Aging
Analytics
Agency

Diabetes Industry in the GCC

Teaser

2023

www.global-diabetes.health/gcc

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Introduction

This case study provides a brief description of the diabetes epidemiological situation in Gulf Cooperation Council (also known as the GCC and comprising United Arab Emirates, Saudi Arabia, Oman, Kuwait, Qatar, and Bahrain).

Despite dedicated nationwide efforts to raise awareness against the harmful effects of fast-food consumption and sedentary lifestyle, the Arab population continues to struggle with an increased risk for metabolic disorders.

The International Diabetes Federation (IDF) has reported that GCC countries have one of the highest prevalence of diabetes and obesity in the world, given the sedentary lifestyles and increased consumption of foods that are high in calories and sugar. Of the 149,600 deaths in the GCC during 2020, nearly 73% were due to noncommunicable diseases (NCDs).

In this report, we reviewed genetic background of diabetes among Arab populations, analysed healthcare market and key market players that offer service for diabetes patients.

Diabetes Industry Framework

Treatment

- Diabetes Treatment
- Gene and Cell Therapy
- Small Molecules
- Drug Delivery Systems
- Supplements
- Formulations (Insulin)
- Probiotics
- Natural Products

Clinics

- Diabetes Screening and Management
- Clinical Trials Management
- Nursing
- Rehabilitation
- Patient Monitoring and Management
- EHR
- Residential, Home and Elder Care
- Assisted living

MedTech

- Medical Supplies and Equipment, Raw Material
- Devices (diagnostics, therapy, glucose monitoring)
- Medical Suppliers
- Diagnostics, Tests and Labs
- E-Pharmacy
- Medical Devices (Artificial Organs)
- Imaging
- Organ Engineering

Scientific innovation

- Biologics (Insulin, RNA, vaccines, AB)
- Genomics and Genetics
- AI for Drug Discovery
- CRO
- AI for Diagnostics (Ommic,Imaging)
- Physiological, Systemic and Digital Biomarkers

Civil services

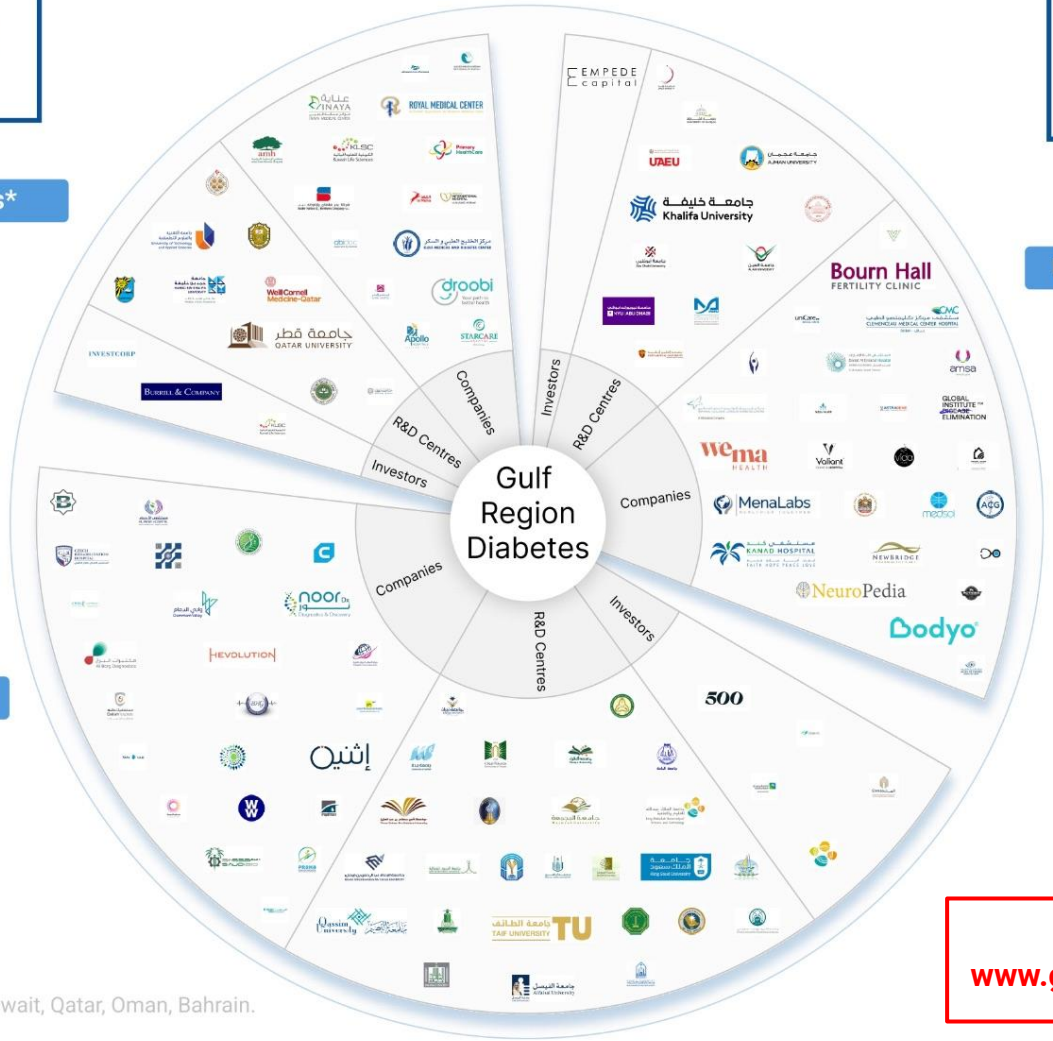
- Insurance
- Contract Manufacturing
- Clinical Data Storage and Management
- Education platforms
- Media
- Non-Profits

Prevention and Care

- Diabetes Prevention
- Healthy Lifestyle
- Fertility in diabetes
- Aesthetics and Skin Care
- Mobile App
- Healthy Nutrition

Diabetes Industry in GCC 2023

Companies - 63
Investors - 9
R&D Centres - 46



AGING ANALYTICS AGENCY

*Others: Kuwait, Qatar, Oman, Bahrain.

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Diabetes Categorisation

Four Main Types of Diabetes	
Type 1 diabetes	historically known as juvenile diabetes
Type 2 diabetes	historically known as adult-onset diabetes
Gestational diabetes	when nondiabetic pregnant women develop high blood sugar levels
MODY*	relatively uncommon, dominantly inherited diabetes with at least 13 subtypes

** **MODY** – maturity-onset diabetes of the young*

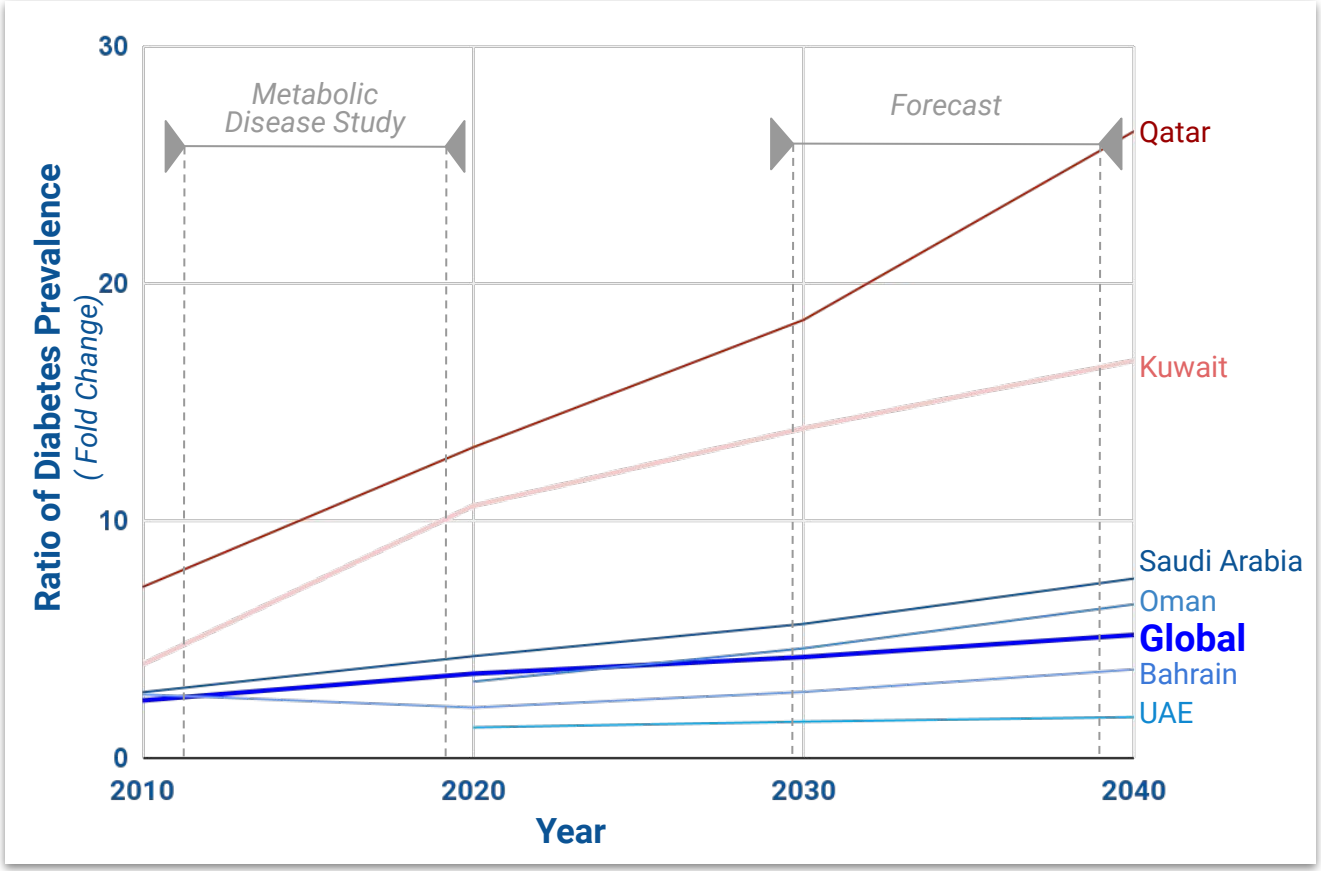
Diabetes, or diabetes mellitus, is a chronic health condition that affects how your body uses food for energy. Your body is not able to move sugar, or glucose, from your bloodstream into your cells, so you end up with a surplus in your bloodstream.

There are four main types of diabetes: Type 1 diabetes, Type 2 diabetes, gestational diabetes, and a maturity-onset diabetes of the young – relatively uncommon, dominantly inherited diabetes with at least 13 subtypes.

With all four, prompt diagnosis is critical, and so is compliance with your diabetes treatment. Over time, high blood sugar levels can damage your blood vessels and raise risk of you developing certain health problems (some life-threatening), so it's important to begin treatment — and stick with it faithfully — as soon as you get diagnosed.

This report investigates to what degree genetic determinants influence the well-known regional differences in incidents. We also identify genetic risk factors that may initiate the autoimmune process or promote already ongoing β-cell damage in Gulf countries.

Dynamics of Diabetes Prevalence Ratio in the GCC (age 10-79 years)

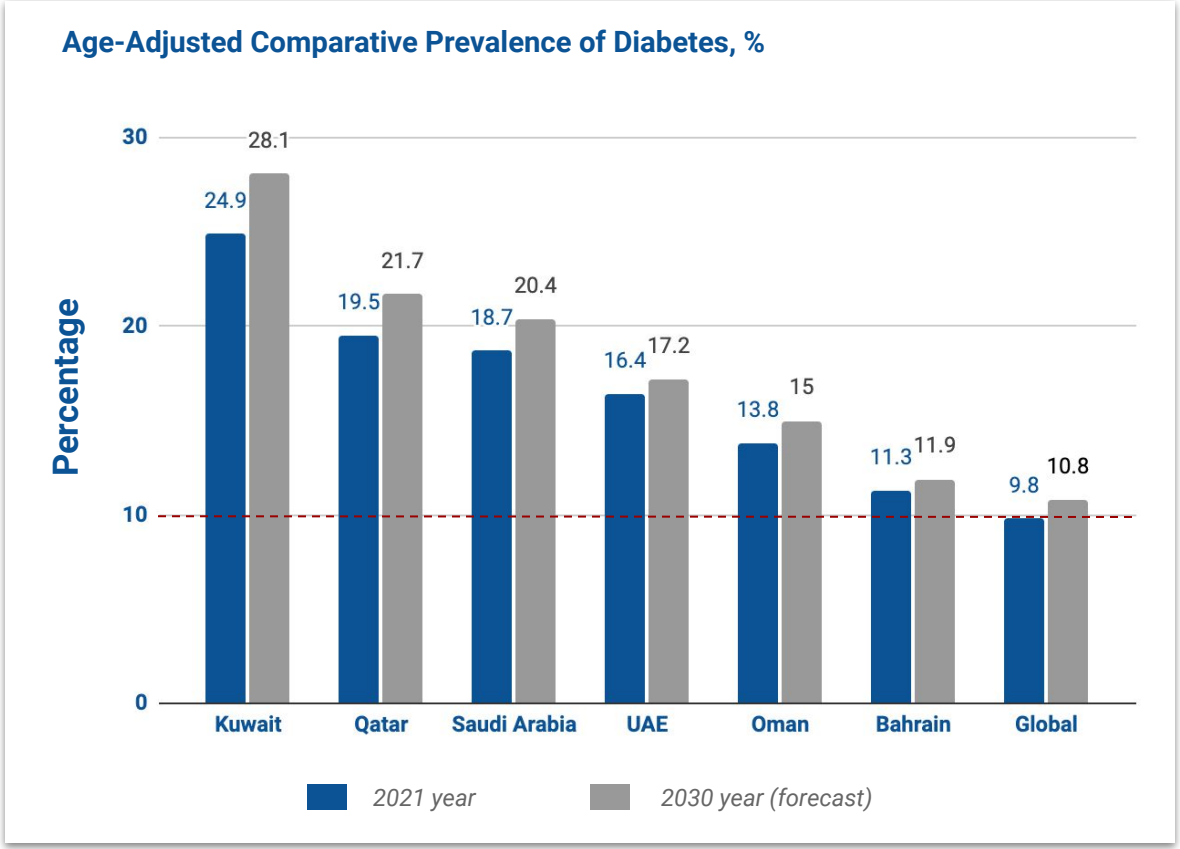


The global prevalence of diabetes continues to rise. The prevalence of diabetes is estimated by the **International Diabetes Federation (IDF)** to be **9.3% in 2019**, increased from **4.6% in 2000** in adults aged 20-79 years. The GCC appears to have a higher prevalence of diabetes than the global average. Five of the top 10 countries with the highest prevalence of diabetes (in adults aged 20 to 79 years) are in the GCC: Kuwait (21.1%), Qatar (20.2%), Saudi Arabia (20.0%), Bahrain (19.9%) and the UAE (19.2%).

We calculated growth ratio of diabetes prevalence in Gulf countries (according 2000 year) from 2010 to 2040. As shown in the chart, the highest prevalence growth rate is in **Qatar** (15-25 fold vs. 2000 year) and **Kuwait** (10-15 fold vs. 2000 year). That is **five and three times faster than the global changes of this parameter for the same period.**

Source: International Diabetes Federation

Comparison of Age-Adjusted Prevalence in the GCC vs. Global



Age-adjusted comparative prevalence (AAP), also referred to as comparative prevalence, is the prevalence calculated by adjusting to the age structure of a standard population.

The **Global AAP** of adult diabetes was **9.8% in 2021** and expected to increase to 10.8% by 2030.

AAP of adult diabetes in the **Middle East and North Africa region**, which includes Gulf countries, is **12.2%,** the highest estimated prevalence of all the IDF regions. Prevalence in the this region is expected to increase to 13.9% by 2030.

The highest AAP is in **Kuwait (24.9%), Qatar (19.5%), and Saudi Arabia (18.7%)**. The forecast in 2030 predicts AAP in these countries of **more than 20% (28% in Kuwait)**.

Taken together, such marked variation in incidence trends is consistent with an etiologic understanding of diabetes as a disease that involves environmental triggers acting with genetic susceptibility to initiate autoimmune destruction of pancreatic β-cells.

Source: International Diabetes Federation

Diabetes Genetic Background Among Arab Population

Diabetes Family-Based Genetic Association Studies in the Arab Population

Novel Risk Loci Identified in Arab Individuals

METABOLIC TRAITS

OBESITY TRAITS

TCN2/rs9606756

BLOOD PRESSURE

MC3R/rs3827103

GLUCOSE

ZNF106/rs12440118

OTX2-AS1/rs7144734

HIGH-DENSITY LIPOPROTEIN

CETP/rs3764261

CETP/rs1864163

CETP/rs1800775

TOTAL CHOLESTEROL

[RPL32P9,LINC01213]/rs10935794

LIPID TRAITS

TRIGLYCERIDE

RPS6KA1/rs1002487

LAD1/rs11805972

OR5V1/rs7761746

PGAP3/rs2934952

ST6GALNAC5/rs10873925

NPY1R/rs10033119

SPP2_ARL4C/rs4663379

LINC00911_FLRT2/rs17709449

CDK12-NEUROD2/rs11654954

STARD3/rs9972882

BUD13/rs9326246

PLGRKT/rs17501809

LOC105376072/rs11143005

IGF1/rs10860880

IMPAIRED CELL FUNCTION

BETA-CELLS

KCNJ11	*HNF1A*
TCF7L2	*HNF1B*
WFS1	*GCK*
IGF2BP2	*CDKN2A/B*
CDKAL1	*ALX4*
SLC30A8	*BCL11A*
KCNQ1	*HMG20A*
JAZF1	*TP53INP1*

INSULIN FUNCTION

PPAR-gamma	*ADAMTS9*
DUSP9	*HNF1B*

ADIPOCYTE

MC4R	*FTO*
GNPDA2	*TFAP2B*

Published reports on diabetes genetics in the Arab population originate from Kuwait, Lebanon, Saudi Arabia, Qatar, UAE, and Oman.

Marriages in the Arab populations are traditionally often consanguineous. An increased risk of diabetes has been observed among the offspring of such consanguineous marriages in Saudi Arabia and Qatar. The familial clustering of diabetes has been reported in the Arab populations from Morocco, Tunisia, Oman, and Qatar. Additionally, the Arab populations exhibit many rare, Mendelian, and familial genetic disorders.

Thalassemia, cystic fibrosis, Huntington's disease, and Friedreich's ataxia are examples of rare disorders that increase patient's predisposition to diabetes.

Source: Frontiers Endocrinology, 2019

Monogenic Diabetes and the Genes Implication

NAME	GENE	LOCUS	CLINICAL FEATURES
MODY 1	***HNF4A***	*20q12–q13.1*	Mild-severe fasting and postprandial plasma glucose (PG) respond well to sulphonylurea agents.
MODY 2	***GCK***	*7p15–p13*	Mild fasting hyperglycemia. Less than 50% of carriers have overt diabetes, and microvascular complications of diabetes are rare. Treatment is not needed except in pregnancy (see below).
MODY 3	***HNF1A***	*12q24.2*	Same as MODY 1.
MODY 4	***IPF1/ PDX1***	*13q12.1*	Pancreatic agenesis.
MODY 5	***HNF1B***	*17cen–q21.3*	Overt diabetes in association with renal and genitourinary abnormalities.
MODY 6	***NEUROD1***	*2q32*	Rare, with phenotype characterised by obesity and insulin resistance.
MODY 7	***KLF11***	*2p25*	Very rare. Phenotype ranges from impaired glucose tolerance or impaired fasting glucose to overt diabetes.
MODY 8	***CEL***	*9q34.3*	Very rare. Associated with both exocrine and endocrine pancreatic deficiency and with demyelinating peripheral neuropathy.
MODY 9	***PAX4***	*7q32*	Very rare. Crucial transcription factor for beta cells development.
MODY 10	***INS***	*11p15.5*	Very rare. Usually associated with neonatal diabetes. < 1 % cases.
MODY 11	***BLK***	*8p23–p22*	These adapter proteins' nucleate formation contributes to the qualitative and quantitative control of beta cell signaling.
MODY 12	***ABCC8***	*11p15.1*	Very rare. Usually associated with neonatal diabetes. < 1 % cases.
MODY 13	***KCNJ11***	*11p15.1*	Very rare. Usually associated with neonatal diabetes. < 1 % cases.
MODY 14	***WFS***	*4p16.1*	Rare. Usually associated with DIDMOAD syndrome. Also, seen with early onset of diabetes.< 1 % cases.

Source: Clinical Diabetes and Endocrinology V.2, 18 (2016)

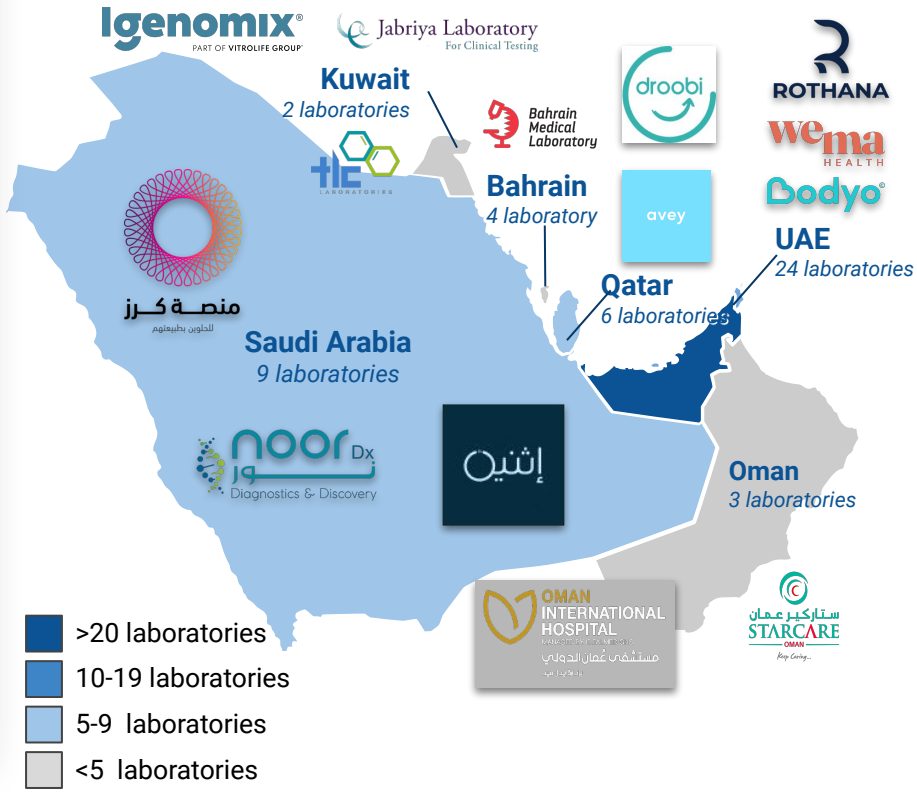
Diabetes Diagnostics in the GCC

Number of Healthcare Companies in the GCC by Country

Advanced medical devices used for the early diagnosis of the diseases, along with growing advancement in the pathological tests, diagnostic tests, and imaging techniques support the growth of the Gulf diagnostic labs market in the upcoming 5 years. The leader on the market of diabetes diagnostics and treatment are the UAE and Saudi Arabia.

Private labs with higher investments and financial supports can afford the inexpensive medical devices with latest technology, thereby supporting the growth of the market. The private sector is also playing an important part in the development of the healthcare industry, encouraged by mandatory health insurance and other reforms. Private players are now being incentivised through public–private partnerships (PPP) to invest and manage operations while the public sector becomes the regulator. For example, in Dubai, the "PPP Law" governing public–private partnerships (Law No.22 of 2015), which came into force in November 2015, seeks to encourage the private sector to be innovative and creative in identifying and funding projects for Dubai. Similarly, in Saudi Arabia: Although the framework for large-scale PPP projects in the Kingdom is yet to be developed, and PPP-style procurement will require careful consideration of some key issues. It is expected to pick up, encouraged by wide-raging institutional changes to the country's fiscal policy.

Number of Diagnostic Centres by Country



Source: International Diabetes Federation

Case Study: Kuwait

Jabriya Laboratory for Advanced Clinical Testing was established in November 1997 by joining Central Gulf Medical Company and Gulf Laboratory. The provision of high-quality clinical laboratory testing services to all customers, regardless of their socio-economic status, and empowering them to make better healthcare decisions to live a healthier lifestyle and safeguard their health for a prosperous future.

Igenomics offers pioneering tests to help reproductive health professionals diagnose and treat their patients. Diagnostics is based on Next Generation Sequencing (NGS) of multiple genes associated to a disease, condition, or phenotype. For diagnostics of endocrine system and diabetes, Igenomics provides two panels: Monogenic and Syndromic Obesity Precision Panel (the heritability of obesity), maturity-onset diabetes of the young and Neonatal Diabetes Mellitus.

TLC Laboratories is united by a set of core values that reflect the care and expertise required to consistently deliver exceptional medical services. TLC offers a wide range of diagnostic tests in biochemistry, haematology, microbiology, immunology, serology, histology, and cytology. TLC is committed to advancing scientific and clinical practice through innovation, research, and development.

Medical Facilities for Diabetes Treatment

Major Diabetes Clinics in the GCC, 2023

The total number of medical centres and clinics specialised on diabetes counts more than 70 facilities.

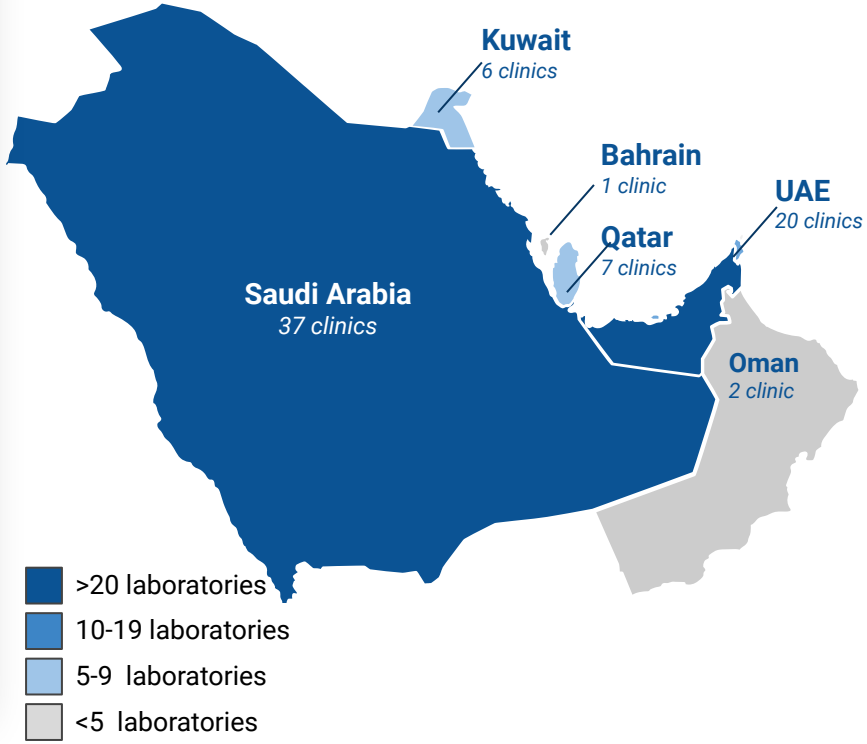
Over 50% of clinics are located in Saudi Arabia (37 clinics) and 28% – in the United Arab Emirates (20 clinics). The most important medical centres are Diabetic Centre of King Faisal Specialist Hospital and Research Centre (Saudi Arabia) and Jazan Diabetes Centre (UAE).

Another key medical facility in the GCC are Hamad Medical Corporation (Qatar) and Dasman Diabetes Institute (Kuwait).

Dasman Diabetes Institute (Kuwait) develops research projects, educational programmes and awareness-raising initiatives. More than 15 clinical trials for diabetes are ongoing in this medical centre.

Overall, the number of the advanced medical centres is shifted to western part of the region and correlates with the size of the city and the local budgets. Since 2015 the local government is responsible for medical facilities. As a result, the richest cities have the most developed medical services.

Number of Medical Centres by Countries



Source: International Diabetes Federation

Case Study: United Arab Emirates

Imperial College London Diabetes Centre provides personalised service built on an effective diabetes management system that allows the patients to undergo all necessary tests, receive results, and meet with the treating physician in the same appointment, ensuring a seamless patient experience. The Centre offers a comprehensive range of diabetes services, including endocrinology, cardiovascular, eye, kidney, and foot care, as well as antenatal/gestational and juvenile diabetes care, nutritional advice, and radiology.

Rashid Centre for Diabetes and Research (RCDR) is a JCI-accredited unique centre of excellence that combines compassionate and modern diabetes, obesity, and endocrine care with high-quality research and professional education. RCDR aims to be the leading all-inclusive comprehensive diabetes care centre in the region. As part of this goal, RCDR has partnered with Cerner to develop the first electronic health record (EHR) registry in the Middle East and a guided workflow focusing on patient-centred care.

Abu Dhabi Stem Cells Centre is the biggest research hub for chronic disease and regenerative medicine in the UAE. Now the centre is providing clinical trials of therapies to treat two of the biggest chronic health issues facing the UAE: diabetes and multiple sclerosis. It will explore therapeutic alternatives and analyse the efficacy of intervention.

Diabetes Clinical Trials in the GCC

Clinical Trials in One Sight, 2010-2022

~188
clinical trials ongoing in the GCC

>110
clinical trials are on the active stage in 2023

Saudi Arabia
showed the highest proportion, contributing with 66.6% of the clinical trial from the region

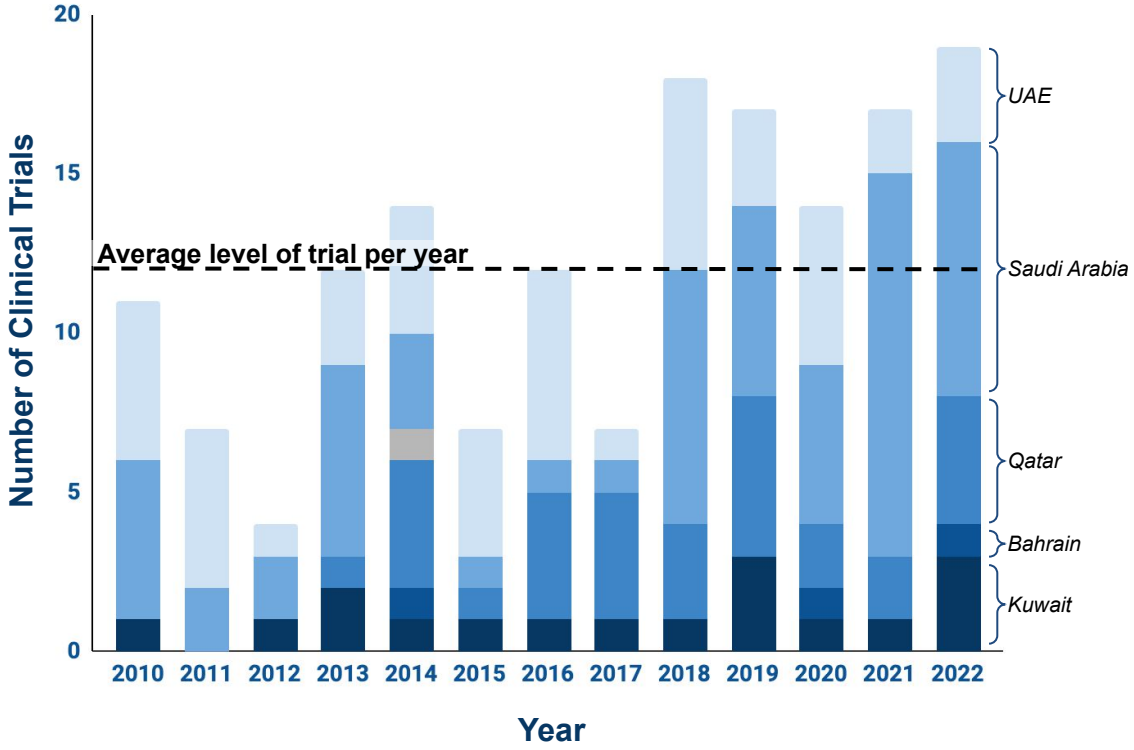
6 countries
collaborate with GCC countries clinical sites that provide research of new therapies

0.37%
of the trials conducted globally

38
local clinical trial sponsors with 113 active trials

Diabetes Clinical Research Activity in the GCC

Dynamic of Clinical Trial in the GCC, 2010-2022



Since 2010, **ClinicalTrials.gov** listed some **188 trials** with sites i**n countries from the GCC**. These countries have attracted pharmaceutical companies from around the world that want to conduct clinical trials of their products. The **average level** of clinical studies until 2022 was pretty stable: **around 12 trials per year**.

At the **beginning of 2022**, **19 new trials** were registered. The total number of trials in 2022 is almost **twice higher** than 10 years ago (2010-2011).

The leaders in clinical research are Saudi Arabia (60 clinical trials), the UAE (48 clinical trials), and Qatar (30 clinical trials). The lowest number of clinical trials was founded in Oman. There was only one clinical research during last decade.

Source: Clinicaltrials.gov

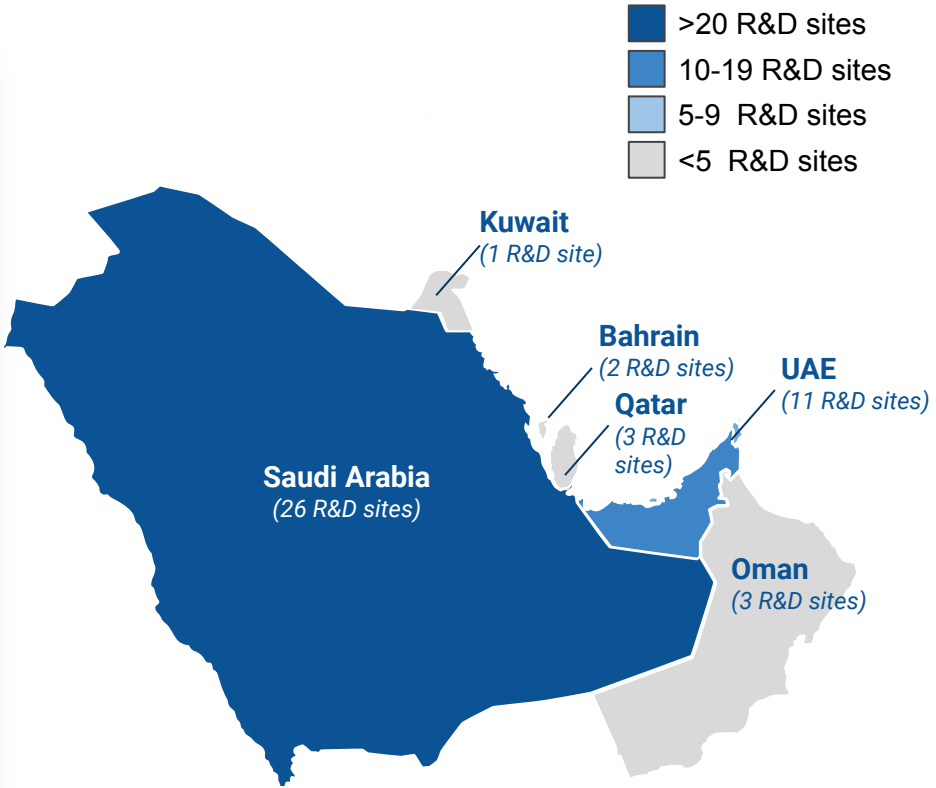
R&D Hubs for Diabetes Research

Geography of R&D and Scientific Labs in GCC, 2023

The total number of R&D sites in the GCC is more than 45. The major scientific hub is **Saudi Arabia** where **26 research centres** that investigate diabetes are placed. The most important are **Umm Al-Qura University**, **King Abdulaziz University**, **King Saud University**, **King Abdullah University of Science and Technology, Alfaisal University, King Saud bin Abdulaziz University for Health Sciences, Imam Abdulrahman Bin Faisal University, Taif University,** etc.

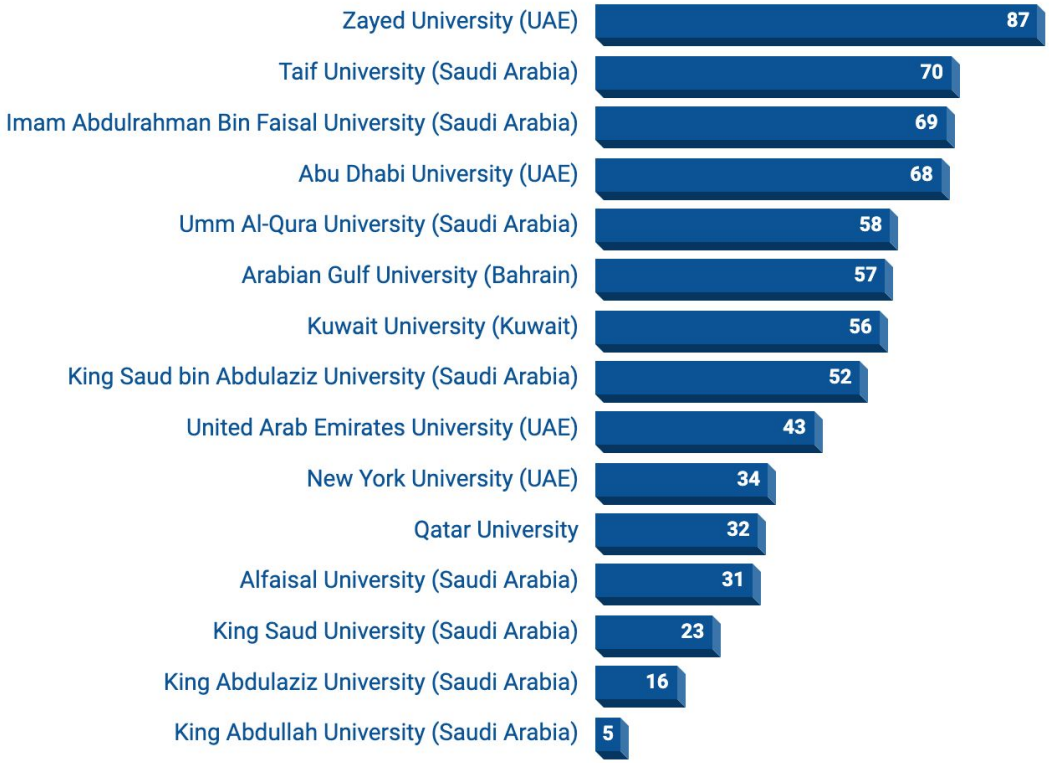
The second hub is **UAE** with more than **10 research centre**. The major diabetes studies are in **United Arab Emirates University**, **Zayed University**, **Abu Dhabi University**, **New York University in Abu Dhabi,** etc.

Oman and Qatar also have scientific laboratories and research centres, but their number is less than five in each country.



Top 15 Universities that Conduct Diabetes Research

Ranking of Innovativeness for Universities from the GCC



We selected universities that have patents in area of diabetes treatment and evaluated them by Innovativeness Ranking proposed by **SIR**.

The leader among universities is **Zayed University** (UAE) and **Taif University** (Saudi Arabia). They have the biggest number of patents for diabetes and diabetes-related disorders, as well as the highest activity in cooperation with international organisations and universities. The specialisation of these organisations is optimisation of insulin delivery and new therapeutics for diabetes treatment.

Source: SCImago Institution Ranking

Diabetes Industry in the GCC: Conclusions

Diabetes in the GCC: Conclusions

- Diabetes in Gulf countries appears to have a higher prevalence of diabetes than the global average. Five of the top 10 countries with the highest prevalence of diabetes (in adults aged 20 to 79 years) are in the GCC: Kuwait (21.1%), Qatar (20.2%), Saudi Arabia (20.0%), Bahrain (19.9%), and the UAE (19.2%).
- The familial clustering of diabetes has been reported in the Arab populations due to consanguineous marriages. But only 25 risk loci have been replicated in the Arab populations.
- Among the GCC, the highest level of undiagnosed diabetes is in the UAE (64%), Oman (50%), and Saudi Arabia (44%). Kuwait, Qatar, and Bahrain show higher level of diagnostics, and estimate level of undiagnosed diabetes in these countries is less than 40%.
- GCC diagnostic companies seems to be the most successful among the whole healthcare market, providing highly technological solutions for an diabetic population with an increased interest in quality healthcare. The market attracts domestic companies, as well as international investors. The UAE and Saudi Arabia have the most developed system of diagnostic laboratories that provide diabetes testing.
- The total number of medical centres and clinics specialised on diabetes is more than 70 facilities. More than 50% of clinics are located in Saudi Arabia (37 clinics), and 28% – in the United Arab Emirates (20 clinics). The most important medical centres are Diabetic Centre of King Faisal Specialist Hospital and Research Centre (Saudi Arabia) and Jazan Diabetes Centre (UAE).
- The leaders in clinical research are Saudi Arabia (60 clinical trials), the UAE (48 clinical trials), Qatar (30 clinical trials). The lowest number of clinical trials was found in Oman. There was only one clinical research during last decade.
- The total number of R&D sites is more than 45. The major scientific hub is Saudi Arabia where are placed 26 research centres that investigate diabetes.

Aging Analytics Agency: Value Proposition

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Aging Analytics Agency is focusing on three key activities:

Providing Commercial Services

Conducting customised case studies, research, and analytics for internal (organisational) use, tailored to the precise needs of specific clients.

Preparing Open Access Reports

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Building Big Data Analytics Platforms

Offering customised analysis using specialised interactive industry and technology databases, IT-platforms, and Big Data Analytics Dashboards.

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