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1. What is the HbA1C test and why is it used to check for diabetes?

Why in News?

India is estimated to have 10.13 crore people with diabetes, and another 13.6 crore people who are pre-diabetic, according to a nationwide study published in 2023. This apart, over 35% of Indians suffer from hypertension and nearly 40% from abdominal obesity, both of which are risk factors for diabetes. India accounts for 17% of all diabetes patients in the world.

Prevention and early detection are key to helping combat this non-communicable disease burden, experts say. One of the most commonly-used tests to diagnose pre-diabetes and diabetes (both type 1 and type 2) and to help manage diabetes, is the haemoglobin A1C (HbA1C) test, also known as the glycated haemoglobin or glycosylated haemoglobin test.

How does the test work?

Sugar enters your bloodstream from the food you eat. The sugar, or glucose, attaches to the haemoglobin in your red blood cells. Haemoglobin is a protein that transports oxygen to all the cells of your body. Everybody has some sugar attached to their haemoglobin. Those with pre-diabetes and diabetes, however, have more. The HbA1C test measures the percentage of your red blood cells that have sugar-coated haemoglobin.

HbA1c test levels

The glycated hemoglobin (HbA1c) test provides average blood glucose levels for the past 2 to 3 months. The following are the HbA1c test results ranges:



Less than 5.7%	Normal range
5.7% to 6.4%	Prediabetes or Risk of hyperglycemia
6.5% or Higher	Diabetes mellitus or Hyperglycemia

What do HbA1C test results look like?

The HbA1C levels are provided as either a percentage or in mmol/mol (which stands for millimoles per mole). A mole is a unit of measurement often used for chemical substances. The higher the percentage, the higher your blood glucose levels are. An HbA1C below 5.7% is considered normal; between 5.7% and 6.4% may indicate you are pre-diabetic; and 6.5% or higher can indicate diabetes. In mmol/mol: below 42 corresponds to below 6.0%; 42-47 mmol/mol to 6.0 to 6.4%; and 48 mmol/mol to 6.5% or over.

Relevance: GS Prelims & Mains Paper II; Governance

Source: The Hindu

2. How were the new Election Commissioners selected? What does the law say on the appointment process? Why has the new Act been challenged?

Why in news?

The President has appointed Gyanesh Kumar and Sukhbir Singh Sandhu, both retired IAS officers, as Election Commissioners (ECs) to fill up two vacancies in the three-member Election Commission of India. The two officials are the first to be appointed under the new law governing appointments to the constitutional body, the Chief Election Commissioner and other Election Commissioners (Appointment, Conditions of Service and Term of Office) Act, 2023.

How were the new ECs selected?

In terms of the new law, the two ECs were selected by a three-member Selection Committee, comprising Prime Minister Narendra Modi, Union Home Minister Amit Shah, and the Leader of the Indian National Congress in the Lok Sabha, Adhir Ranjan Chowdhury, as leader of the largest party in the Opposition. They were chosen out of a shortlisted panel of six names. The shortlisting was done by a committee which, according to the Act, is headed by the Union Minister for Law and Justice and includes two officials of the rank of Secretary to the government.



What was the process before this?

Article 324 of the Constitution vests the "superintendence, direction and control of elections" in an Election Commission. It also says the EC shall consist of the Chief Election Commissioner and such number of other Election Commissioners, if any, as the President may fix from time to time. This provision was subject to any law made in that behalf by Parliament. However, for nearly 40 years from the adoption of the Constitution, the EC only had a Chief Election Commissioner (CEC). It was not until October 1989 that it became a multi-member body. However, the

appointment of two Election Commissioners was rescinded within a short time, that is on January 1, 1990.

A law was enacted in 1991 to fix the conditions of service of the CEC and the ECs, and amended in 1993. However, it did not provide for any appointment process. In the absence of any particular process being laid down by parliamentary law, the President has been appointing the CEC and ECs. The only known process is that the Law Ministry puts up a panel of names to the Prime Minister, who recommends the appointment of one of them as EC to the President. It had become a convention to appoint officials as ECs first and then, on the completion of the tenure of the CEC, the senior EC was elevated as CEC.

What did the SC rule on the process?

In *Anoop Baranwal versus Union of India*, a five-member Constitution Bench ruled that it was the intention of the makers of the Constitution that the power to appoint the CEC and other ECs was not meant to be given exclusively to the executive and that the power was to be exercised "subject to any law made by Parliament". Noting that no such law was enacted since the inception of the Constitution, the court laid down an interim arrangement for the appointment. This was to operate until Parliament made its own law. The court said the appointments should be made by a three-member committee comprising the Prime Minister, the Leader of the Opposition in the Lok Sabha (or the leader of the party that is largest in the Opposition) and the Chief Justice of India. It was in response to this that Parliament enacted the 2023 Act, which received presidential assent and was notified late in December 2023.

What is the criticism against the Act?

The foremost criticism from those who have challenged the new Act is that it has removed the CJI from the selection panel and has made a Union Minister a member instead. This gives the executive a two-one majority in the three-member committee. The government has argued that the Act does not really remove the CJI from the appointment process, as the inclusion of the CJI was only a stop-gap arrangement put in place until the enactment of a law. The Supreme Court has repeatedly rejected attempts to obtain a stay on the new Act. The petitioners have approached the court again against the appointment of the two ECs. Their primary argument is that the Act violates the main principle in the Constitution Bench judgment — the need to free the appointment process from the executive.

Relevance: GS Prelims & Mains Paper II; Governance

Source: The Hindu

3. The big promise of small-scale LNG as fuel for India, with first SSLNG plant commissioned

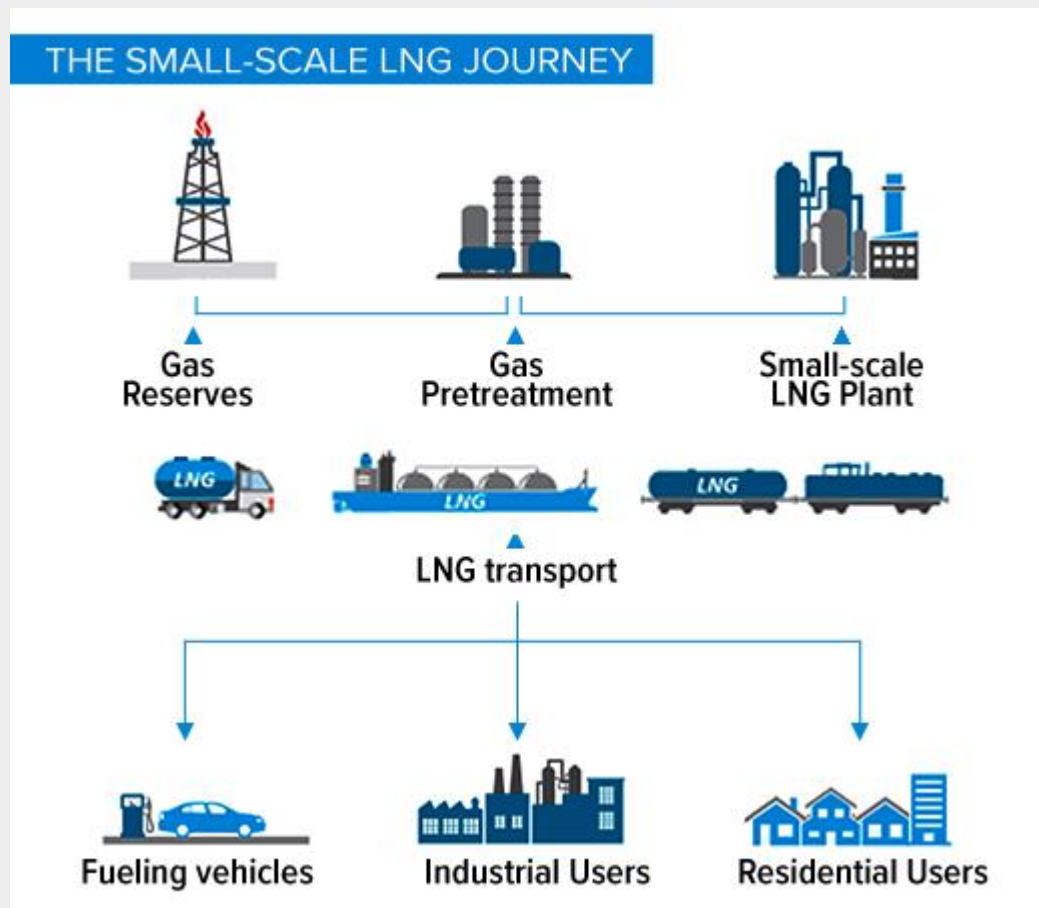
Increased share of natural gas

The government has an ambition to turn India into a gas-based economy by pushing adoption and use of natural gas across sectors and across the country.

India aims to increase the share of natural gas in its primary energy mix to 15 per cent by 2030 from a little over 6 per cent at present. Why? Because natural gas is far less polluting than conventional hydrocarbons like oil and coal, and is cheaper than oil, for which India depends on imports to meet over 85 per cent of its requirement. As the country moves towards green energy and future fuels, natural gas is seen as a key transition fuel in that journey.

Challenges

Among the biggest challenges of scaling up gas consumption in India has been the transportation of gas to areas that are not connected by the country's natural gas pipeline grid. This distribution-related challenge has also been hindering the adoption of technologies like using liquefied natural gas (LNG) directly as a fuel for long-haul trucks and inter-city buses, and even as marine fuel, which are seen as key growth areas for gas demand in the country.



Even as large-scale pipeline projects are in the works, they will take years to be completed and even then, last-mile delivery challenges may remain in numerous parts of the country. In such a scenario, a few new-age solutions with fast turnaround times can play a pivotal role in vastly expanding natural gas reach, access, as well as consumption.

One such promising solution is small-scale LNG (SSLNG). India's largest gas utility GAIL (India) Ltd recently commissioned the country's first SSLNG unit at its Vijaipur complex in Madhya Pradesh. According to Petroleum Minister Hardeep Singh Puri, many such plants are expected to come up in the coming years, which could potentially change the country's natural gas landscape.

Soon after commissioning the SSLNG plant, GAIL also announced a planned investment of Rs 650 crore to develop LNG dispensing stations along the Golden Quadrilateral and other major highways to provide LNG as an automotive fuel.

What is small-scale LNG?

Still seen as a nascent industry globally, SSLNG refers to liquefaction and transportation of natural gas at a significantly smaller scale and using unconventional transportation mediums as compared to the regular large-scale liquefaction, regasification, and transportation infrastructure and processes.

While there is no standard or specific definition of SSLNG internationally, it basically pertains to supplying gas in its liquid or super-chilled form—LNG—to industrial and commercial consumers through specialised trucks and small vessels in regions that do not have pipeline connectivity.

In the relatively traditional use cases like supplying compressed natural gas (CNG) for vehicles and piped gas for households and manufacturing units, the buyer would regasify the LNG using small vapourisers, and then supply it to end users. In cases where the fuel is to be used directly in its liquid form, it would be supplied to end users as it is without regasification.

The SSLNG chain can start from an existing large-scale LNG import terminal, from where LNG is transported to consumers by cryogenic road tankers or small vessels, instead of being regasified and supplied through pipelines. It can also start from a location that has ample natural gas supply or production by setting up small liquefaction plants there. GAIL's SSLNG unit at Vijaipur is essentially an example of the latter. GAIL's Vijaipur complex is the company's largest gas processing facility.

Mechanics of GAIL's Vijaipur SSLNG facility

Built at a cost of Rs 150 crore, the Vijaipur facility has SSLNG skids with a combined capacity of 36 tonnes per day and associated liquid handling systems. The plant includes treatment skids—zeolite pretreatment skids (ZPTS)—and liquefaction skids, known as cryo boxes, for converting natural gas to LNG.

The natural gas is first processed in the ZPTS at a pressure of approximately 15 bar for removal of the non-desirable components such as nitrogen, water, sulphur, and carbon dioxide (CO₂). It is then fed to the cryo box, where it is compressed through a four-stage compressor to a pressure of around 260 bar.

The temperature of the gas is then cooled down through the propane-based external refrigeration system to around -60 to -70 degrees celsius, and is subjected to an expansion such that the temperature drops to below minus 140 degrees celsius, thus allowing it to liquefy. This small-scale LNG unit is controlled by an automated web-based supervisory control and data acquisition (SCADA) system.

The LNG produced from the plant will be dispatched through cryogenic LNG tankers to nearby areas for use in city gas distribution (CGD) networks as CNG and piped gas, and for proposed LNG filling stations for fuelling medium and heavy-duty vehicles.

SSLNG's use case and business case

Even as GAIL has emerged as the first Indian company to set up an SSLNG unit in India, and followed it up with a major investment announcement to retail LNG as an automotive fuel, it is not the only one that has its eyes set on this potentially high-growth segment. Almost all the major oil and gas companies in India are eyeing it.

In fact, the first strong push for the idea of SSLNG in India came years ago from Petronet LNG Ltd, the country's largest importer of LNG. Petronet has, in fact, been supplying LNG directly to some of its small industrial consumers from its large LNG import terminals at Dahej in Gujarat and Kochi in Kerala.

The LNG importer, which is jointly promoted by GAIL and three other public sector oil and gas companies, has also been pushing for greater adoption of LNG as a fuel for long-haul trucks and inter-city buses, as well as a marine fuel, apart from the regulation use cases like in the CGD sector and other industries that use natural gas as feedstock or fuel.

Petronet's push for SSLNG and use of LNG as a direct fuel for road and marine transportation seemingly had two broad objectives—raising LNG consumption in India by positioning it as an alternative fuel to the likes of diesel, and increasing the LNG volumes at its Kochi terminal, which was struggling due to lack of pipeline connectivity to major consumers.

LNG as fuel for long-haul trucks, buses

Heavy duty trucks and inter-city buses are seen as a potential growth segment for LNG as an automotive fuel. As compared to diesel, which is the dominant fuel in India in these segments, LNG is a significantly cleaner fuel with reduced CO₂ emissions and negligible amounts of other pollutants like particulate matter, nitrogen oxide, and sulphur dioxide, while providing slightly higher range with a similar-sized fuel tank.

LNG has been used aggressively and successfully as a fuel for medium and heavy commercial vehicles in various countries, most notably in China. It is also usually notably cheaper than crude oil, from which diesel is derived. Although India depends on imports to meet around half of its natural gas requirement, the dependency level is much lower than in the case of crude oil.

If LNG indeed is able to replace a significant chunk of India's diesel consumption volumes, it could lead to substantial foreign exchange savings for the country.

There are, of course, teething troubles in India when it comes to use of LNG as a long-haul commercial vehicle fuel, despite its evident advantages. These challenges include lack of easy availability of LNG-powered vehicles, a virtually non-existent LNG retail network, higher initial price of LNG vehicles as compared to those powered by diesel, and absence of an LNG vehicle financing ecosystem.

A few Indian companies, including GAIL and Petronet, are evidently working to build the ecosystem and make it viable and attractive for transporters to shift from diesel-guzzling vehicles to LNG-powered ones.

Petronet has collaborated with commercial vehicle manufacturers and other public sector oil and gas companies for trials and pilot projects for LNG-fuelled trucks and buses. According to the company's website, it is in discussions with various state roadways corporations, truck fleet operators, and other transporters to run vehicles on LNG. Petronet has also established a few LNG dispensing stations, mainly along highways.

Bigger players like GAIL and Indian Oil Corporation (another promoter of Petronet), who have a lot more experience in liquid fuel and gas retail, are looking to build LNG dispensing stations along major highways. GAIL's Vijaipur SSLNG unit is also being seen as a key first step in taking SSLNG distribution deep inside the country.

Relevance: GS Prelims & Mains Paper III; Economics

Source: The Indian Express

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