

Health

Scientists pinpoint body 'weakness' that makes the elderly susceptible to cancer

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In Kenya, the ageing population is faced with many medical challenges and according to the 2019 census. Photo credit: Shutterstock



By Francis Mureithi Writer
Nation Media Group

Do you know why sometimes you hear people sarcastically say others are ageing fast?

Well, the answers may be in the offing after scientists from Nanyang Technological University, Singapore (NTU Singapore) mapped out the molecular structure of a key part of our chromosomes – called telomeres – which plays a pivotal part in ageing and cancer.

Health 70+ years in Kenya increased from 225,930 in 1971 to 718,620 in 2020 growing at an average annual rate of 2.40 per cent.

However, the elderly population has increased by 538,220 since 2009 when they were recorded at 1,332,273. There are more women in the 65 years+ group than men accounting for 55.8 per cent in 2019 compared to 54.8 per cent in 2009.

In 2021 population aged 65 years and above fell gradually from 3.3 per cent in 1972 to 2.6 per cent.

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People in Kenya are living longer lifespans and this has been attributed to improved medical care, improved diet and nutrition, as well as general wellbeing.

The World Health Organisation (WHO) says that by 2050, older people will constitute more than one-fifth of the world's population.

The National Policy for Older Persons has been reviewed and aligned with the Constitution.

The population of older people in Kenya will rise from 1.9 in 2020 to 2.6 million in the next two years.

The demographic shift towards increased older persons in society has been accompanied by rapid urbanisation, shifting attitudes within communities and population movements.

On the other hand, rural-urban migration has also created a segment of older persons in urban areas who face peculiar challenges.

Structure of telomeres

In Kenya, the number one cancer in terms of deaths is cervical, followed by breast, oesophageal, colorectal, and prostate.

Health The adoption of unhealthy lifestyles.

The Singapore team discovered that the building blocks of telomeres are stacked in columns like a spring. They also found that the shape of telomeres leaves a part of the DNA exposed and unprotected, leaving it more susceptible to damage than previously thought.

The researchers said that their advance in genetic research would aid in explaining why humans age and develop cancer.

To arrive at their results, the researchers used a state-of-the-art cryogenic electron microscope at the NTU Institute of Structural Biology to probe the structure of telomeres.

Previously, scientists have struggled to duplicate enough telomeric DNA in the laboratory to be able to use electron microscopes to observe how it is structured.

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In their study published in the journal Nature, the researchers adapted existing processes to replicate DNA and saw that in telomeres, the nucleosomes, which contain tightly packed strands of DNA (deoxyribonucleic acid), are stacked in columns around chromosomal proteins called histones.

Professor Lars Nordenskiöld, Chair of NTU's School of Biological Sciences, who led the study, was quoted by Nature saying: "Our study showed that telomeres are not structured in the zig-zag formation as depicted in textbooks, but rather in columns and a spring formation. This leaves the crucial part of the DNA – its helix – exposed. This helps us understand how telomeres, despite their essential role in preventing damage to DNA, are themselves hotspots for DNA damage."

He added: "Our study will help researchers and doctors understand the reasons behind how telomeres are damaged at a molecular level, as detailed research on the structure of the DNA

Health The study, which represents an advance in understanding the underlying biology of how the human body ages and becomes susceptible to diseases, reflects NTU's commitment to responding to the needs and challenges of healthy living and ageing, which is one of four humanity's grand challenges that the University seeks to address through its NTU 2025 strategic plan.

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Besides growing knowledge of how telomeres are involved in processes such as ageing and DNA damage, the findings by the NTU research team may also be useful in developing potential treatments for diseases that are caused by dysfunctional telomeres.

Bone marrow failure

These include aplastic anaemia when the human body stops producing enough new blood cells and dyskeratosis congenita, a rare genetic form of bone marrow failure, and the inability of the marrow to produce sufficient blood cells, which typically results in death by the age of 30.

Dr Aghil Soman, Research Fellow at NTU's School of Biological Sciences, who co-authored the study, said: "A specific future focus in our study of DNA will be how our structure interacts with previously discovered telomere-specific factors, with a keen focus on factors associated with cancer development and longevity."

"Our structure also provides an avenue to improve small molecule anticancer drugs. Armed with the structure of telomeric nucleosome assemblies, we can now potentially design anticancer drugs that solely target telomeres with high affinity. This would help overcome the limitation of drugs like cisplatin, which

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Prof Nordenskiöld added: “The organisation of the proteins in telomeres, at the molecular level, revealed in this work, paves the way for further structural studies. This can shed light on the structure-function relationship of telomeres in the context of ageing and cancer.”

“It can also provide a template to develop treatments for genetic diseases. From our study, we also discovered elegant grooves formed by DNA that suggest how remodelling might happen within telomeres. This could provide a future platform for studies on drugs to target damage at the telomeric level,” he concluded.
fmureithi@ke.nationmedia.com



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