobalt, selenium and fluoride.

B) MACRO-NUTRIENTS

- **These** are the main nutrients that make up the foods we eat. There are three macro-nutrients - **Carbohydrate, Protein and Fat**.

FATS - SIGNIFICANCE - LIMITATIONS AND TYPES

- **Significance of fats as nutrients**
 - It is the most concentrated form of energy. Body uses fat as a fuel source and as major storage of energy.
 - It helps in absorbing vitamins like A, D, E and K.
 - They also provide cushioning for the organs.
 - They are an important constituent of cell membrane and provide taste, consistency, and stability.

C) TRANS FAT VS SATURATED FAT VS MONO-SATURATED FAT VS POLY-UNSATURATED FAT

- All fats have a similar structure - a chain of carbon atoms bonded to hydrogen atoms.
- The differentiating factor is the length and shape of the carbon chain and the number of hydrogen atoms connected to the carbon atoms.

1) Trans Fat (worst type of dietary fat)

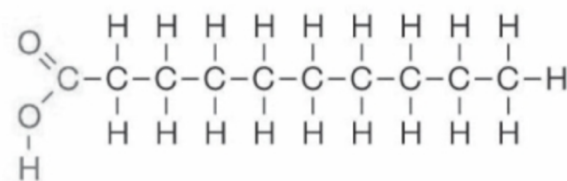
- According to the World Health Organization, approximately 5.4 lakh deaths take place each year globally because of the intake of industrially produced trans fatty acids. They come in both natural and artificial forms.
- Trans fats are the result of **partial hydrogenation of unsaturated fat**. This turns healthy oil into solids.
 - **Process:** Heating liquid vegetable oils in the presence of hydrogen gas and a catalyst, a process called hydrogenation.
 - **Advantages:**
 - Partial hydrogenation of vegetable oil makes them more stable and less likely to become rancid. The process also converts the oil into a solid, which makes it easy to handle.
 - Partial hydrogenation oils can withstand repeated heating without breaking down, making them ideal for frying fast foods.
 - **Note:** Partial hydrogenation is not the only source of trans-fat in our diet. Trans fats are also naturally found in beef fat and dairy fat in small amounts.
 - Trans fats have **no known health benefits and no safe level of consumption**.
- **Disadvantages:**
 - Trans-fats are worst type of fat for the heart, blood vessels, and rest of the body:

- Eating trans-fat increases harmful LDL (low density lipoprotein) cholesterol in the blood stream and reduces the amount of beneficial HDL (high density lipoprotein) cholesterol. It is linked to heart disease, stroke, diabetes, and other chronic conditions.
- They contribute to insulin resistance.
- It is **banned** in many countries. India currently allows trans-fatty acids upto 3% (by weight).
- In Jan 2020, FSSAI has capped the amount of trans fatty acids (TFA) in oils and fats to 3% for 2021 and 2% by 2022, from the current permissible limit of 5% through an amendment to the Food Safety and Standards (Prohibition and Restriction on Sales) Regulations.
- **In May 2018**, WHO also gave a call to eliminate trans-fat in foods by 2023.
- For this WHO has launched an initiative **REPLACE**, that will provide guidance for all countries on how to remove artificial trans fats from their foods, possibly leading to worldwide eradication.
 - It stands for **Review** dietary sources, **Promote** use of healthier fats, **legislate**, **assess** changes, **create** awareness, and **Enforce** regulation.
 - The initiative promotes countries to establish legislation to eliminate the trans-fats.

2) Saturated Fats

- A saturated fat is a type of fat in which the fatty acid chains have all or predominantly single bonds.

Saturated

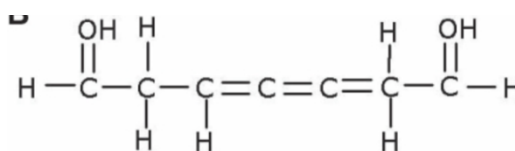
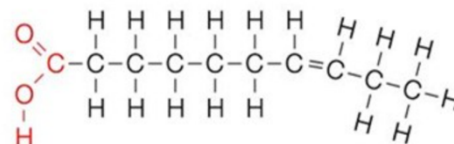


- Common **source** of saturated fats are red meat, whole milk and other whole milk dairy products, coconut oils etc.
- **Health Impacts**
 - Can drive harmful LDL cholesterol.
 - But recent research, have again raised the debate whether saturated fats are actually harmful and cause heart disease.

3) Monounsaturated Fat and Poly Unsaturated Fats

- **Monounsaturated Fats** are fatty acid chains that have one double bond in the fatty acid chain with all the remainder carbon atoms being single-bonded.
- **Poly Unsaturated Fats** are fatty acids with more than 1 double bond.
- Thus, these fats have fewer hydrogen atoms bonded to carbon atoms when compared to saturated fats.
- They are liquid at room temperature.
- **Sources of monounsaturated fats**
 - Olive Oil, peanut oil, canola oil, avocados, nuts etc.
- **Sources of Polyunsaturated oils**
 - Corn oil, sunflower oil, and safflower oil, fish oil etc. are common examples.

Monounsaturated Fat



Polyunsaturated fatty acid

- These are **essential fats** and are required for normal body functioning, but our body can't make them. They are used in building of cell membrane and covering of nerves. They are also needed in blood clotting, muscle movement and inflammation.

- Two Main types of Polyunsaturated Fatty Acids

- **Omega-3 Fatty Acids**
- **Omega-6 Fatty Acids**

3) FORTIFICATION OF FOOD

- Why in news?

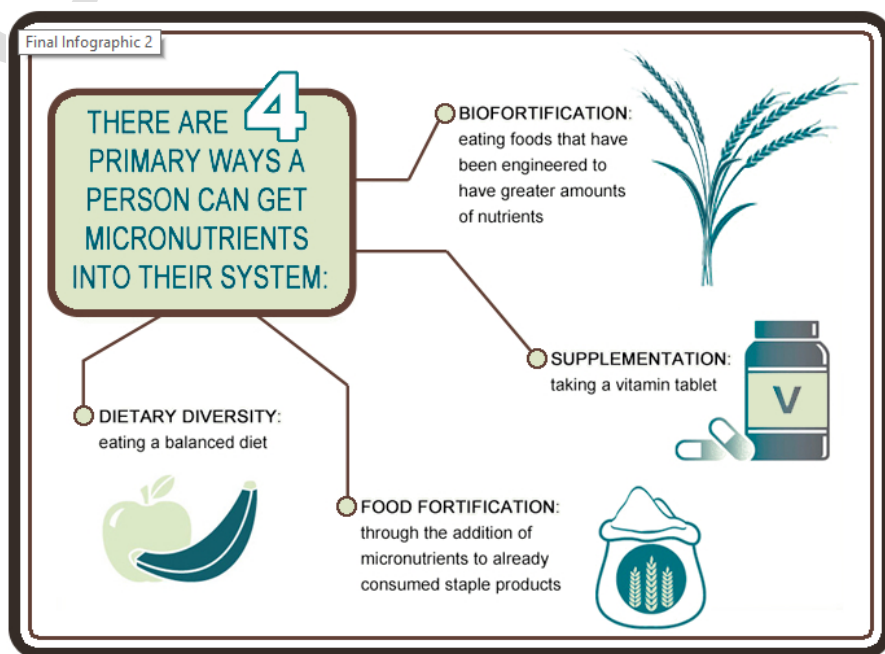
- During his Independence Day speech, PM Modi announced that, **by 2024, rice provided to poor under any government scheme** - PDS, mid-day-meal, anganwadi - **will be fortified**. (Aug 2021)

A) FOOD FORTIFICATION

- Fortification means deliberately increasing the content of essential micronutrients (such as iron, folic acid, iodine, vitamin A, Zinc etc) in a food so as to improve the nutritional quality of food and to provide public health benefits with minimal risk to health. According to FSSAI it is a scientifically proven, cost effective, scalable and a sustainable intervention that addresses the issue of micronutrient deficiencies.
- **Advantages of Food Fortification** over other nutrition fulfillment mechanisms:
 - » **Cost Effective:**
 - » **Well Proven Method:** It has been used around the world since 1920s. The World Health Organization (WHO), UNICEF, and the Gates foundation, to name only a few, endorse food fortification as a primary means of improving micro-nutrient health.
 - » **Eating Habits not needs to be changed**
 - » **Socio-culturally more acceptable**
 - » **Scalable and Sustainable:** Can be introduced quickly and can provide nutritional benefit to people in short period of time.

- Different ways in which people get micro-nutrients and why food fortification can be effective.

- Since most population in resource-poor settings do not have access to adequate quantities of fruits, vegetables, and meats where micronutrients are abundant, and because providing vitamin tablets poses logistical and economic constraints, food fortification is a practical and inexpensive alternative.



B) BIOFORTIFICATION:

- » Biofortification is the process by which the nutritional quality of the food crops is improved through agronomic practices, conventional plant breeding, or modern biotechnology.
- » It aims **to increase nutrient level in crops during plant growth** rather than through manual means during processing of the crops.
- » Biofortification may therefore present a way to reach population where supplementation and conventional fortification activities may be difficult to implement and/or limited.
- » Scientists at ICAR have been developing biofortified crops in India with a view to eradicating malnutrition amongst the poor sections of society. As per ESI 2021-22, currently in India the number of biofortified varieties have increased to 87.
 - None of these are GM crops. They have been developed through conventional crop breeding techniques.
- » E.g.
 - Zinc biofortification of wheat, rice, beans, sweet potatoes and maize

C) RICE FORTIFICATION: EXTRUSION TECHNOLOGY:

- » In his Independence Day Speech (Aug 2021), PM Modi announced fortification of rice distributed under various government schemes, including the PDS and midday meals in schools, **by 2024**.
- » **Various technologies** are available for rice fortification - coating, dusting etc. But '**extrusion**' is considered the best technology. This involves the production of fortified rice kernels (FRKs) from a mixture using an extruder machine. The fortified rice kernels are then blended with regular rice to produce fortified rice.
- » **How does extrusion technology to produce FRK work?**
 - Dry rice flour is mixed with a premix of micronutrients, and water is added to this mixture. This mixture then goes into twin-screw extruder with heating zones, which produce kernels similar to shape and size to rice. These kernels are dried, cooled and packaged for use. FRK have shelf life of at least 12 months.
 - As per the guidelines issued by the Ministry of Consumer Affairs, Food and Public Distribution, **the shape and size of the fortified rice kernel should "resemble the normal milled rice as closely as possible"**. According to the guidelines, the length and breadth of the grain should be 5 mm and 2.2 mm respectively.
- » **According to FSSAI norms, 1 kg of fortified rice will contain the following:**
 - Iron (28 mg-42.5 mg), folic acid (75-125 microgram), and vitamin B-12 (0.75-1.25 microgram).
 - Rice **may also be fortified** with zinc (10 mg-15 mg), vitamin A (500-750 microgram RE), vitamin B-1 (1 mg-1.5 mg), vitamin B-2 (1.25 mg-1.75 mg), vitamin B-3 (12.5 mg-20 mg) and vitamin B-6 (1.5 mg-2.5 mg) per kg
- » **Why is rice fortification needed?**
 - High levels of Anaemia and malnutrition in India. Rice is a stable crop of India.
- » **Cost of fortification:**
 - The Ministry estimates that the cost of producing FRK with three micronutrients - iron, folic acid, and vitamin B-12 - will come to around Rs 0.6 per kg. This cost is shared between centre and states and government will pay this cost to rice millers.

- » **Identification:**
 - Fortified rice will be packed in jute bags with the logo ("F") and the line "Fortified with Iron, Folic Acid, and Vitamin B12" will be mandatorily printed on them.
- » **How has government distributed fortified rice so far?**
 - In 2019-20, the Ministry launched a Centrally sponsored pilot scheme, 'Fortification of Rice and its Distribution under PDS', for three years with a total budget outlay of Rs 174.64 crores. The pilot scheme focuses on 15 districts in 15 states Andhra Pradesh, Kerala, Karnataka, Maharashtra, Odisha, Gujarat, Uttar Pradesh, Assam, Tamil Nadu, Telangana, Punjab, Chhattisgarh, Jharkhand, Uttarakhand, and Madhya Pradesh.
 - According to the Ministry, six states, including Maharashtra and Gujarat, have started distributing fortified rice as part of the pilot scheme, with approximately 2.03 lakh tonnes distributed until June 2021. Four more states are expected to start by September
- » **Has any other country done this?**
 - Rice fortification is mandatory in 7 countries: The USA, Panama, Costa Rica, Nicaragua, Papua New Guinea, Phillipines, and the Solomon Islands.

4) DISEASES DUE TO NUTRITIONAL DEFICIENCIES

Disease	Deficiency of	Other comments
Rickets	Vitamin D along with calcium and potassium	<ul style="list-style-type: none"> - Rickets is characterized by <u>weak and soft bones, bowed legs and bone deformities</u>. - <u>Fish, fortified dairy products</u>, liver, oil and sunlight are some rich sources of vitamin D.
Osteoporosis	Vitamin D with Calcium	<ul style="list-style-type: none"> - Deficiency of <u>Vitamin D</u> and calcium in the body can <u>negatively affect the health of the bones and spine</u>. It leads to <u>unhealthy, soft and brittle bones</u> that are prone to fractures and defects in the spine structure. - <u>Bananas, spinach, milk, okra, soy and sunlight</u> are natural sources of Vitamin D and calcium that act to eliminate this deficiency
Pellagra	Vitamin B3 or Niacin	<ul style="list-style-type: none"> - 4D's: Dementia, diarrhea, dermatitis and death are the four Ds that characterize Pellagra. - <u>Tuna, whole grains, peanuts, mushrooms, chicken etc.</u>
Scurvy	Vitamin C or ascorbic acid	<ul style="list-style-type: none"> - Scurvy basically <u>inhibits the production of collagen</u> in the body which is the <u>structural protein that connects the tissues</u>. • <u>Decaying of skin and gums, abnormal formation of teeth and bones, delay or inability to heal wounds and bleeding</u> are the effects of scurvy - Vitamin C can be derived from <u>Citrus fruits</u> like oranges, lemon, strawberry etc. and <u>Broccoli</u> regularly.
Beri-Beri	Vitamin B1 or Thiamin	<ul style="list-style-type: none"> - The most common symptoms of this illness are <u>altered muscle coordination, nerve degeneration and cardiovascular problems</u>.

		<ul style="list-style-type: none"> - Meat, eggs, whole grains, dried beans etc are rich in thiamine and thus, should be consumed in proper amounts every day to avoid this painful ailment
Xerophthalmia or Night Blindness	Vitamin A	<ul style="list-style-type: none"> - Xerophthalmia or night blindness is characterized by blindness <u>due to the poor growth, dryness and keratinisation of epithelial tissue or chronic eye infection.</u> - In worsened situations, night blindness can <u>aggravate to complete loss of vision</u> - The safest way to enhance the Vitamin A levels in the body is by <u>consuming natural food sources like carrots, green and leafy vegetables, cantaloupes etc</u>
Goitre	Iodine	<ul style="list-style-type: none"> - Goitre leads to enlarged thyroid glands causing <u>hypothyroidism, poor growth and development of infants in childhood, cretinism and even mental retardation</u> - This disease is commonly found to occur in places having iodine deficit soil. <u>Iodised salt and saltwater fish are rich sources of iodine</u>, and must be consumed regularly to avoid goitre.
Anaemia	Iron	<ul style="list-style-type: none"> - It is characterized by a <u>decrease in the red blood cell count or haemoglobin in the body</u>, resulting in <u>fatigue, weakness, dyspnoea and paleness of the body.</u> - It can be easily treated by changing to a <u>healthy diet and consuming iron supplements</u> on a regular basis. <u>Squashes, nuts, tofu, bran</u> etc are rich sources of iron for the body.
Kwashiorkor	Protein and Energy	<ul style="list-style-type: none"> - It is characterized by anorexia, <u>an enlarged liver, irritability and ulcerating dermatoses.</u> - These are the one of the <u>nutritional deficiencies in children, especially from famine-struck areas</u> and places with poor food supply, Kwashiorkor is caused by malnutrition. - A healthy and balanced diet enriched with protein and carbohydrate sources like eggs, lentils, rice etc helps combat this problem
Depression	deficiency of Vitamin B7 or biotin	<ul style="list-style-type: none"> - This deficiency can be <u>fatal if present in an aggravated form.</u> - Consume <u>poultry products, dairy items, peanuts, nuts etc</u> that are rich sources of biotin. These must be consumed along with supplements to recover and prevent these illnesses

7. PRACTICE QUESTIONS

- | | |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Consider the following statements about National Family Health Survey (NFHS) in India</p> <ol style="list-style-type: none"> 1. The first NFHS was conducted right after independence of India to understand the health situation in the country 2. International Institute of Population Sciences, Mumbai is the nodal agency for conducting NFHS |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

	<p>3. NFHS is conducted in approx. 50% households of the country</p> <p>Which of the above statements is/are correct?</p> <p>A. 1 only B. 2 only C. 1 and 2 only D. 2 and 3 only</p>
2	<p>Consider the following statements about the key findings of the NFHS-5:</p> <ol style="list-style-type: none"> 1. The Total Fertility Rate (TFR) has declined to below the replacement rate in India 2. Between NFHS-4 and NFHS-5, the share of under-15 population has increased in India 3. For the first time since NFHS survey started in the country, the female population have been found to be higher than man population in NFHS-5 <p>Which of the above statements is/are correct?</p> <p>A. 1 only B. 2 only C. 1 and 3 only D. 2 and 3 only</p>
3	<p>Which of the following health indicators have shown an improvement in NFHS-5 when compared to NFHS-4?</p> <p>A. Percentage of Anaemic Population B. Percentage of Obese population C. Both A and B D. Neither A nor B</p>
4	<p>Consider the following Assertion(A) and Reasons (R):</p> <p>Assertion(A): As per NFHS-5 India is seeing a substantial increase in C-section deliveries</p> <p>Reason(R): With improved health facilities, more women are able to access complex delivery processes for risky deliveries</p> <p>Which of the above statements is/are correct?</p> <p>A. Both A and R are correct and R is the correct explanation of A B. Both A and R are correct, but R is not the correct explanation of A C. A is correct and R is incorrect D. Both A and R are incorrect</p>
5	<p>Which of the following statements is/are not correct?</p> <ol style="list-style-type: none"> 1. Ayushman Bharat only envisages health insurance for secondary and tertiary health needs of the poor and vulnerable 2. Adhaar card is mandatory to get benefits under the Ayushman Bharat Initiative <p>Choose the correct answer from the codes provided below:</p> <p>a. 1 only b. 2 only c. Both 1 and 2 d. Neither 1 nor 2</p>
6	<p>Consider the following statements about Ayushman Bharat Digital Health Mission (AB-DHM):</p> <ol style="list-style-type: none"> 1. AB-DHM is the largest pan-India health insurance scheme

	<p>2. It is centrally sponsored scheme with a budgetary outlay of Rs 64,180 crores for the FY 2021-22 to 2025-26</p> <p>Which of the above statements is/are correct?</p> <p>A. 1 only B. 2 only C. Both 1 and 2 D. Neither 1 nor 2</p>
7	<p>‘Mission Indradhanush’ launched by the Government of India pertains to (Pre 2016)</p> <p>(a) immunization of children and pregnant women (b) construction of smart cities across the country (c) India’s own search for the Earth-like planets in outer space (d) New Educational Policy</p>
8	<p>Consider the following statements about the report 'Healthy States, Progressive India':</p> <ol style="list-style-type: none"> 1. The report is published by Ministry of Health and Family Welfare 2. It is an annual report 3. The report promotes competitive and cooperative federalism among states in the country <p>Which of the above statement(s) is/are incorrect?</p> <p>A. 1 only B. 2 only C. 3 only D. 1, 2 and 3</p>
9	<p>Which of the following is/are true about the National Health Policy, 2017?</p> <ol style="list-style-type: none"> 1. The NHP targets to increase the health expenditure to 2.5% of the GDP 2. It envisages Health and Wellness Centres in the country to strengthen primary health services 3. The policy intends to leverage AYUSH facilities to strengthen the health sector in the country <p>Choose the most appropriate answer from the codes provided below:</p> <p>a. 1 only b. 2 only c. 3 only d. 1, 2 and 3</p>
10	<p>Vaccinations for which of the following diseases are covered under Mission Indradhanush?</p> <ol style="list-style-type: none"> 1. Diphtheria 2. Hemophilus influenza type B 3. Rotavirus 4. Hepatitis C <p>Choose the correct answer from the codes provided below:</p> <p>A. 1 and 3 only B. 2 and 4 only C. 1, 2 and 3 only D. 1, 2, 3 and 4</p>
11	<p>Consider the following statements about BCG Vaccine:</p> <ol style="list-style-type: none"> 1. BCG is a tuberculosis vaccine used for more than 100 years now 2. It is an mRNA vaccine 3. BCG has low effectiveness in countries on or near equator like Kenya, Malawi and India

	<p>Which of the above statements is/are correct?</p> <p>A. 1 and 2 only B. 1 and 3 only C. 2 and 3 only D. 1, 2 and 3</p>
12	<p>Which of the following is/are the indicator/indicators used by IFPRI to compute the Global Hunger Index Report? (Pre 2016))</p> <p>1. Undernourishment 2. Child stunting 3. Child mortality</p> <p>Select the correct answer using the code given below.</p> <p>(a) 1 only (b) 2 and 3 only (c) 1, 2 and 3 (d) 1 and 3 only</p>
13	<p>Dr Muthulakshmi Reddy Maternity Benefit Scheme is being implemented by which of the following state?</p> <p>A. Telangana B. Andhra Pradesh C. Karnataka D. Tamil Nadu</p>
14	<p>Consider the following statement(s) about Pradhan Mantri Matritva Vandana Yojna (PMMVY):</p> <p>1. The PMMVY aims to provide partial compensation for the wage loss in terms of cash incentive to pregnant and lactating mothers for the first living child 2. It is a central sector scheme 3. The scheme has been able to cover more than 90% of the pregnant women in the country</p> <p>Which of the above statement(s) is/are correct?</p> <p>a. 1 only b. 1 and 2 only c. 2 and 3 only d. 2 only</p>
15	<p>The State of Food Security and Nutrition in the World report is published by:</p> <p>A. World Health Organization B. World Economic Forum C. Food and Agriculture Organization D. None of the above</p>
16	<p>Consider the following statements about the PM POSHAN Initiative:</p> <p>1. The initiative is being implemented since 2017 with a focus on reducing malnutrition in the country 2. It targets to bring down stunting of the children in the age group of 0-6 years to 25% by the year 2022</p> <p>Which of the above statements is/are correct?</p>

	<p>A. 1 only</p> <p>B. 2 only</p> <p>C. Both 1 and 2</p> <p>D. Neither 1 nor 2</p>
17	<p>Which of the following statements is not correct? (Pre 2019)</p> <p>(a) Hepatitis B virus is transmitted much like HIV.</p> <p>(b) Hepatitis B, unlike Hepatitis C, does not have a vaccine.</p> <p>(c) Globally, the number of people infected with Hepatitis B and C viruses are several times more than those infected with HIV.</p> <p>(d) Some of those infected with Hepatitis B and C viruses do not show the symptoms for many years.</p>
18	<p>Consider the following statements about micronutrients:</p> <ol style="list-style-type: none"> 1. Vitamin B and C are the only fat-soluble Vitamins 2. Iron and Iodine are among trace minerals required by our body 3. Pellagra is caused by deficiency of Vitamin D 4. Beri-Beri is caused by deficiency of a water soluble vitamin <p>Which of the above statements are correct?</p> <p>A. 2 and 4 only</p> <p>B. 1 and 3 only</p> <p>C. 1, 2 and 3 only</p> <p>D. 1, 2, 3 and 4</p>
19	<p>Golden Rice is an example of:</p> <ol style="list-style-type: none"> 1. Genetically modified food crop 2. Biofortified food crop <p>Choose the most appropriate option from the codes provided below:</p> <p>a. 1 only</p> <p>b. 2 only</p> <p>c. Both 1 and 2</p> <p>d. Neither 1 nor 2</p>
20	<p>Which of the following vaccines are not provided throughout the country under Mission Indradhanush?</p> <ol style="list-style-type: none"> a. Polio b. Childhood TB c. Rotavirus d. Whooping Cough
21	<p>Which of the following is/are true about significance of fat as a macro-nutrient for humans?</p> <ol style="list-style-type: none"> 1. Fat acts as a concentrated form of energy storage in human body 2. It helps in absorption of vitamin A, D, E and K 3. It provides cushioning for organs 4. It is an important constituent of cell membrane and plays a role in biogenesis <p>Choose the correct answer from the codes provided below:</p> <p>A. 1 and 2 only</p> <p>B. 2, 3 and 4 only</p>

	<p>C. 1 and 4 only</p> <p>D. 1, 2, 3 and 4</p>
22	<p>Which of the following is not true about the process of hydrogenation which converts vegetable oil into trans-fat:</p> <ol style="list-style-type: none"> 1. It increases the shelf life of oil 2. It converts the vegetable oil into solid at room temperature <p>Choose the most appropriate answer from the codes provided below:</p> <ol style="list-style-type: none"> a. 1 only b. 2 only c. Both 1 and 2 d. Neither 1 nor 2
23	<p>Consider the following statements about Trans-Fat:</p> <ol style="list-style-type: none"> 1. Trans-fats are not found in nature and are only produced through the industrial hydrogenation process 2. Eating trans-fat increases harmful LDL (low density lipoprotein) cholesterol in the blood stream 3. Because of harmful health impacts of trans-fat, it has been completely banned in India <p>Which of the above statements is/are correct?</p> <ol style="list-style-type: none"> A. 1 and 2 only B. 2 and 3 only C. 2 only D. 3 only
24	<p>Consider the following statements about Vitamin D:</p> <ol style="list-style-type: none"> 1. It is a fat soluble secosteroid 2. It contributes in increasing intestinal absorption of Calcium, Magnesium, and phosphate 3. Vegetables are rich in vitamin D and proper consumption of green vegetables can fulfill the daily Vitamin D requirement of an adult 4. Rickets and Scurvy are primarily caused by Vitamin D deficiency <p>Which of the above statements is/are correct?</p> <ol style="list-style-type: none"> A. 1 and 2 only B. 1, 2 and 4 only C. 2, 3 and 4 only D. 1 and 4 only
25	<p>Consider the following statements about minerals required for human health:</p> <ol style="list-style-type: none"> 1. Sodium, Potassium and Iron are included in the category of "major minerals" 2. Coconut water is a healthy source of daily mineral requirements of a human diet <p>Which of the above statements is/are correct?</p> <ol style="list-style-type: none"> A. 1 only

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| | <ul style="list-style-type: none">B. 2 onlyC. Both 1 and 2D. Neither 1 nor 2 |
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