MATTERS OF THE Heart

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There is an urgency to extend initiatives for cardiovascular health protection, such as increasing awareness for improved life style, nutritious and healthy food, and promote health wellness programmes to combat heart diseases. "Matters of the Heart" is designed to provide public health education in these areas.

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PSYCHOLOGICAL FACTORS AND HEART ATTACK

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Mental health and physical health are essentially interlinked. Mental or psychological disorders maylead to pathophysiological changes increasing the risk of developing cardiovascular diseases.Psychological variables can affect the physiological mechanism of an individual either directly or indirectly and therefore they have a significant impact on the health or illness conditions of a person. The relationship between both is likely to be bidirectional. Individuals who are prone to negative psychological conditions can have unfavourable cardiovascular outcomes and very poor cardiovascular profile [1]. These individuals are most likely to adopt harmful behaviour patterns such as smoking, alcohol consumption, inadequate physical activity etc.These could lead tochanges in physiological functions of neuro-endocrine system, inflammatory and immune responses, and poor accessibility to health care facilities. Important psychosocial factors are depression, anxiety and stress.

Major depression is considered an independent risk factor for the development of heart disease and it doubles the risk to individuals who are otherwise healthy [2]. The factors linking depression with cardiac

problems are several.Depression could be a cause for non-adherence to medical treatments.Higher rates of chronic smoking or addiction to smoking are observed in the depressed. Depressed individuals are also at greater risk for obesity. Moreover, depression exposes individuals to sympathetic hyperactivity and increased platelet reactivity which in turn lead to ischemic heart disease. Depression causes changes to pro-inflammatory processes and an elevation of the body levels of interleukin -6 (IL-6), which is a primary pro-inflammatory substance released by cells. Inflammation promote atherosclerosis which leads to increased cardiac events [3].

Anxiety can initiate a chain reaction in the body and it is most likely to be mediated by the sympathetic nervous system and culminates in the sensitization of cardiac sympathetic nerves. Constant experience of these emotions can predispose an individual to over stimulation of the sympathetic nervous system,changes in cardiac rhythm and to the risk for coronary artery spasm, which can eventually lead to cardiovascular events and death. Individuals whose sympathetic nervous system response to stress is severe and prolonged over time are at higher risk for development of atherosclerosis and subsequent coronary artery diseases [4].

Apart from these, other anxiety induced psychological and physiological activities in the body such as heartbeat, blood pressure, and heart output would risk the cardiovascular system of patients. Raised heart rate is considered a marker of cardiovascular risk in the general population as well as those with existing heart disease [5].

Everyday stress situations or laboratory or experimental stressors have great implication in the causation of coronary heart disease. There is no concrete evidence of physiological mechanisms linking stress and cardiovascular events; however, it is most likely that the increased levels of hematocrit (the percentage volume of blood that is occupied by red blood cells) and blood viscosity would increase the stress on susceptible atherosclerotic plaques leading to plaque rupture and blood clot

formation which result in cardiovascular events, especially myocardial infarction (heart attack) [6].

Stress can induce elevation in the blood levels of cholesterol, triglycerides, free fatty acids, fibrinogen, haptoglobin, and seromucoids, platelet aggregation and adhesiveness, and total red blood cell count, which are linked to accelerated atherosclerosis and coronary occlusion. It is also observed that people without significant coronary occlusion may also have myocardial infarction as a result of the damage caused at myocardial nerve endings by excessive release of norepinephrine, a neurotransmitter that is secreted in response to stress [7].

While research on the effect of psychological risk factors on the incidence of coronary heart disease have been going on in Western countries over several years and have clearly identified and established a link between psychosocial factors and heart diseases in their population, limited data are available on the association between the two in the Indian population.

We have recently published in theJournal of Clinical and Preventive Cardiology[8],the results of our study on the association of depression, anxiety and stress with myocardial infarction (MI)in Keralites. Our studies have revealed that an association exits between psychological factors and myocardial infarction. The study included all consenting patients who presented with first episode of MI (incident Cases) diagnosed as per a standard protocol. The patients were in the age group of 25 to 65 years, and were all admitted in our hospital during the study period. Patients with unprovenMI, history of any other heart disease or other major diseases (AIDS, cancer, chronic obstructive pulmonary disease and physical deformities), and psychiatric illness, and those on antipsychotic medicationswere excluded. The control group included all consenting in-patients admitted to the General Medicine department during the study period, in a similar age group and had no history of MI or cardiovascular disease risk factors or major illnesses. The Depression Anxiety and Stress Scale (DASS) a self-reporting questionnaire

with 21 items (seven items for each category) based on a four-point rating scale,was used to assessdepression, anxiety, and stress in the study participants. We found that people with higher level of depression, anxiety and stress are at an increased risk for MI when compared with individuals in the control group.

A clear link between psychological factors and coronary heart diseases as observed in other countries is also seen among Keralites.

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THE MULTIPLE RISK FACTOR INTERVENTION TRIAL: MUSINGS OF A MEDICAL STUDENT OF THE DIGITAL AGE

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The day I joined medical college, I received a false health message in a WhatsApp group, which I sent to many people excited at joining the profession of healthcare. I soon realised that it was fake from a doctor's response in the group. I ended up apologising to everyone I sent the message to and rectifying the information. I have been cautious ever since. During my community medicine posting, I came across the Multiple Risk Factor Intervention Trial (MRFIT) in the cardiovascular disease epidemiology section. It struck a chord with me. The misinterpretation of the findings and the subsequent consequences bore resemblance to how easily people are deceived and public opinion misshapen through false information, especially regarding health and disease, on social media and group messaging platforms. As a medical student interested in epidemiology and biomedical research, I took away the messagethat research findings need to be carefully interpreted, requiring a stepwise, logical and unbiased approach. Such an approach is not only useful for interpreting scientific evidence but also for making judgements in our daily lives.

The Multiple Risk Factor Intervention Trial was a randomised control

trial designed to assess whether the combined control of risk factors through an intervention program would cause a significant decline in mortality of a group of men at high risk for coronary heart disease [1]. The study was implemented in light of the fact that long-term follow-up studies, most notably the Framingham Heart Studyhad established definite modifiable risk factors for coronary artery disease [2].With the National Heart, Lung and Blood Instituteas the implementation agency in the United States, it was conducted at 22 US clinical centres from 1973 to 1982.

12,866 men were randomly assigned into the intervention program and to their usual sources of health care in the community. The intervention comprised of regular counselling for cigarette smoking, dietary plan to lower serum cholesterol and stepped-up care for blood pressure control (starting with the drugs chlorthalidone or hydrochlorothiazide) [3]. An average follow-up period of seven years revealed that though risk factor levels declined to a greater degree in the intervention group, there was only a statistically non-significant 7.1% decline in deaths from coronary heart disease. The authors concluded that these results were non-conclusive and further investigation is needed to ascertain the role of risk factor intervention in heart disease [1].

It is rightfully said that “vultures spiralled down to pick at the fresh carcass of multi-factor cardiovascular disease prevention” [4]. The industries likely to have been most affected, including the dairy, beef, egg and tobacco industries cited the study extensively to promote their products. The hypertensive community grew apprehensive of thiazide diuretics based on the limited results of the study [5]. Immediately following the publication of the study, clinicians and public health officials who were sceptical about the concept of risk factors in disease causation, viewed the results as a reaffirmation of their stance [4]. Though on follow-up, the trial did generate significant results on various aspects of cardiovascular disease prevention, the study had issues in its design and implementation [6]. The trial had been criticised early on for being underpowered; not being blinded to researchers, patients, or

clinicians, and inaccurate assessment of reduction in smoking[4,6,7-9]. Despite early indications of critical issues in the study design and the subsequent inconclusive results, why did the study have the impact it did?

The reason is that epidemiological exploration, as any other in science, is a balancing act.We infer clues about the functioning of the world by modelling an aspect in such a way that it can be observed or changed in isolation. We then quantify the probability that our results represent a random occurrence and then weave a story out of our findings that ultimately, in unison with multiple other such explorations, lead us to the truth. So intricate is this art of affirming that something is true that unless all the various steps along the way are considered together in the backdrop of current perspectives,our interpretations could be wrong. Believing blindly that the results of a study are true is akin to a juror believing that an accused person is guilty before a fair trial. Modern medicine is relatively young having emergedin the 18th century. Since then we have made tremendous progress that has rewritten the fate of human life on earth. But the fact remains that we have miles to go. Rather than thinking in absolution about various ideas, we will hence have to frame our beliefs by weighing the evidence available and viewing new evidence in the context of existing knowledge. When we do not have answers, we must be willing to admit that we donot know.

This is especially important in today's digital age where we are bombarded with information from all sides. Taking a rational and critical approach is vital especially when it comes to information about health. Fake health messages on social media are a pressing issue today, as exemplified by the 2018 Nipah outbreak in Kerala, when the government had to enforce legal action against people spreading false information [10]. Medical students and professionals must be even more cautious as their messages are seen as authentic by the public.

I have come to realise that most of the time, the path to establishment of a hypothesis as a fact is a long process requiring strong evidence from

multiple sources. Most of what we believe is based on a quantification of probability and hence it is a question of strength of belief. To determine the same, there is a need to understand the multiple facets of the process of scientific inquiry, most importantly the basic concepts of statistics. Thiswould help better decision making with available evidence. Hence there is a need to include stronger statistics and scientific approach sessions in college and even school curricula. The question remains as to how layman and students in their formative years can interact with the clutter of information around them. The answer I believe, is to gather information from reliable sources including expert opinions and authentic references. A simple strategy would be to provide authentic citations for all health-related messages spread by social media giving an opportunity for the readers to provide verification. Here too, messages stating that these are from a doctor, working at a particular hospital should be viewed with caution for they can be unauthentic. Leaving interpretation of study results to experts who can gauge the circumstances of the study is the best way until one develops the skills to do the same.

What if one does not agree with conventional wisdom? I believe that such thought is the basis of development,innovation and progress. However, the foundations of the ideas must be robust, supported by or planned to be supported by solid evidence generated by a process of scientific inquiry. I recently came across an interaction between flat-earthers and scientists, during which a member of the former said that it is an individual's right to interpret the world they see around them and science has no right to dictate the same to them [11]. A scientist rightly replied that if they could explain existing phenomena with the model or provide scientific ground for future work, their beliefs would not be blind. The anti-vaccination movement is another classic example in the field of medicine of blind beliefs, in this case, contributing to the re-emergence of deadly infections of a bygone age.

On a more personal note, the scientific approach to arriving at the truth, I realise, can be applied to our personal lives as well. When we

jump to conclusions about a person or occurrence based on a single isolated incident, we are often going to reach the wrong conclusions. I draw an analogy with the famous tea tasting experiment wherein one tests a person's ability to distinguish whether the tea or the milk was added first to a cup. The calculations reveal that for a person to identify correctly so that the chance that it could be due to chance is less than 5% ($p<0.05$). He or she would have to try a minimum of four times and get all of them right. This principle forms the basis of the Fisher's exact test in statistics. Though not practical all the time, in theory we would seem to need to give a minimum of four trials before we come to a judgment.

Can we be completely free of being deceived by false information? The short answer is no.

Data fudging, p-hacking, bootstrapping, vested interests of the investigators and so on are on the increase today. The push to publish for promotion in academic institutions has increased publications in predatory journals leading to the generation of misinformation. Besides disclosure of conflicts of interest and data sharing, we need to devise checkpoints at all levels to regulate the process of medical research.

With artificial intelligence and machine learning at our doorstep, we are going to be weaving stories from data at a faster rate than ever before. The field of medicine is no exception [12]. As a medical student, I have realised that evidence-based practice not only applies to medicine but to many other aspects of our life. Today, though the concept of reducing multiple risk factors to prevent heart attack and stroke has been established by evidence from numerous trials, the Multiple Risk Factor Intervention Trial stands in history as a case in point for the consequences of reaching hasty conclusions. Let us hope or a future driven by a rational approach to science and its achievements.

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THE EFFECT OF SPACEFLIGHT ON HEART CELLS

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With the turn of the 21st century, space travel has become increasingly common, so much so that some privatecompanies have even floated plans of space tourism. Though space travel is undoubtedly exciting, conditions in the space are strikingly different and can have profound effects on the human body and health. For this reason, astronauts embarking on space travel undergo rigorous physical and mental tests and undertake various protective measures to minimise healthrisksdue to spaceflight. Despite thevarious precautionary measures, long term spaceflights can cause multiple health problems like bone density loss, loss of muscle mass, adverse effects on cognitive performance, microbial shifts and changes in gene expression. It is therefore essential to understand the effects of spaceflights on human physiology which can help us devise strategies to overcome the limitations.

Heart is one of the major organs affected by conditions of microgravity that exists in space.In simple terms, microgravity refers to the condition in space where the effects of gravitational forces are minimal, which causes the people and objects to appear weightless. Microgravity leads to redistribution of body fluids away from the extremities,which can impact cardiovascular physiology. Studies have noted reduced heart

rate and lowered arterial pressure under conditions of microgravity. A recent study published in the journal Science earlier this year, conducted a multi-dimensional analysis of the effect of spaceflight on a pair of twins. The invstigators noted that long-term exposure to microgravity reduces mean arterial pressure and increases cardiac output. An article by Wnorowskiet al.which appeared this month in the journal Stem Cell Reportsoffers some new insights on the effect of microgravity on cardiac function in humans at cellular and molecular levels. Studies in the past on the effect of microgravity on heart cells have primarily employed rat or mouse-derived cardiomyocytes (heart muscle cells), since it is very difficult to source and propagate human cardiomyocytes. However, Wnorowski and his colleagues employed cardiomyocytes derived from human induced pluripotent stem cells (hiPSCs)generated from mononuclear cells in peripheral blood sourced from three different individuals.The study therefore offers novel insights into the effect of microgravity on human heart cells in the space.

The scientists grew the cardiomyocytes in specially crafted fully enclosed 6-well plates called Biocells and maintained them in an on-station incubator at the International Space Station. A replicate (an exact copy) plate of cardiomyocytes was maintained at identical conditions at the ground station for comparison. After maintaining the cardiomyocytes for almost 5.5 weeks at the space station, the cardiomyocytes were returned to earth and the structural, functional and molecular properties of the cardiomyocytes were compared withthose of the ground controls. Notably, they did not find any marked changes in the overall cellular structure or the cytoskeletal (cell's skeleton structure) organisation. Also, the beating rates of the cardiomyocytes were also not significantly different. However, they observed reduced calcium recycling rates in these cardiomyocytes. The calcium flux into and out of the membranous compartments of the cardiomyocytes is critical for their rhythmic beating.In line with this, they observed irregular beating intervals in these cardiomyocytes. This indicates that microgravity can induce changes in the beating pattern even in the

isolated heart cells.

Next, to understand the changes at the molecular level, they profiled the changes in the expression levels of the various genes by RNA sequencing. Three distinct samples of cardiomyocytes; a sample of space-flown cardiomyocytes maintained in space for 4.5 weeks, a sample ofpost-flight cardiomyocytes from day 10 after return from space and a ground control sample at the post-return time point were compared against each other.Though calcium recycling and contractility were impaired in space-flown cardiomyocytes the expression of the genes related to these processes were not significantly altered due to microgravity. This indicates that these defects might be caused due to more direct effects of microgravity on the cellular physiology rather than at the gene-expression level.

Further annotation of the RNA-sequencing data revealed that there was a marked upregulation of the genes related to mitochondrial function in the space-flown cardiomyocytes. On the other hand, genes related to DNA damage and repair and enzymes related to DNA/RNA unpacking were reduced in space-flown cardiomyocytes. Analysis for co-ordinately regulated set of genes revealed that genes targeted by Sp1 and MEF2 transcription factors were markedly upregulated in the space-flown samples. Finally, analysis of gene expression patterns by two-group comparisons revealed that the number of differentially expressed genes was higher in the space-flown vs ground samples and space-flown vs post-flight samples when compared to ground vs post-flight samples. This suggests that some of the gene-expression changes induced by spaceflight are reversibleupon return to normal gravity.

The study offers several new insights into the changes caused by spaceflight in cardiomyocytes. However, it is crucial to consider some of the caveats and limitations of the study which the authors also explicitly acknowledge in their article. First of all, in addition to microgravity, the radiation levels are quitehigh in space which might also have contributed to the observed changes in gene expression. Next,

the space-flown samples experienced the additional stress of launch and re-entry, which the ground samples did not. Finally, the use of hiPSC derived cardiomyocytes poses some limitations. Some fibroblasts were also present in the cardiomyocyte preparations and obtaining a pure population of cardiomyocytes from hiPSC remains a challenge. Though the hiPSC cardiomyocytes represent the best available model, they do not represent the mature cardiac muscle cells in entirety. The study however lays a solid groundwork for future studies in this direction. Technical advancements which can overcome some of the shortcomings noted here can provide a more refined model of the effect of spaceflight on cardiovascular physiology.

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DOWNSIDES OF GOING LOW-CARB : WHAT ARE WE MISSING OUT?

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Eat fat, stay trim – that is the basic principle behind the popular low carbohydrate diet. In this day and age, carbohydrates instead of high fats, are more likely vilified in miracle diet charts. There are several hypothetical concerns on the long-term safety and health impacts of low-carb diets. As yet some studies have shown that low carb diets reduce trigylcerides and increase HDL (high density lipoproteins or good cholesterol) [1] while a few other studies report an increase in LDL (low density lipoproteins or bad cholesterol) with low-carb high fat diets [2].

Current buzz in nutritional research circles is about a study published in the September 2019 issue of European Heart Journal. Researchers of International Lipid Expert Panel (ILEP) and the Lipid and Blood Pressure Meta-analysis Collaboration (LBPMC) group found that low

carbohydrate diets are extremely risky and should be avoided [3]. For the study, the lead author Mohsen Mazidi and his team examined the relationship between low-carb diets and all-cause deaths, and deaths from coronary heart disease, cerebrovascular disease (including stroke) and cancer in 24,825 participants. Participants had an average age of 47.6 years and 51% of them were women. Participants were divided into quartiles based on the usual percentage of carbohydrates in their diet. They observed that people who ate a low carbohydrate diet, were at a greater risk of premature death. Risks were also increased for individual causes of death including coronary heart disease, stroke, and cancer.

Compared to participants with the highest carbohydrate consumption, those with the lowest intake had a 32% increased risk of all-cause deaths during a 6 year follow-up. In addition, risks of death from coronary heart disease, cerebrovascular disease and cancer were increased by 51%, 50%, and 35%, respectively. The results were confirmed in a meta-analysis of seven other studies with nearly half a million participants and an average follow-up of over 15 years, which found increased risks in mortality with low carbohydrate diets compared to high carbohydrate diets.

Whilst low carbohydrate diets including Atkins and ketogenic dietary intervention might be useful in the short term to aid weight loss, lower blood pressure, and improve blood glucose control, the study suggests that in the long-term, they are not safe. This raises the question whether these diets should be routinely recommended in clinical practice in light of their short-term weight loss effects, until these potential harmful long-term outcomes have been further evaluated. “Low-carb diets are unsafe and should not be recommended”, opine co-author Maciej Banach, Professor at the Medical University of Lodz in Poland.

The reasons for the negative health consequences of going low carb may be that a low carbohydrate diet means that less fibre and fewer fruits and vegetables are eaten, which is likely to reduce vitamin and

antioxidant intake. In addition, animal protein is likely to be increased in such diets and too much animal protein has been shown in many studies to have a negative effect on various aspects of health [3, 4].

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RED MEAT: TO EAT OR NOT EAT?

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In my article in a previous issue of Matters of the Heart, I had emphasized on considering both red and white meat to be equally bad for the heart. My recommendation was based on an article in the Journal of Clinical Nutrition. In October 2019, however, a panel of researchers from McMaster and Dalhousie Universities suggested that adults can continue red and processed meat consumption. The authors arrived at this conclusion after performing four systematic reviews focused on randomized controlled trials and observation studies looking at the impact of red meat and processed meat consumption on cardiometabolic and cancer outcomes.These reviews are published in the Annals of Internal Medicine as Dietary Guideline Recommendations from the Nutritional Recommendations (NutriRECS) Consortium. NutriRECS, an independent group of nutritionists and health researchers, says its mission is "to produce trustworthy nutritional guideline recommendations based on the values, attitudes and preferences of patients and community members."

The recommendations were developed by using the Nutritional Recommendations (NutriRECS) guideline development process, which includes rigorous systematic review methods and GRADE(Grading of Recommendations, Assessment, Development and Evaluation)

methods to rate the certainty of evidence for each outcome and to move from evidence to recommendations. A panel of 14 members, including 3 community members from 7 countries (Canada, England, Germany, New Zealand, Poland, Spain, and the United States)voted on the final recommendations. Strict criteria limited the conflicts of interest among the panel members. Considerations of environmental impact or animal welfare did not bear on the recommendations.

The consortium perceives evidence for the 'undesirable health effects' of meat-eating as a risk of bias from non-validated surveys, results from qualitative studies with small number of participants, and the "failure to specifically ask about the health benefits that would motivate a reduction in red or processed meat consumption".

These findings are significant, as scientific evidence from several laboratories have not significantly influenced the dietary choices of meat eaters. The scientists in this study state that they only looked at the health impact of a red and processed meat diet and not animal welfare or environment. In a review of 12 trials involving 54,000 people, they did not find any statistically significant association between red meat consumption and the risk of heart disease, cancer or type 2 diabetes. However, they did a find a small reduction in the risk of such diseases among those who consumed three fewer servings of red or processed meat a week.

The independent panel used the findings from five comprehensive meta-analyses. One meta-analysis included all randomized, controlled trial (RCT) evidences; three others included data from all observational studies with >1000 participants, and one concerned participants' values and preferences about meat consumption. A summary of results of panel's evaluation are:

a) Meta-analysis of the 12 RCTs did not reveal any significant difference for the outcomes of all-cause mortality, cardiovascular disease (CVD), CVD -related mortality, or cancer-related (including colorectal cancer) mortality (low- to very low–certainty evidence)between patients who

consumed higher and those who consumed lower quantities of red meat during longer than 10 years of follow-up.

b) The observational studies indicated that, for every 100 people who reduced processed or unprocessed meat intake by 3 servings per week, roughly 1 person avoided death and 1 person avoided a diagnosis of diabetes during 11 years of follow-up (low- to very low–certainty evidence).

It is a fact that meat is a rich source of vitamins and minerals. These micronutrients play an important role in the manufacturing of blood cells. Plant-based diets do provide these micronutrients but any reduction in meat intake has to be supplemented by a wide variety of fruit, vegetables, pulses and whole grains to provide these nutrients. Meat is also the cheapest and best source of such nutrients and the first choice among the poorest of the world.

Several nutrition experts and physicians have however strongly opposed the NutriRECS findings probably because of the severity of the recommendations. These experts request and recommend limiting consumption of red and processed meat in order to save people from heart diseases and cancer.

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STATINS: FRIEND or FOE?

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Increased deaths from heart diseases are of utmost concern globally, despite several therapeutic advances. The World Health Organisation reports that 17.9 million people die each year due to heart disorders and the number is expected to reach 20.5 million [1]. An alarmingly high number of deaths due to this disease calls for an urgent management strategy; however, the solution is still unclear.

A substance which is believed to be the root cause of coronary heart disease (CHD) which in turn leads to various heart disorders is cholesterol; its gradual build up results in narrower arteries. Consequently, a conventional preventive approach to maintain healthy heart is removal of extra cholesterol from the blood. To reduce low and high density lipoproteins (LDL & HDL)---forms in which cholesterol is carried in the bloodstream---a class of drugs, STATINS, are used.

Statins, are inhibitors of the enzyme 3-hydroxy-3-methylglutaryl–coenzyme A reductase and for a couple of decades, have been known for their antioxidant and anti-inflammatory actions. Recently, I read a

brief twitter thread on statins in which the drug was being discussed. The concern was that doctors prescribe statins for elderly people on the grounds of a slightly higher amount of LDL than the normal range. In that thread, a contrarian point of view seemed to gather much support. This view claimed that instead of preventing, statins cause heart diseases by accelerating arterial calcification resulting in hardening of the arteries. The effects of statins in preventing heart diseases is already well established. I was hence intrigued by the contrary side-effect of the drug and tried to investigate whether this view has any supportive evidence in the scientific literature.

Several studies done recently indicate an inverse relationship between cholesterol and mortality rate due to heart disorders and, thus question the role of statins as a drug against the disease [2, 3, 4]. Taking it up a notch, a few clinical trials have resulted in demonstrating the adverse effects of statins. This includes artery calcification due to reduced vitamin K2 synthesis, interference in the cholesterol synthesis, alteration in insulin sensitivity resulting in diabetes (one of the major risk factors for heart disorders), cognitive impairment, and myalgia [5, 6, 7].

To an extent, I am sceptical about the use of statins as a therapeutic drug against heart diseases. Certainly, based on existing evidence, we can question the conventionally stated benefits of statins as a preventive measure for heart diseases. But before we draw any concrete conclusion, we need to overcome the evidence gap. Nevertheless, for maintaining heart-health, we should emphasise more on the perfectly safe alternatives such as exercising, natural anti-inflammatory and cardioprotective food like ginger, garlic, turmeric, etc.

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AGEING DECODED?

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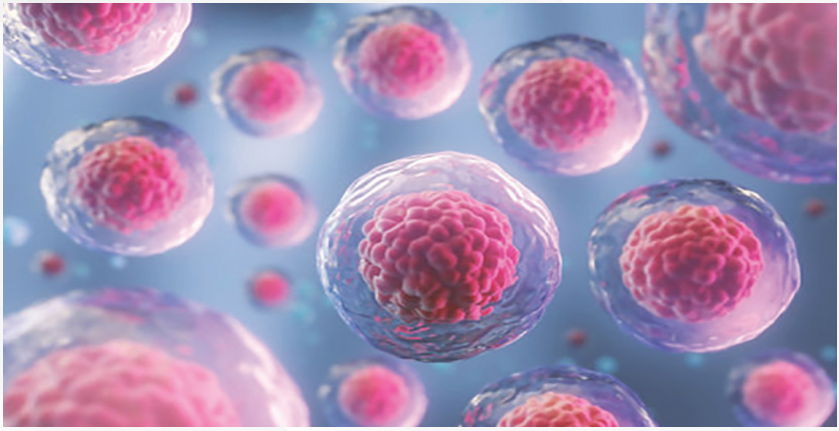
Researchers at University of Southern California, USA have investigated the underlying mechanisms of ageing. Their findings could be useful in the treatment of ageing associated diseases including heart diseases and cancer as well as enhancement of the lifespanof healthy humans.

Nicholas Graham and colleagues who published their findings in Journal of Biological Chemistry argue that for drinking from the fountain of youth, you need to find out its origin and the mechanism of action. They tried to investigate how cells age, so that they could discover and design newer treatments for the aged.



Cells Illustration Credit: © Anusorn / Adobe Stock

What causes aging of cells?

To identify cause of ageing, the investigators focussed on 'senescence', a natural process during which the cells permanently stop creating newer cells. Ageing associated decrease in DNA (deoxy ribonucleic acid) length, increase in DNA damage and signals that lead to cancer contribute to senescence. Senescent cells contribute to age related decline in health, abnormal growths in tissues and aging associated disorders including heart diseases and cancer. In contrast to stem cells which have unlimited potential to divide and self-renew,aged or senescent cells exit from cell division irreversibly. Senescent cells loose some of their essential chemicals such as the nucleotides, the building blocks of DNA.

When synthesis of these nucleotides was blocked in young cells, the cells soon became senescent or aged. The results suggested that nucleotide production keeps cells young; preventing loss of nucleotides can slow cellular ageing. In order to trace how the various metabolic pathways in cells utilize nutrients supplied to them, young cells were fed with stable isotope labelled carbon molecules. Scott Fraser and his collaborators developed 3-D images of the cells. The 3-D images revealed that senescent cells have two nuclei instead of one and that they do not synthesize DNA.

Senescence has been mostly studied in fibroblasts, the most abundant cells found in connective tissue of animals. The authors of this study however took epithelial cells which make up the structure and shape of body tissues and are the cells in which most cancer arises.

Senescence process is considered as a double-edged sword as,while advancing ageing and associated tissue dysfunction, it prevents cells from dividing in an uncontrolled manner, thus protecting the body against cancer. It is hence possible that prevention of senescence to promote healthy lifespan could unleash uncontrolled cellular proliferation leading to cancer. Senescent cells however can be removed to promote healthy life span, the authors opine.

Clinical trials on humans are in early stages but studies in mice haveindicated that selective removal of senescent cells could be a useful strategy for development of drugs for extending the lifespan. Mice having symptoms of progressive ageing and tissue dysfunction were treated with senolytic drugs and their function was rejuvenated. Senolytic drugs (which removes senescent cells) can be a fountain of youth, the authors remark. The key to development of senolytic drugs is to design them specific to senescent cells excluding non-senescent cells which could remain unaffected. The researchers specially targeted the metabolism of the senescent cells so that metabolic pathways can be manipulated for development of efficient and specific therapy for prolonging healthy lifespan.

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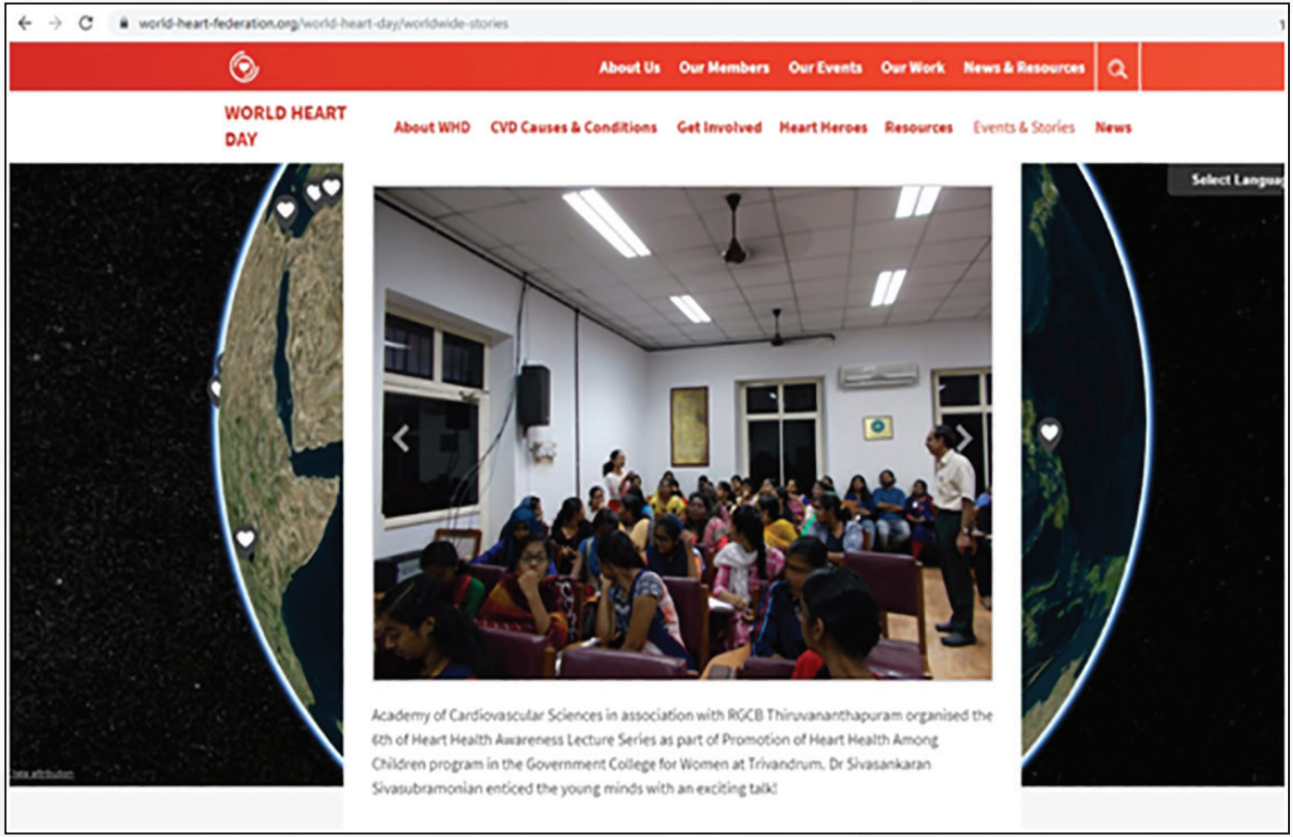
WORLD HEART DAY CELEBRATIONS 2019 THEME: MY HEART, YOUR HEART

Academy of Cardiovascular Sciences (IACS-India Section) celebrated the World Heart Day 2019 by organizing at Government College for Women, Thiruvananthapuram,a talk by Professor S Sivasankaran, Department of Cardiology, Sree Chitra Tirunal Institute of Medical Sciences. His lecture was attended by first year undergrad students of departments of Botany, Chemistry and Nutrition Science. Dr Sivasankaran spoke at length on the role of healthy food habits to keep chronic diseases such as diabetes and heart disease at bay. Comparing the first 20 years of adolescent life to twenty- twenty cricket he emphasized on the need for youngsters to start on a balanced diet and moderate exercises early in life so as to prevent heart diseases in later life. In a move to endorse his thoughts, the Academy provided the participants with an antioxidant rich red banana (Kappa pazham) to highlight the need for healthy snacking habit in youngsters.

The World Heart Federation highlighted our event in their website. For details please check out this link: https://www.world-heart-federation.org/world-heart-day/worldwide-stories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Academy of Cardiovascular Sciences in association with RGCB Thiruvananthapuram organised the 6th of Heart Health Awareness Lecture Series as part of Promotion of Heart Health Among Children program in the Government College for Women at Trivandrum. Dr Sivasankaran Sivasubramonian enticed the young minds with an exciting talk!

Professor Sivasankaran speaking to the young minds
at Women's College, Thiruvananthapuram

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