Precision medicine represents a tailored response to an individual's healthcare needs. What are the more specific benefits of this approach for a population such as that of Qatar?

The Qatari population is small, comprising about 300,000 individuals. We showed recently that it is genetically diverse; at least three different genetic signatures were identified, reflecting the history of human migration to Qatar. Similar population stratification is expected to be found in other Gulf Cooperation Council (GCC) populations. This genetic diversity will undoubtedly have significant implications in terms of precision medicine.

Why do you think the implementation of a precision medicine programme is likely to succeed in Qatar?

There are many factors. The mainstay being the vision and the commitment from the leadership of the country to dedicate resources for the implementation of world-class standards in healthcare, higher education and research. The conception of the Qatar Foundation by the Father Emir HH Sheikh Hamad Bin Khalifa Al-Thani and HH Sheikha Moza Bint Nasser was the initial translation of this vision. Currently, world-class healthcare and research facilities are available. Furthermore, Qatar is attracting, through various initiatives and projects, world-renowned physicians and researchers who in turn are heavily investing in local capacity building. Finally, the small size of the Qatari population and the recent launch of Qatar Genome Project will reinforce the implementation of a precision medicine programme.

What were the main objectives of launching the Qatar Genome Project?

Qatar not only wants to provide accessible healthcare services to the entire population but also to deliver precision medicine and healthcare services managed according to world-class standards. The Qatar Genome Project is an ambitious programme that aims to provide whole genome sequences for the entire Qatari population to deliver personalised healthcare. It will chart a roadmap for future treatment through precision medicine.

Could you discuss the correlation between the integration of genomic technologies and healthcare, and the development of a knowledge-based economy?

The conception of multiple research centres and branch campuses of prestigious universities embodies the national vision to turn Qatar into a knowledge-based economy on par with the most technologically advanced countries. In order to implement this vision, Qatar has committed 2.8 per cent of its Government revenues to R&D. Qatar has already made significant achievements in several disciplines such as engineering, computing, transportation and information technology, but, due to the complicated infrastructure required, biotechnology has lagged behind. This is reflected in the modest presence of biotech companies in the Qatar Science & Technology Park.

What are the challenges surrounding precision medicine, including cultural misconceptions and difficulties in capacity building?

The most challenging task is how to convince healthcare practitioners of the attractiveness of precision medicine for their daily practice. Without their buying into it, it would be difficult to make patients adhere and contribute to the success of the programme. Misperception of genomics studies by the community and fear of stigmatisation can be an additional challenge. That being said, based on my own experience, patients in Qatar are very respectful of their physician’s opinion and keen to participate in medical research. Islamic studies scholars could enlighten the community about the benefits of precision medicine and dissipate any concerns regarding compliance to their beliefs and Islamic principles.

With the launch of the Qatar Genome Project, new avenues could be opened for the biotech and pharmaceutical industries. The effective application of precision medicine in Qatar could improve population health and the development of a knowledge-based economy. Seeing Qatar as a potential hub to GCC and other markets, biotech and pharmaceuticals companies from the US and Japan have already expressed their interest in setting up joint business ventures in Qatar.
QATAR MAY BE small, but it boasts the third largest natural gas and oil reserves in the world. This wealth has enabled Qatar to build up a high-income economy and achieve the highest per capita income globally. As a result of this, in the space of just a few generations, Qataris’ lifestyles and diets have changed significantly. Unfortunately, some of these changes have had negative impacts on public health.

Precision medicine is a healthcare model in which care is personalised to the patient, with therapies and treatment plans being selected based on individual genetic, molecular or cellular factors. At Weill Cornell Medicine-Qatar, Dr Lotfi Chouchane, a professor of genetic medicine and immunology, is one of a growing number of health professionals dedicated to the promotion of precision medicine in Qatar as a tool for tackling some of the country’s most urgent health challenges.

OBESITY: A GROWING PROBLEM
One major public health concern in Qatar is the rapid increase in the prevalence of obesity. According to the World Health Organization (WHO)’s most recent statistics, 73 per cent of Qatari men and 70 per cent of Qatari women are overweight.

Obesity is associated with dangerous conditions such as diabetes, cardiovascular disease and cancer, and as such represents a major threat to the population. “The lack of knowledge about genetic and environmental risk factors in certain populations that are disproportionately affected by obesity, such as the Qatari population, is a critical unmet research and public health need,” Chouchane states.

Work is therefore underway to address this knowledge shortfall. Chouchane and his colleagues are engaging in extensive collaboration, both with other leading institutes in Qatar and further afield, with the aim of identifying epidemiological risk factors and genomic signatures associated with obesity (both its onset and progression) in the Qatari population. Additional research is also in progress to identify molecules capable of inducing brown fat production in adults, which could have therapeutic potential for the treatment and/or prevention of obesity and obesity-associated conditions.

CANCER IN QATAR
Another area in which Chouchane feels precision medicine could bring about significant health benefits in Qatar is the treatment of cancer. Breast cancer is a particularly prominent example, as it is the most frequently diagnosed malignant disease affecting Arab women. Importantly, breast cancer has been shown to manifest itself differently among Arab women than in European and US populations; women in Arab populations are more likely to be diagnosed with breast cancer at a younger age, to be at a more advanced disease stage at first presentation and to have a larger tumour.

Genomic signature and diseases

Researchers at Weill Cornell Medicine-Qatar are collaborating with colleagues, at both the national and international level, to bring world-leading precision medicine to the Qatari population.
Breast cancer is the most frequently diagnosed malignant disease affecting Arab women.

Importantly, in a healthcare model in which precision medicine is incorporated, an individual patient’s BAD profile would be used, together with other relevant factors, to identify an optimal treatment strategy. “Precision medicine should not only rely on the genomic and clinical investigation in a given patient or group of patients with breast cancer, but rather employ a more holistic approach including patient–doctor relationship, epidemiological data collection, awareness campaigns, screening and early detection,” Chouchane suggests.

Chouchane has also collaborated with colleagues in Qatar to successfully identify, using high-throughput genomic analyses, a set of genes differentially expressed in breast tumours from Arab populations – a finding that could pave the way for future developments in breast cancer prevention and treatment strategies.

THE QATAR GENOME PROJECT

In an effort to learn more about the diseases affecting the local population and how best to treat them, Qatar launched an initiative to map out the genome of the entire Qatari population.

To date, no Arab population has been included in any of the large-scale international genomic consortiums, including the HapMap Project and 1,000 Genomes Project. As such, although high-throughput technologies such as next generation DNA sequencing are available, they are overwhelmingly being applied to populations of European, American or Asian ancestry. Until these technologies are applied to Arab populations, lifesaving insights relating to the onset, pathogenesis, diagnosis and treatment of common diseases like cancer and diabetes cannot and will not be achieved.

This dearth of data relating to Arab populations has led stakeholders in Qatar to collaborate on the Qatar Genome Project – a programme aimed at developing genome sequence and molecular –omics data on all Qatars, with a view to paving the way for developments in precision medicine.

Launched in 2013, the Qatar Genome Project has already achieved a number of important milestones, including the development of cutting-edge facilities at Qatar Biobank and the Sidra Medical and Research Center. At present, a pilot-phase study aimed at optimising the systems and procedures needed for the project is underway.

A HEALTHIER FUTURE

In spite of significant advances in this area, the implementation of a precision medicine model in Qatar is not without its challenges. Public and stakeholder education is essential if all sectors of Qatari society are to become aware of the possibilities represented by precision medicine. Other obstacles relate to practicalities, such as the capacity building required when dealing with a project of such a large scale.

However, Chouchane is positive that precision medicine has the potential to significantly impact the Qatari healthcare system. “I think there are several benefits of precision medicine for the Qatari population, and that many factors will contribute to the success of an attractive programme in Qatar,” he confirms.