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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LIFE STYLE AND LIFE STYLE DISEASES

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Life style is the way we live. All humans are born the same. We suck at the breast and sleep well cared by the mother. Then we develop our life styles, based on our culture, religion, overpowered by the industry driven advertisements and peer pressure. We love to be identified as the -----boy or the ----baby, taller, smarter and what not. If such a life style leads to diseases are we committing suicide? Or by encouraging our children to adopt the modern life full of stress and risks are we committing homicide? An ideal life style should enable us to live our full biological potential in the most adapted way to our environment. When our body systems evolved in nature, nature never expected us to extract salt from the sea, sugar from sugar cane, oil from oil seeds, nor fruit juices and alcohol. Deep frying and

sumptuous feasting on the industry driven products, which have a long shelf life and indulgence in the use of tobacco and alcohol, had generated the new epidemic on non-communicable diseases as the Killer disease of Mankind. To tackle this, the United Nations has put forward the target of one third by 2030 as an integral part of the sustainable development goal (SDG).

Mission one third by 2030

As the statistics goes, two third of the present day hospitalisations and mortality at the younger age below the age of 70 years are related to life style factors which lead to what are called non-communicable diseases (NCDs). The four life style factors are unhealthy diet, physical inactivity, tobacco use and unhealthy use of alcohol. The diseases they lead to are broadly put under the group of cardiovascular diseases (stroke, heart attack,) diabetes, cancers,

Figure 1. *Nine aspects of the global target for Non-communicable disease control initially proposed which is the fore runner of the one third by 2030 Mission adopted for ensuring healthy lives and to promote well-being for all at all ages, as the integral component of United Nations Sustainable Development Goals.*

and lung disease. The target that is now put forward is to achieve a one third reduction in premature death related to these diseases globally by a 9-point action by the participating 194 Nations which is actually the extension of the 25 by 25 global target, figure 1, adopted earlier for NCD control. India had modified this into a 10-point agenda by including efforts to reduce air pollution along with its massive National Programme For Prevention and Control of Cancer, Diabetes, Cardiovascular Disease and Stroke (NPCDCS). To achieve this, we need a mass movement of community education and action. Kerala with its enlightened public, and its model of good health at low cost could lead the nation and the world in this context.

Timing is the key

The best example of the diet life style interaction is the honey bee. All honey bee larvae are born the same. Those larvae fed on pollen develop as the short lived impotent worker bee and the those fed on Royal jelly develop as the Queen bee with 20 time more longevity and good fertility. Similarly, nature has one goal in potentiating growth. The species should be at is best when they parent a baby. After parenting, the species slowly, enter the phase of senescence. Hence the younger age onset of non- communicable diseases does represent premature aging and maladaptation to the industry driven modern life style. Therefore, the best investment to avoid premature aging is to achieve your best at peak adolescence. Rough estimates show that tobacco is one product which guarantees that half the users will die due to a disease attributable to tobacco use. One cigarette ensures 10 minutes of your life to a hospital and one Kg of additional body fat over your best body weight at peak adolescence will ensure 3 months of your life to a hospital bed.

Who is at risk?

Younger age escalation of risk factors and diseases in India and Kerala clearly point to the fact that women and children suffer the brunt of damage due to the changing life style. Traditionally use of

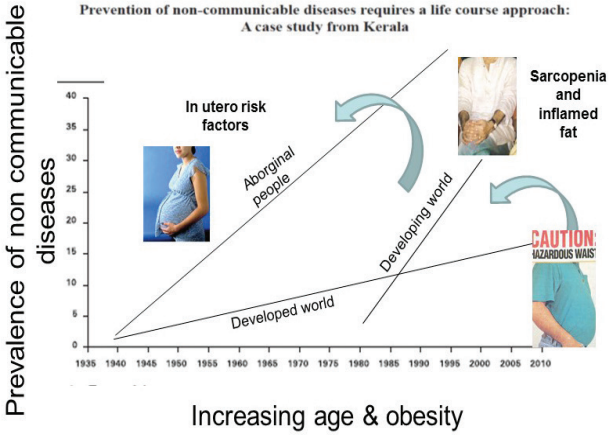

Figure 2. *Three patterns of increase in non-communicable disease in relation to age and body weight are observed in the world. In developed world, increasing age and obesity accounted for the majority, and in the developing world people developed the diseases because of less skeletal muscle (sarcopenia) and abnormal fat accumulation without becoming overtly obese. Younger age escalation is propelled further by the in-utero programing when the pregnant mother develops the risk factors and diseases like obesity, diabetes, hypertension and vitamin D deficiency. (IJMR 2013; 137:874-877)*

tobacco and alcohol consumption is the least in this sub group. Hence unhealthy diet and physical inactivity are the key drivers for the development of risk factors for non-communicable diseases in this age group. In the last 3 decades, gestational diabetes in women in the reproductive age group has increased 4 times, obesity now affects one third of the Kerala women, and polycystic ovarian diseases affects 10 -15% of adolescent girls. Vitamin D deficiency affects 2/3rd of the women in the reproductive age group. Breast cancer incidence in this age group is steadily increasing. Thus, the vulnerable group in the society namely women and children are at the greatest risk, and physical inactivity is thrust upon them by the ever-increasing academic pressure, and lack of enabling environment for physical activity. Recent follow up of children born in the New Delhi

birth cohort documented the incidence of these diseases in India. In the last decade, the incidence of obesity, hypertension, and diabetes between the ages of 29 to 36 years were 2%, 2-4% and 0.5 to 1% per year among women and men respectively. Figure two pictorially represents the trends in non-communicable diseases in relation to age obesity, physical inactivity and development of risk factors in the pregnant mother.

Go red for women

'Go Red For women' represents the public health movement initiated by American Heart Association, in 2000 specifically aimed at reducing the heart disease and risk factor burden in women. This is all the more relevant for developing countries like India. Three patterns of increase in non-communicable disease is documented as shown in figure 2. The first pattern seen in developed countries documented increase in these diseases with advancing age and increasing obesity. The second pattern seen in developing world showed younger age escalation of risk factors and diseases out of proportion to increase in obesity where rapid urbanization and growing physical inactivity played a major part. These two patterns are further worsened by the in-utero programing, when the prospective mothers harbour the disease risk factors which pre-dispose for early onset of the disease and risk factors in the offspring. Both maternal diabetes and vitamin deficiency are now documented to herald early onset of non-communicable diseases in the offspring from the Mysore birth cohort follow up study. Integration of non-communicable disease control with the reproductive and child health program could turn out to be the optimal strategy for prevention of younger age onset of risk factors and diseases in the developing countries. The two risk factors that needs to be targeted in this age group are unhealthy diet and physical inactivity. Further efforts at encouraging physical activity and healthy diet in this age group is likely to penetrate the whole family. At present, there is a legal ban on sale of tobacco products and alcohol to children and adolescents below the age of 18 years. It is equally important to implement salt fat sugar and

soda taxes to reduce the consumption of these industry driven products by children to prevent the early onset of risk factors. The present efforts in India, like fat taxes in Kerala and taxes on fried items in Bihar and the banning of sale of Junk food at schools by the Delhi, Odisha and Punjab governments are key health reforms. Banning of junk food sales in schools essentially resulted because of the legal efforts by the Uday foundation. These efforts follow the initial 1972 prescription from the symposium on dietary prevention of non-communicable diseases which highlighted the lower the better concept with respect to blood pressure, blood cholesterol levels and body weight as seen in figure 3. Recent studies on childhood prevention of adult onset diseases like the STRIPS study which restricted salt and fats to children from weaning add lot of scientific support to this concept. Healthy mother hood and achievement of best health at peak adolescence, thus turns out to be the best investments for achieving the one third by 2030 target.

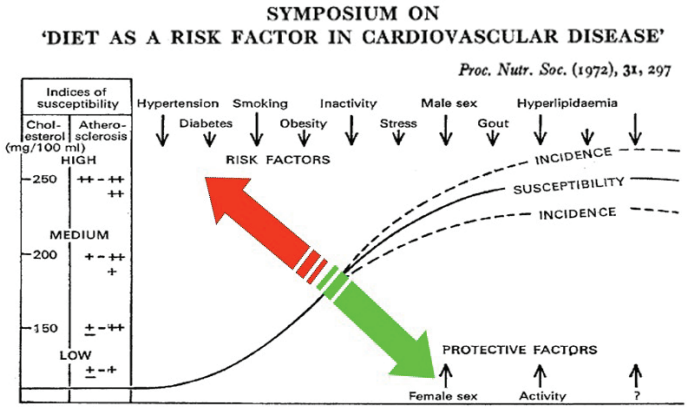

Figure 3.*Community susceptibility and incidence of coronary artery disease as put forward by the Nutrition Society Symposium in 1972, (Shaper AG.ProcNutrSoc 1971;31:297) which highlighted the concept of tracking of higher childhood values of blood pressure, obesity and blood cholesterol to early onset of adult diseases and increasing incidence of non-communicable diseases. The picture essentially stresses the need for childhood prevention strategies to be adopted universally to achieve the one third by 2030 target.*

WHAT IS NEW IN STRATEGIES TO REJUVENATE DAMAGED HEART?

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Human body is built to heal itself by replacing devitalized and missing cellular structures or tissue layers. When cells in the human body are damaged, the process of repair begins immediately. The chain of events initiated ends only when the damaged area is brought back to normal pre injured state. New cells may replace old cells. The sequence of events involves a series of functional changes and a fine balance among these events is crucial for the survival and necessary actions of the human body. In most of the cases, the healing phase is initiated by the renewal and replacement of worn out cells by new dividing functional cells. Most organs in the human body are repaired in this way. Heart is an exception; cells of the heart are not easily replaced by new cells.

Heart is one of the 5 vital organs and is assigned with the role of pumping blood and essential nutrients throughout the body. Heart is the first organ to form during the development of the foetus; its relentless muscular activity makes heart stand out from other organs. Cells of the heart are unique. It is interesting that the same set of muscle cells (cardiac muscles/cardiomyocytes) keeps the heart beating right from the time of one's birth till death. Any injury to the heart, can wipe out 25% of its cardiomyocyte pool within a few hours, resulting in a notable reduction in the pumping efficiency of the heart. Mammals are not equipped with the natural capacity to replace heart muscles that are lost by injury. Once damaged, these cells would be replaced by a collection of dead cells (tissue)or a scar instead of fresh cells, eventually leading to heart failure and death depending on the extent of injury. Heart failure is mostly managed with medicines, while in certain instances implantation of mechanical pumps (ventricular assist devices) is required to maintain blood flow. Another choice isreplacing the diseased heart with a healthy heart from another donor individual who has died (heart transplantation). All these strategies have limitations. Hence researchers have been attempting to find new treatment approaches. One approach is to find ways to grow new heart cells or make healthy heart cells to divide and multiply.

Extrapolating the observations made in experiments in small organisms and animals, researchers have been able to identify and show regenerative or cell renewal responses in human hearts as well. Recent studies demonstrated that mammalian hearts retain an inborn regenerative capacity for cardiomyocyte turn over throughout life. These findings have challenged the long standing dogma that heart is an organ without cell turnover or renewal potential.The discoveries in field of heart regeneration havenew impetus to find new ways to treat heart failure.

Current experimental approaches to vitalize an injured heart by having more healthy muscle cells can be mainly categorized under

three heads: stem cell therapy, cellular reprogramming and tissue engineering. Exciting progress has been made in the field of cardiac repair with advances in stem cell biology, cell transplantation techniques, developmental biology and biomaterials. Stem cells are stock cells capable of giving rise to indefinitely more cells of the same type.Cell transplantation therapy involves external delivery of corrective cells to the injured heart by delivery of cells through the coronary artery that supplies blood to the heart or by direct injection of cells into heart. This idea was mooted with the understanding in stem cell biology, and the vast potential of stem cells in dividing and replacing worn out cells of the body. The thinking was that if the residing stem/progenitor cells in an adult are capable of producing new heart cells, the delivery of stem cells might speed up the generation of a complete functional heart muscle tissue. Various adult stem cell types obtained from bone marrow heart, fat tissue, supporting tissue (mesenchymal stem cells), and skeletal muscle were evaluated for their potential to restore the lost heart muscle cell pool in the injured heart. With the success in studies in experimental animals, heart repair has moved rapidly into clinical trials involving patients. Clinical trials involving bone marrow stem cells, revealed a moderate improvement in the pumping efficiency of the heart. The efficiency was however, considerably less owing to the extent of dead tissue formed in the injured heart. Use of certain activator factors such as erythropoietin and granulocyte colony stimulating factor which would mobilize one's own or the inherent stem cell pool to the site of injury was also attempted in clinical trials of cardiac regeneration.

Cellular reprogramming, technique of converting one specific cell type to another, based on the pioneering work by the 2012 Physiology and Medicine Nobel laureates Gurdon and Yamanaka, was suggested as a possible alternative for cell transplantation therapy and also heart repair. In this approach, the dead tissue-forming cells called the fibroblasts (the most prevalent set of cells found in the heart), were reprogrammed to functional heart muscle

cells (cardiomyocytes), in a process termed 'transdifferentiation'. Certain crucial genes responsible for the cardiac myocyte genetic makeup (like transcription factor, Myo D) were overexpressed in the fibroblast cells making them transformed into cardiomyocytes. With the advent of more sophisticated methods in gene modification, scientists used combinations of transcription factors and generated much efficient cardiomyocytes from cardiac fibroblast cells. The fibroblast transformed cardiomyocytes, however, showed only 1% success in exhibiting spontaneous beating, the characteristic feature of cardiomyocytes. Active research is progressing in this area in order to utilize this approach to coax the failing heart to recover.

Tissue engineering, technique of growing functional tissues on porous, biodegradable meshes made of plastics (polymers), is yet another effective approach in regenerative therapy. Cardiomyocytes obtained from young animals or stem cells are used in preparing assemblies of engineered heart tissues. These constructs after proper conditioning could be sutured into injured adult hearts. Better contractile function was observed in the engineered heart tissues with good establishment of electrical connectivity with the surrounding viable heart tissue. Clinical studies are due although success has been reported in a handful of animal studies.

Another ground breaking discovery in the field of regenerative medicine is the 3-D printing technology, in which human organs are created using a highly specialized and unique printer. Beating three dimensional mass of heart cells (termed oraganoids) were created in laboratory using specialized heart cells using this technique. The research team is using an adapted version of ink-jet printing technology to print these artificially engineered heart tissues. The field is growing with varied applications in complex cardiovascular diseases and also many other surgical and interventional procedures.

The growing field of cardiac regeneration has potential benefits in treating millions affected by cardiovascular disorders, the leading cause of death and hospitalization around the world. Although adult

heart renew naturally, the process is very slow and is clearly not enough to repair the damage caused by a heart attack. From the first repair in 1953 of a defect in the heart septum, followed by successful heart transplant in 1967 and the first infusion of bone marrow-derived cells to the human myocardium in 2002, researchers have come a long way and developed several promising strategies for treating heart diseases. These strategies may eventually reveal novel possibilities for treating patients by turning on the heart's own repair mechanisms. Nevertheless, maintaining heart health is a personal responsibility and one is never too young, nor too old to take care of their heart.

MY TRYST WITH THE HEART

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It was a cold December morning around 6 am 20 years back, when I woke up with a sharp pain on one side of my neck. Reminding myself to improve my sleeping posture, I stood up to start my morning chores. Next thing I remember are the pale, worried faces of my wife and daughter trying to pull me up and a horde of neighbors in the room. I was bundled up into someone's car and driven to SUT hospital in Pattom. Thus started my tryst with doctors, cardiologists, neurologists and hospitals!

The first priority of a hospital when a 49 year old is admitted to the casualty with a pain anywhere near the heart is to monitor his heart rhythms using an ECG. The second is to draw out blood and check all

blood parameters so far discovered. By afternoon, I and the doctors concluded that I had not suffered a heart attack and so far as I was agile, probably not a stroke either. These two terms were not totally unheard for me as I had three maternal uncles who passed away before reaching old age due to heart attack. It was perhaps just a coincidence that they were all alcoholics!

Ultimately, the whole scare turned out to be a pain in the neck (literally) which became too unbearable for me resulting in the faint. My blood reports, however failed me, with a cholesterol level of around 400mg/dL and triglycerides somewhere of the same standards. Dr Bharat Chandran, a dimunitive but sharp and rational doctor assured me that both are not good for my heart and they should be frequently monitored and I should start exercising. My family heard, digested and translated faithfully every word the doctor advised. And I was put on a low carbohydrate-oil diet and the trio marched towards good health every day for 40 minutes, a practice which I have been carrying forward since then. I also started on the "wonder drugs" statin and aspirin daily.

I was sure my medical problems have been stalled forever when, after 10 years, during a routine medical check I was diagnosed with diabetes. Diabetes! Is that a disease? Sugar is a must for the functioning of the body (In 10 years I had gained enough knowledge of medical science!). The human body has a self mechanism to contain excess sugar. When that system fails excess sugar in the body becomes a problem, serious problems. It affects functioning of the heart, kidneys, eyes, uncurable wounds and so on. By the time blood testing in the laboratory detects high blood sugar levels most of us would have passed onto the second stage of disease namely, complications of diabetes.

What causes diabetes? One, I am a Malayali; so genetically designed to be a diabetic. Second, being a Malayali it is not in our nature to use our body for hard work. Third, we are slaves of coconut, sweet payasams and delicacies. In combination with increasing stress levels, use of excessive alcohol, sedentary work status and competition to

eat, Kerala has managed to top at the art of producing patients with diabetes.

Now, I had two additional tests every 4 months, the HbA1c and PPBS and an additional "wonder drug" metformin added to my daily diet. My well read doctor also prescribed ACE inhibitors and beta blockers to my already well balanced and delicious breakfast! I realized that once you start using medicines, there is no escape from it. One's life depends on these medicines. The irony of these medicines is that they do not cure the disease instead, halt the symptoms. I eagerly look forward to medicines which would actually increase insulin receptors in my body rather than bringing down blood sugar levels. My doctor however, gave me a smart advice: If someone kidnaps you and while keeping you hostage gives a choice between medicines and exercise; choose exercise.

Over the years, I have realized that proper care of the body, disciplined lifestyle, regular medicines, smart eating and frequent exercising has always kept me going. At 69, umpteen visits to the diagnostic laboratories and hospitals have not dampened my spirits. I refuse to be labeled as a patient. I however do advise my children and grandchildren to take corrective measures when they have a chance. Good eating and exercise habits should start young and not at 50. The present generation is more aware about lifestyle diseases, however, it is yet to be translated into life practice. My take: Live healthy, live well.

RESEARH NEWS

Think before you pop the calcium pill!

A false notion of "more is always good for health" has prompted the wide spread use of minerals, vitamins and calcium supplements. Amongst the new age pills, calcium supplements are more misused as it is believed to be good for bone health. To reduce the risk of loss of bone substance (osteoporosis), women above 60 years of age have the habit of taking calcium supplements without consulting a doctor. A group of researchers have done a randomized study on heart disease risk associated with calcium supplement intake and their findings are now published in *Journal of the American Heart Association (*2016; 5 (10): e003815). The authors suggest that it is better to consult a doctor before taking calcium supplements. The study was done in 2,700 patients who were followed up for a period of 10 years. Two categories of people were included in the study (a) those taking calcium supplements such as pills, chewable tablets, liquids and powders and (b) those taking calcium through food alone. Cardiac CT scanning was done to measure calcium deposits in the heart arteries at the beginning of the study and ten years later. The study revealed that people taking calcium supplements had a 22% increase in heart artery calcium scores after 10 years and they were at increased risk for heart disease. People consuming high levels of calcium through diet alone had a healthy heart. Eminent researcher John J.B Anderson opines that "There is clearly something different in how the body uses and responds to supplements versus intake through diet. It could be that supplements contain calcium salts, or it could be from taking a large dose all at once that the body is unable to process". The message is that do not be misled with false advertisements and better stick to a healthy diet. It is always better to consult a doctor before taking calcium supplement on your own, to minimize the risk.

Jaya Mary Thomas

Healing the heart with 'Passion'

Fruits are one of the oldest forms of food known to man. There are many references to fruits in ancient literature. Vedas state that fruits form the base of the food of Gods. According to Quran, fruits such as grape, date, fig, olive and pomegranate are heavenly fruits of God. They contain substantial quantities of essential nutrients in a rational proportion.

Seeds of passion fruit contain polyphenolic compounds such as piceatannol and scirpusin B, which can relax blood vessels and exert strong effects on free radicals which damage cells (antioxidant effects) making the crunchy seeds of this fruit an excellent functional food for those who are looking to reduce their risk of cardiovascular disease.

According to Sano and his group (JAgricFood Chem 201;59: 6209-6213), passion fruit seeds can relax blood vessels (vasorelaxation), increase their lumen and thus increase blood flow. Vasorelaxation results from relaxation of muscle cells within the blood vessel walls. Widening of blood vessels leads to a decrease in vascular pressure, important for a healthy cardiovascular system.

Passion fruit seeds provide a nice crunch when eaten with the fruit pulp and they deliver abundance of nutritional and health benefits to maintain healthy cardiovascular and intestinal systems. The fruit seeds are packed with beneficial nourishment essentials for optimum growth as well.

Ciji Varghese

Mother's blood sugar levels during first three months of pregnancy could affect baby's heart

An elevated blood-sugar level in the mother during pregnancy is coupled to risk for heart-defects in babies. Recently a preliminary study by Stanford University researchers (JAMA Pediatr 2015;169:1112-1116) in 19,107 pregnant women revealed that pregnant women with increased blood-sugar levels during first three months of pregnancy (first trimester) are more prone to have babies with heart defects at birth (congenital heart defects), even if their blood sugar is below the cutoff for a diagnosis of diabetes.

Congenital heart defects are problems with the heart's structure that are present at birth. It may relate to a defect in the interior walls of the heart or the valves inside the heart or the arteries and veins that carry blood to the heart or the body. Every year around 35,000 babies are born with congenital heart defects.

Researchers found that for every 10 mg/dL increase in blood sugar, the risk of delivering a baby with congenital heart disease increases by about 8%. Elevated blood sugar in early pregnancy can predict congenital heart disease risk better than an oral glucose tolerance test, which is currently used to identify mothers at risk for carrying children with congenital heart disease.

Control of blood sugar of the mother during early pregnancy may result in fewer occurrences of congenital heart disease and save the lives of numerous newborn babies.

Vinitha A.

Heart made of bone!

Bones are made of calcium, but in some individuals their hearts also develop calcium deposits. Supporting and binding (connective tissue) cells in the heart turn into bone-producing cells as a response to injury. Scientists working in the University of California (*Cell Stem Cell*2016) explain why some people who survive heart damage develop abnormal calcium deposits (primarily the main component of bones) in the walls of the heart.

Calcium deposits (calcification) occur in organs such as heart, kidneys and blood vessels with age and are aggravated in people with diabetes or kidney disease. In the heart, calcification can disrupt electrical transmission and also cause block in blood flow. If calcium deposits are formed in heart valves, there are currently no treatments to break them down.

Arjun Deb, of the Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research based at the University of California, Los Angeles hypothesized that maybe it is cardiac fibroblasts, cells that give rise to scar tissue after injury, that are contributing to the calcification process. They tagged heart fibroblasts in mice and monitored them as they changed into bone-forming, osteoblast-like cells after heart injury. The researchers isolated heart fibroblasts from the region of calcification and put them under the skin of healthy mice. They observed calcification under the skin similar to that seen in the mice from which heart cells were taken. Human heart fibroblasts were also seen to be capable of forming similar calcium deposits outside the body. The researchers also observed that injecting a drug called etidronate interfered with the activity of a protein called ENPP1 that seemed to be increased in the heart fibroblasts during the process of calcification. A decrease of 100% in the extent of calcium deposition after injury was seen after treatment with etidronate.

Surya Ramachandran

The long and short of it

Telomeres are a region of nucleotides (DNA parts) at the end of each chromosome which protects the chromosome (threads carrying genetic information in the cells) from deterioration. With every cell division, telomeres would shorten and as such have been used as an important marker of aging phenomenon. In short lived wild animals telomeres erode faster than in slow aging, long lived species. The story is however different in a species of dormouse (*Glisglis*), which is a rodent. The telomere length significantly increases in the second half of its life. Interestingly, the dormouse has a maximum lifespan of 13 years which is quite high for a rodent.

Franz Hoezl and his colleagues from Vetmeduni Vienna demonstrated (*Scientific Reports* 2016; 6: 36856) using DNA isolated from scrapings from lining of the mouth of free living dormice, the relative telomere length of each of them. They found that dormice can re-elongate its telomeres, if food availability is high. The rate of telomere elongation also increased with increasing age of the dormice. The probability to reproduce also increased with age suggesting that telomere elongation is a part for preparation for reproductive events and an attempt by the animal to protect its genetic makeup.

Surya Ramachandran

An eye for cardiovascular diseases

Heart attack is often considered as a first sign of cardiovascular disease. But symptoms which we leave unnoticed may be an early indication of the onset of cardiovascular disease. “Observing eyes is an easy way to have a look at the vascular system” says Georgalas (Authors of a case report published in the *New England Journal of Medicine 2015;* Nov 25).Vascular problems in other parts of the body can be first recognized in blood vessels of eye. People with an

embolus or blockage in the retinal artery have an increased risk of a serious or fatal stroke. A 77-year-old man reported three episodes of blurred vision in his right eye without any previous history of blockage in the blood vessels of the eyes. He was taking statins for high levels of blood cholesterol. The patient underwent successful removal of a block in the neck blood vessel, following which his clarity of vision was normal, and had no remaining symptoms related to vision. This Greek man was later diagnosed with 80% block in artery on right side of neck because of fat deposits. According to Georgalas, neck artery block resulting in temporary loss of vision is reported in about 30% of the cases; it may be the only indication of an upcoming blood vessel related complication.

Perhaps we should have a different approach to patients who have intermittent loss of vision. They may require urgent diagnostic workup.

Dhanya Rajendran

Cardiac health begins from the mouth?

A link between cardiovascular disease and oral health has been proposed for several decades. Bjorn Klinge and his research team from Karolinska University Hospital in Sweden recently evaluated this association. Their findings from a multicenter, case-control study named as "PAROKRANK" [Periodontitis (gum disease) and its relation to coronary artery disease] were recently published in the American Heart Association journal *Circulation*. Out of 1600 study participants, they observed that individuals with gum disease were 49% more likely to have a heart attack than those without gum disease. Though the evidence is circumstantial, a positive association is evident. Periodontis is linked to heart disease because of the inflammatory nature of the disease. Another possibility is the presence of proteins such as heat shock protein-60 which is produced by *Tannerella forsythia* and *Porphyromonasgingivalis*, the organisms which cause gum inflammation. The antibodies to heat-shock proteins of gum bacteria are cross-reactive with the human protein that is exposed in an injured inner wall of blood vessels. This reaction can initiate abnormal immune response resulting in fatty deposits in the vessel wall (atheroma). Previous studies also showed that the bacteria such as *Streptococcus sanguis* found in gum disease may spread to the heart through blood. Further research is needed to have a better understanding about the relationship between gum disease and heart health.

Sumi S.

Cancer survivors are more likely to have heart attacks

Researchers at Mayo Clinic in Rochester, USA (*Mayo ClinProc* 2016;91:1680-1692) recently analyzed the link between cancer survivors and heart attacks (myocardial infarction) in them. Surprisingly they found that increased risk of severe myocardial infarction (increased workload and deficient oxygen supply in the heart). Cancer survivors were more likely to be hospitalized for heart attacks during a follow-up. Although, not all of these patients had high mortality risk, the rate of attacks was considerably higher in them. This study did not reveal significant differences in terms of new-onset heart failure, cardiac arrest or disorders of heart rhythm in heart attack, among patients with and without cancer.

In addition, hospital and further follow-up studies revealed the strong association of myocardial infarction in patients with a history of cancer. However, higher or long-term deaths from heart disease were not noticed among these patients. Acute coronary event (an adverse event caused by diseases affecting blood vessels) and cancer spread (metastasis) were observed as major non-heart related factors for deaths among cancer patients.

According to the National Heart, Lung, and Blood Institute (NHLBI) at the USA, patients with a history of cancer have higher mortality and heart attack rates than patients without a history of cancer. Information on an association of cancer with heart failure or heart attack is scarce because most of the trials on drugs for heart diseases exclude cancer patients.

Vikas Kumar

PRO♥C is on!

As part of our Academy's mission, we have initiated programs in schools to promote good heart health. The aim is to spread awareness about keeping heart diseases at bay during youth by taking appropriate measures from the age of 13-15. You might be aware that there are inadequate community level initiatives for increasing awareness about risk factors for cardiovascular diseases which can enable preventive strategies early in life. We believe that the change in perception of heart diseases and its prevention is best initiated in an individual's formative years.

Promotion of Heart Health among Children (PRO♥C) is one of our first ventures in this direction. We intend to spread this program to all schools in the state of Kerala with campaigns in different forms such as educational lectures, walk challenges, interactive discussions, quiz competitions *etc* to spread awareness about prevention of heart diseases by leading a healthy and wise lifestyle right from childhood.