SAPIENS HEALTH FOUNDATION

Save your kidneys. Only YOU can!

DECREASE SALT. INCREASE LIFE.

EXCERPTS FROM

The Salt 5ight

Conference on Salt awareness

Preface

Dr. Rajan Ravichandran

According to WHO, about 9.8 million people die every year due to hypertension related complications. Hypertension is considered a silent killer producing heart disease, kidney failure and strokes. About 35% of world population above the age of 25 suffer from hypertension. One of the important strategies to lower hypertension in the population and its complications is reducing salt intake. Developed countries like Finland, United Kingdom, Australia and Canada have been actively campaigning for salt reduction in the population. In these countries, there has been a close association between government and NGO's for this purpose. Finland was the first country to show an enormous health benefit by reducing salt in the diet. Not only the population's health improves, there is also a great benefit in saving health expenditure related to heart revascularization and dialysis.

The average intake of salt in the Indian diet varies from 10-15 grams per day. There is a paucity of recent data, especially with reference to the processed food in the country. The WHO's recommendation of salt intake from all sources is less than 5 grams per day. Salt or sodium is present in natural food, it is added while cooking and also used as a preservative for processed food. Considering the rapid economic growth that is happening in our country with urbanization and increased demand for processed food, it is imperative that we act at the earliest to control salt intake of Indian population.

Salt or Sodium in various forms has been used as a preservative for several thousand years .It enhances the taste, prevents growth of harmful microorganisms and can improve the

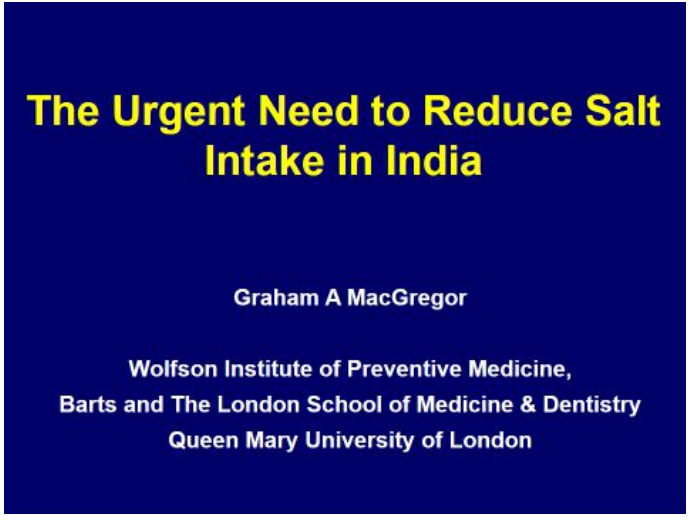
Dr. Rajan Ravichandran is the founder chairman of Sapiens Health Foundation. He has also initiated The Cystinosis Foundation India. He is the Director of MIOT Institute of Nephrology MIOT Hospitals Chennai. He is an adjunct professor at IIT Madras. He is a specialist in kidney treatment. He is a pioneer in ABO incompatible kidney transplantation.

Sapiens Health Foundation and Cystinosis Foundation India serve under privileged patients along with creating awareness on prevention of renal disease. He has taken on now salt reduction campaign across the country.

texture of food, Taste is often a habit and high salt intake can saturate the taste buds. If you lower salt intake for 2 weeks you can start appreciating low salt intake and other tastes. With the availability of refrigeration and other preserving methods like ultrafiltration, vacuum packing etc the sodium use should come down. However this has been a responsibility of the food manufacturers who should voluntarily bring down the salt content. UK has been very successful in this aspect and the populations salt intake has dropped by 2 gms in the last decade. Sodium in various forms is used as a flavoring, buffering, anticaking, thickening and stabilizing agent. The biggest culprit is in baked goods specially bread and instant noodles.

Some of the tips to reduce salt intake are to get used to low salt to allow the taste buds to recover, eat fresh food when possible, add less salt in cooking, not to add extra salt on table (a special problem in India since salt is served in the food plate as a routine and salt shakers for soups) and use herbs and spices as flavoring agents. It is essential to target the young college and school students and educate them. It is a myth that Indians require more salt due to the weather and sweating. The maximum salt lost is in urine (that's why 24 hours urine sodium is measured to calculate a person's salt intake) Sweat once acclimatized has very low sodium .Increased sweating requires more water intake and not salt. It is also a myth that children require more salt. According to WHO children require less salt than adults.

Sapiens Health Foundation a NGO committed to the cause of kidney failure patients has been campaigning actively for the last 5 years throughout India to reduce the salt intake. Print and visual media have been used enormously and walkathons have been conducted in several places for this purpose. The foundation in association with IIT Madras held the SALT fight conference. The theme of the conference was to create an awareness in the population with regards to the amount of salt intake permitted, relationship between salt and disease specially hypertension and measures to reduce salt consumption. The conference was held on November 2017 at IIT Madras. Prof. Graham MacGregor of WASH (World Action on Salt and Health) from UK was the key speaker. This book basically has his talk. He is a powerful speaker and has been responsible for the salt reduction in the UK. I am sure Prof. Macgregor would convince you the urgent need to reduce salt intake in our population.


The Urgent Need to Reduce Salt Intake in India
Graham A MacGregor
Wolfson Institute of Preventive Medicine,
Barts and The London School of Medicine & Dentistry
Queen Mary University of London

KEY NOTE ADDRESS BY

Professor Graham Macgregor

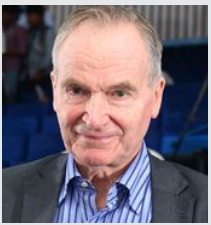
Thank you very much, particularly Dr. Rajan Ravichandran, for inviting me here today. We are both nephrologists who come from a nephrology background and I thank this IIT institute and others who made it possible.

I love south Indian food and in the hotel last night I asked the chef for a south Indian meal with far less salt in it, which he provided. It was absolutely fantastic. You have an amazing range of spices, herbs, and ways of cooking food and you don't need to add salt to it.

The following picture shows the 20 leading risk factors for disability adjusted life years. It is the same if we look at the major causes of mortality or premature mortality which is when you die before the age of 70. If you die before the age of 70 you are likely to be actively contributing to society and particularly, you are more likely to be responsible for a family. The impact when you are ill is a disaster.

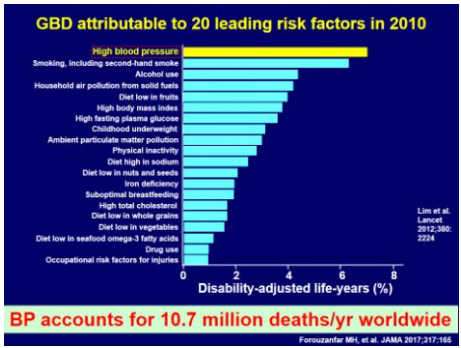
But it is clear if you look down this list, that unhealthy food, that is foods that are high in salt, fat and sugar are by far the biggest cause of death, the biggest cause of premature death and the biggest cause of disability. At this talk I am only going to look at salt but we must remember there are other dietary factors that are also important in causing obesity, Type 2 diabetes, atheroma particularly through cholesterol and lack of fruit and vegetables.

The second very important finding from the Global Burden of Disease, is of all the things that we can measure in humans the one most associated with death is high blood pressure. You



Graham MacGregor is a British academic, professor of Cardiovascular Medicine at the Wolfson Institute, Queen Mary University of London.

He developed an interest in the relationship between kidney function and high blood pressure which led him to a parallel campaigning role, attempting to persuade food manufacturers to reduce the quantity of salt in factory produced food.

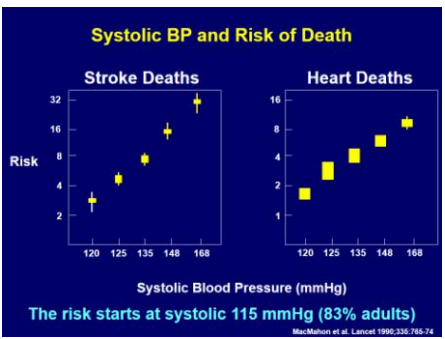


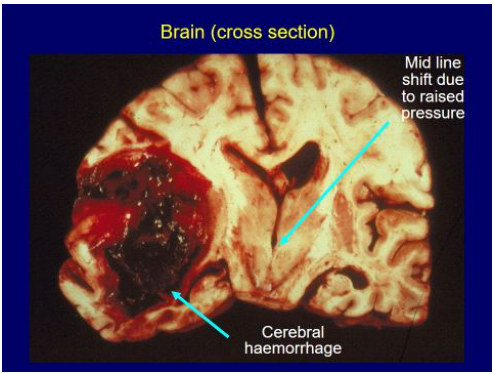
can see from the above slide that it's causing 10.7 million people a year to die in the world, and that's now much more than tobacco, and with all the other things you can see here.

I wonder how many people in this room know what their blood pressure is. Can you put your hands up now if you know what it is? Remember, it's the biggest killer in the world and if you don't know what it is, I strongly suggest you have it measured in the next week or so.

Why does raised blood pressure kill you? Well, the first thing is to look at the risk of blood pressure against the level of blood pressure. You can see on the slide below that the higher the blood pressure the greater the risk of stroke or heart attacks. Starting at a systolic of 115 the size of the boxes indicate the number of deaths at each level of blood pressure. You can see from this that the number of people dying below a systolic of 140 is actually greater than those dying above. This is because although the risk is less in people with a systolic of less than 140, there is a much greater number exposed.

You can see from slide that 83% of adults have blood pressure above a systolic of 115 mmHg which puts them at increased risk of a stroke or heart attack. So don't just think it's those people with high blood pressure that are at risk. Most of us in the room are. And why do you die from an increase in blood pressure which is conventionally measured in your arm?





The first reason is increased pressure.

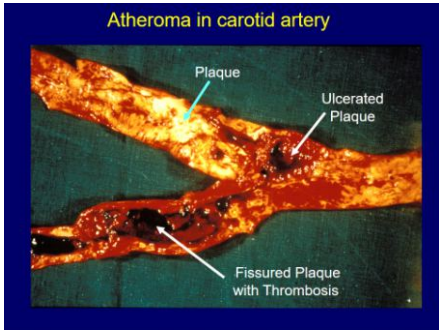
This is a cross section of the brain of a patient who died from what's called a cerebral haemorrhage, where the small vessel has burst because of the high blood pressure and it bleeds into the brain. You can see the clot that is formed here. But because the brain is in a closed box it pushes across and causes the bottom of the brain to be forced out on the skull, and this compression, which is called the brain stem, is all the nerves that come up and down from the body stops them working and you die as you stop breathing.

Fortunately this is a relatively rare cause of death now as we are able to treat more severe forms of blood pressure. Small vessel damage to vessels supplying the brain stem, the critical area which goes down to the body do cause major strokes, the classic paralysis on one side and depending on the speech centre whether you can talk or not.

The other effect of the increase in blood pressure is on the heart as the higher the pressure it has to pump against, the greater the amount of work it has to do. If the heart is already damaged by coronary heart disease then the heart may fail in an accumulation of the fluid in the lungs or it can go to the legs and abdomen as well.

It is now becoming a much bigger cause of death as we rescue people from heart attacks but they still get damage to the heart muscle. Direct pressure can also cause kidney disease and also accelerate any form of kidney disease that the person may have already.

However the biggest cause of death in the world is so called Atheroma, the gradual narrowing of the arteries due to cholesterol deposits.



The picture shows a carotid artery which has been cut open, and you will see the part of the atheroma that is plaque, that is cholesterol deposited in the artery wall with a fibrous cap over it. This in itself does not do any damage and you have to narrow the artery by 70% to cause any reduction in blood flow beyond the artery.

What does happen is that the fibrous cap becomes unstable and may shear off. As you can see with an ulcerated plaque where the cap has sheared off, leaving a very reactive element underneath which platelets and red cells come in and try and perform a healing process.

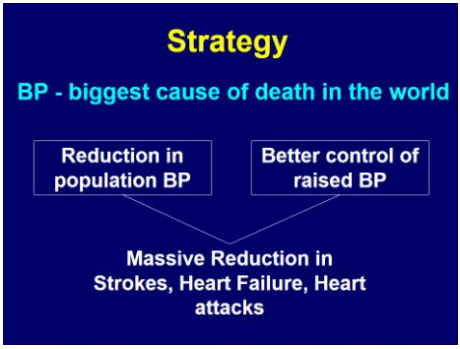
The difference between a similar cut on the skin and in the artery is that blood is going by 70 times a minute and knocks off bits of clot containing platelets and red cells into the brain or kidney and this causes damage to the small vessels and can cause dementia in the brain or heart muscle failure or kidney disease.

But the thing which is the biggest cause of death is when the plaque split open and red cells and platelets go in, clot and come out of the crack in the atheroma and block the artery. This is what happens in a heart attack and you know that Indians are particularly predisposed to this form of atheroma and can get heart attacks and strokes prematurely.

One of the major factors that accelerates the disposition of atheroma is the height of the blood pressure. The other, is of course, the level of cholesterol which depends on the amount of saturated fat in your diet and you do in India eat large amounts of palm oil, coconut oil and animal fat which is particularly ghee.

Most people have atheroma but hopefully not as bad as shown in the picture. Of course the determining event is the destabilization of the plaque and it either ulcerates or as you see here or it can fissure and clot.

Other factors that can accelerate atheroma and the deposition of plaque as the higher the pressure the greater the stress on the plaque and the more likely you are to rupture or fissure it. As soon as you lower the blood pressure the plaque will re-stablise.

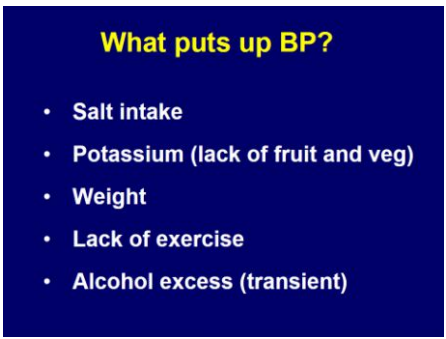


Other factors that determine not only the rate of deposition of the plaque but also how stable the fibrous cap is, is the level of cholesterol and tobacco smoking. You should now be able to understand why raised blood pressure is such an important cause of death.

Every country needs to adopt a strategy where they seek out people with high blood pressure and treat them, and this is very beneficial. But at the same time they need to take measures to reduce population blood pressure.

If this is successful, it will have a much greater effect on reducing strokes, heart attacks and heart failure then better control of high blood pressure. But clearly countries need to do both in order to get a massive reduction in the commonest cause of death in the world, in India and elsewhere.

Moving now on to what puts up blood pressure, we know the biggest factor is salt and it's also one of the easiest ones to tackle.



Mammals living away from the sea had no access to salt and man like all other mammals is able to survive on a very low salt intake as we did during early evolution, 20-50 times less than what we now eat.

The reason we eat so much salt is that the Chinese and Egyptians discovered about 7000 years ago that if you soaked meat or fish in salt solution or brine you could preserve it, particularly during the winter when supplies of fresh meat and vegetables and so on were not available.

This allowed the development of civilization and settled communities. Salt was seen as a great benefit and it became of great religious significance.

Anyway yet it is one of the most dangerous things that human beings can eat. It is killing many of us unnecessarily. With the advent of the deep freeze and refrigerator salt intake has been falling but more recently has been going up courtesy of the food industry, because more and more of the salt we eat is not added by the consumer but is added by the food industry.

The reason is that they can take extremely cheap foods and can add salt and sugar and the right amount blending of fat and make it edible. These foods are very profitable as the ingredients cost very little. Without any salt they would not be edible.

Good examples of this are Macdonald hamburger, Kentucky Fried Chicken, sausages or all the other rubbish that we eat in the West which is going to permeate through India in the next 10-20 years.

Salt in reality is an appalling preservative

and is not used by the food industry except in very few products. An example in India would be dry salted fish. There are much better chemicals that can now be used to stop bacterial growth and it has been proved that is quite easy for the industry to use other preservatives that make the food safe.

Evidence

• Epidemiology	>50 studies
• Intervention	Portuguese villages
• Genetic/Mechanisms	All related to Na balance
• Animal	e.g. chimpanzees
• Treatment	Meta-analyses
• Mortality studies	Cohort studies, outcome trials
• Population studies	Japan, Finland, UK

What is the evidence connecting salt to blood pressure? Nephrologists in France in the late 19th century were the first to relate salt to blood pressure. So we have over a hundred years of studies.

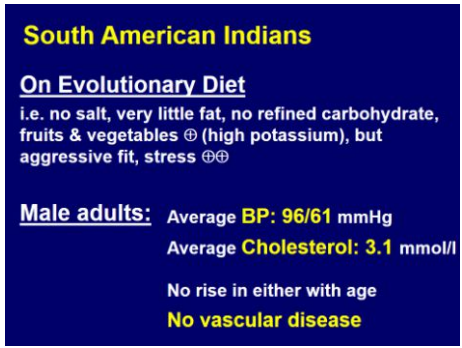
Many different types of studies been done as you can see from the above table of the different types of evidence that we have. Epidemiological intervention studies or the genetic mechanisms involved in putting up or lowering blood pressure all relate to salt.

Animals that have developed high blood pressure have to be given a high salt intake and most illustrative of all is when chimpanzees are given the same salt as you and I eat, their blood pressure goes up.

Treatment trials where people have been randomized to a lower salt diet compared to those on a usual salt intake show clear falls in blood pressure.

There are also mortality studies, cohort studies, outcome studies all showing that salt is important. And now, very importantly, we have population studies where salt intake has been reduced in the whole population and blood pressure has fallen and stroke and heart attacks and heart disease rate have also fallen.

This is a young man living in the Venezuelan jungle, a Yanomamo Indian. Those who are still left lead an evolutional life style. Of course they are gradually



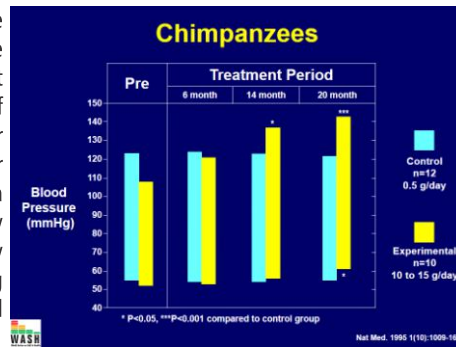
being killed by Brazilian loggers who are moving in to burn the forest and by infectious disease.

They still eat the same diet you have eaten in India over the last million or so years and have no access to salt, lots of fruits and vegetables, roots and only a very little meat that they could catch. They are very fit and live in a very hot climate, and often run for 20 to 30 miles a day to seek out animals

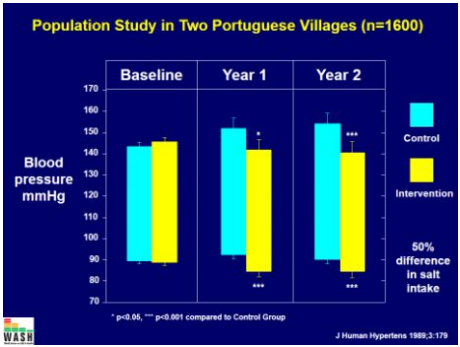
Careful studies done in the 1980's showed that in the average weight of a man was 75 kilos with an average blood pressure of 96/61mmHg. The average cholesterol was 3.1mmol/l. I would guess that the average blood pressure in India is very similar to the UK which is 130/80mmHg.

This is not an average, it's way above what it should be, similarly for cholesterol the average cholesterol in England is around 5.5mmol/L when it should only be around 3mmol/L. Furthermore there is no rise in blood pressure with age and no vascular disease but they obviously die young from infectious diseases.

This slide just illustrates a very good study done in chimpanzees. One group were given a diet with 10 to 15 grams of salt a day, the other remained on their normal diet of half a gram a day which is very similar to what they would eat during evolution and we would have eaten.



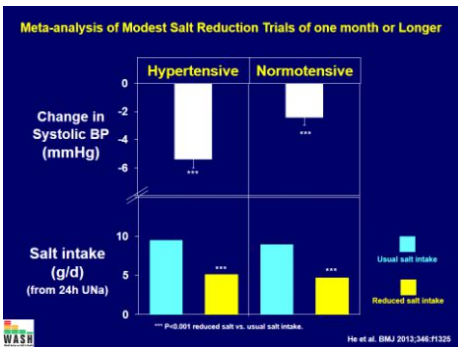
You can see clearly that the chimpanzees given the 10-15gm of salt a day, their blood pressure goes up and also interesting that in the wild chimpanzees have a blood pressure of around 90/60 mmHg which is very similar to gorillas or other apes and there are probably only a few young females in the audience who have blood pressures at this sort of level.



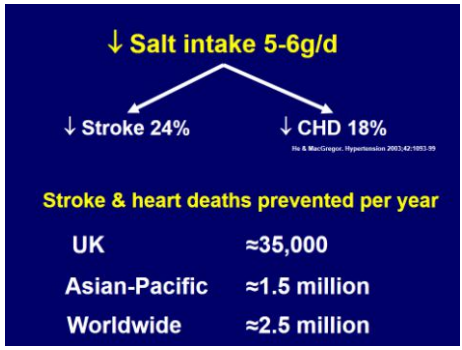
The next slide shows an interventional study in Portugal. Portugal has the highest salt intake in Europe and thereby the highest stroke rate.

The two villages that were chosen had the same blood pressure measured and one was instructed how to reduce salt particularly given Portuguese processed food products with much less salt; the other village had no dietary advice and continued with their normal salt intake. In the intervene village, salt intake was reduced by 50% as measured by 24 hour urinary sodium excretion.

You will see there is a big difference in blood pressure between the two villages at one year which is even larger at two years, clearly demonstrating the effect of eating less salt on blood pressure in a whole community.



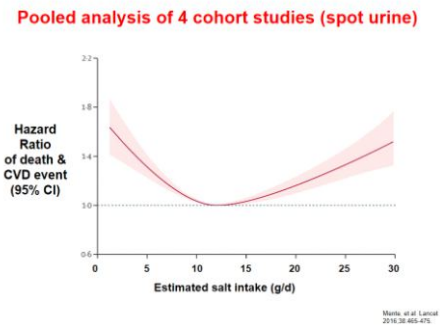
These are controlled studies randomized trials in humans one group with reduced salt and the other don't, in very well controlled studies and you can see the fall in blood pressure



because of lowering salt intake. And if you put up these together you can work out that fall in blood pressure in population and it causes effect, it causes a quarter reduction in strokes, and one fifth reduction in heart diseases.

Worldwide, there is around 2.5 million deaths seen in a year and if we work out in India, which has 1.4 billion people, the number of lives saved can be huge. It has a huge number of deaths due to eating too much salt.

Recently my colleague Dr. Salim Yusuf claimed in a paper in a study published in the Lancet, using estimated sodium intake that lower intakes of sodium, below 12gm a day, an increase in deaths in cardiovascular events. There are major problems with this study. Firstly because he used spot urine which is an extremely unreliable measure of 24 hours sodium excretion with inherent bias, particularly at low and high levels. Secondly the estimation of salt intake over such a short period does not indicate salt intake over the next 10-20 years' time. These people already had quite severe cardiovascular disease and during the course of the study many of them died. When you are dying you don't eat food and therefore the low salt intake or the low fat intake is not the cause of the death it's the other way round. This is known as reverse causality and it's impossible to correct for this.



In my view the study can be ignored

particularly if you look at studies with multiple 24 hour urine collections over a period of time. There is then a close relationship between salt intake and hazard ratio as you can see in this study.

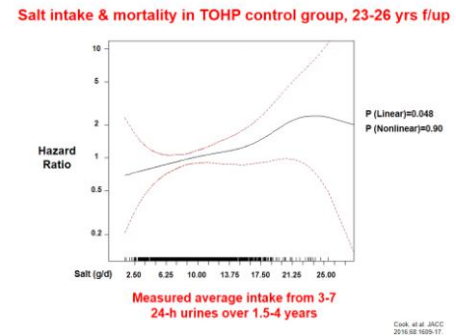
Methodological Issues in Cohort Studies

- Reverse causality – you do not eat when you are ill
- Measurement error & bias, e.g. spot urine
- A single spot or 24h urine does not reflect an individual's usual salt intake

∴ Multiple 24h urines needed

There are now three cohort studies with 24 hour urines all showing a direct linear relationship between salt and cardiovascular events and mortality down to an intake of 3gm a day. Perhaps even more persuasive is the fact that there are now three countries that have reduced salt intake in the whole population and shown that with a reduction in salt intake there is a big fall in blood pressure and cardiovascular mortality.

When we do studies, properly done with multiple 24 hours urine collections in population who did not have vascular disease, relatively well, followed up, this is the result.

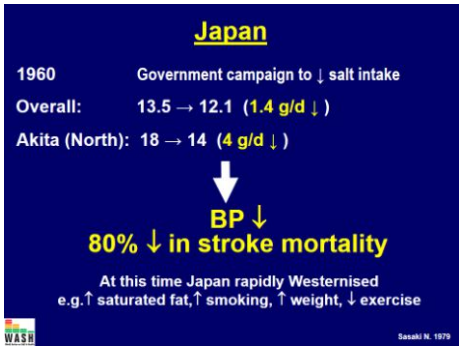


3 recent cohort studies with multiple 24h urines all show a direct linear relationship between salt intake and CVD event and mortality down to a salt intake of 3 g/d

1. Cook, et al. JACC 2016;68:1609
2. Mills et al. JAMA 2016;315:2200
3. Olde Engberink et al. Circulation 2017;136:917

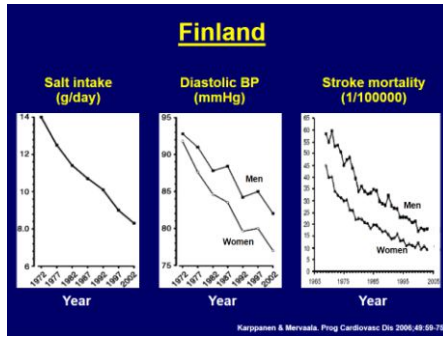
You see the line in the middle, shows direct straight line relationship between salt intake measured on multiple occasions using 24 hours urine against the mortality. So lower the salt intake, the lower the mortality and now in fact 3 studies showing the same thing

For instance in Japan in the 1960s successfully reducing salt intake with a big Government

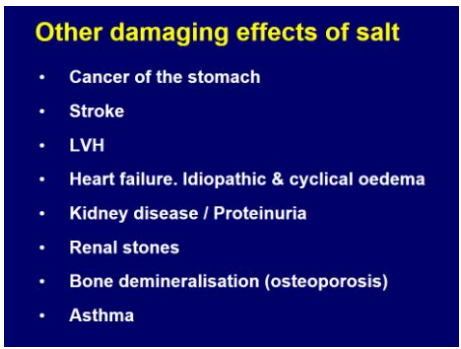


campaign, particularly in the north of Japan where salt intake was highest. This was accompanied by large falls in blood pressure and an 80% reduction in stroke mortality.

At the time Japan was rapidly becoming westernized increasing fat intake, increasing smoking, increased obesity, less exercise and less fruit and vegetables all of which had opposite effects on stroke mortality.

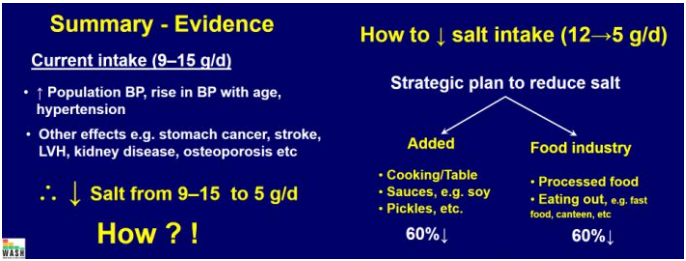


You can see from the next slide that in Finland, a similar programme starting in 1970 was very successful in reducing salt intake.



Big falls in blood pressure and again accompanied by very big falls in stroke mortality.

Salt also has other damaging effects. It's a cause of stomach cancer, particularly by making H.Pylori infection more likely and also causes of independent blood



pressure, heart failure and kidney disease and bone demineralization.

This is particularly relevant in older women who are now developing quite osteoporosis with terrible pain from collapsing vertebrae.

High salt intake leeches out calcium from the bones into the urine. There is therefore no question that our high salt intake needs to be reduced.

WHO has set a worldwide target, of a maximum for adults of 5 grams a day. The question is how should we do this?

As you can see from the above slide, the major two sources of salt are either added by the consumer or from the food industry, either in shops or when we eat out.

In India to get to the target of 5gm a day, you need about a 60% reduction in the salt added by the consumer to food and a 60% reduction in salt already in the food ie in processed food or when you out.

The Public Health message is clear and stark. That is, salt added to food is chronic poison that slowly puts up your blood pressure and is a major cause of death and disability through strokes and heart failure it causes.

This needs to be widely disseminated to school

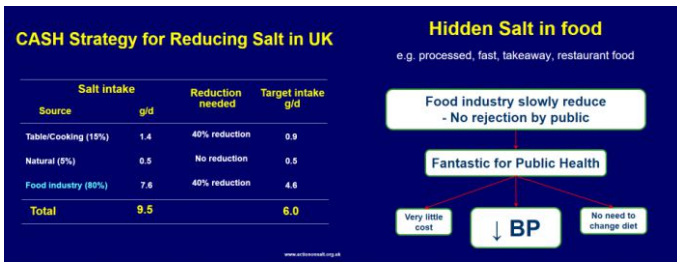
children, parents, communities, tv, media and particularly now on social media. It's difficult to get people to change their diet and it needs great perseverance.

The next step is to get industry slowly to remove the huge amounts of salt they put into their foods. This is now being done very successfully in many countries and was pioneered in the United Kingdom.

The problem is that the food industry tried to wriggle out of any responsibility, saying its up to the public to purchase more healthy food and then spend billions of pounds promoting and advertising the unhealthy food because they make far more money out of it.

But nevertheless, they now know that they are slowly poisoning the population with these high amounts of salt and they only have one option. That is to slowly reduce it and it is essential that we get the Government involved in organizing this process of slow reduction.

In the United Kingdom we were successful in setting up a salt reduction programme which aimed to get salt intake from the current intake then of 9.5gm a day to 6gm a day.



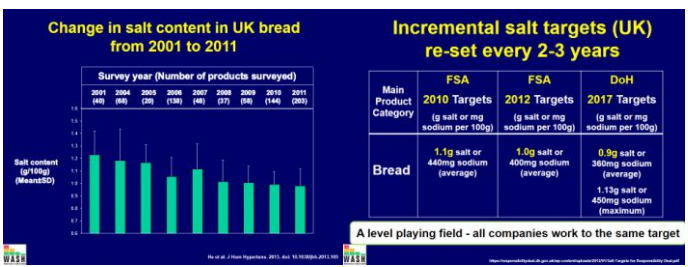
This required the development of a new policy. That is, getting the industry to slowly take out the salt across the board without the public necessarily being aware. Everything gets reduced in salt. The way that this was done was by setting targets for each food group which they have to achieve in four years, making it a relatively easy 10-15% salt reduction and then resetting the target two years later, for two years ahead of the previous target.

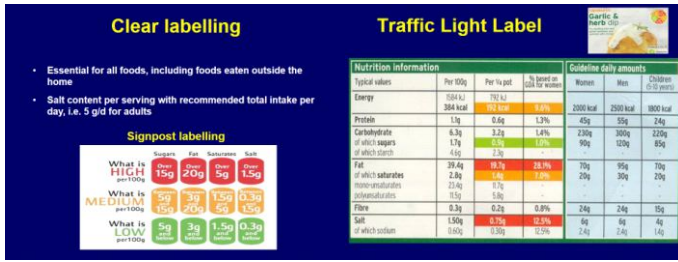
This has now been done three times in the UK and has resulted in large falls in the salt added to food in most processed foods. For instance, bread has been reduced by about 30%, cereals by 50%, ready prepared meals by 40-50%.

It costs very little to the Government or the consumer as the food industry bears the cost. It's proved relatively easy to do with just a few technical problems. The brilliance of it is that there is no need to change the diet which is extremely difficult to do, so people go on consuming the same food and most don't even realize there is less salt in it. But because salt intake falls, blood pressure falls and there are very large reductions in strokes and heart attacks.

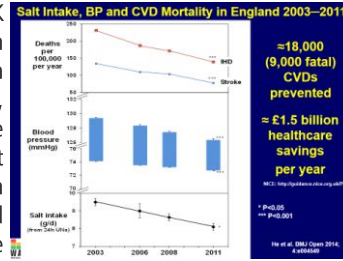
These are the targets here for bread showing gradually slowing down, you can see the target falling.

Here are the reductions that have occurred in the salt content of bread over this period of time, falling by roughly 30%.





It's also important to have clear labelling of food with the salt content and ideally traffic light labels that guide to the serving size and the amount that it takes up of your maximum intake for the day.



This slide shows the results of the UK salt reduction. You can see the fall in 24 urinary sodium that occurs which has been very carefully measured, the fall in population blood pressure over the five or six years of salt reduction and the big falls in coronary heart disease, strokes and deaths. Some of this reduction is due to a reduction in smoking but looking at the blood pressure fall we can work out that this would have prevented 18,000 strokes and heart attacks and 9,000 of which approximately are fatal.

The National Institute of Clinical Excellence looks at health policies in the UK, calculated that for a 1gm reduction in population salt intake it would have saved £1.5billion in healthcare saving costs a year. And the WHO now recommends it as the most cost effective of all of the targets for prevention of non-communicable diseases.

With the success of the UK salt reduction we decided to spread this out worldwide and to stimulate people like Dr. Ravichandran and many others in different countries to

set up their own salt reduction groups, and try to get a coherent plan for their own country. This has been very successful and over 50 countries have set salt targets.

The slide above shows those countries that have got voluntary salt targets and regulated salt targets. The food industry paradoxically prefer regulated targets because they know that all their rivals are going to have to do the same and this means that they get a level playing field, so there is no competition between those companies who are reducing salt in their products and those that are not.

India, of course, has a long way to go. It is quite complicated, firstly because it is such a large country, secondly very diverse with very different diets between different ethnic groups, rural and urban.

The principle is the same, you need to work out roughly how much salt people are eating, where it has predominately come from and then spend a few days working out what is a coherent plan and how you are going to get it done. Clearly if you are going to reduce salt intake from what we estimate is 12-14gm a day down to 5-6gm, it is going to be a mixture of consumer action and getting them to reduce the amount of salt they use in their own cooking, sauces, spices, pickles and all those sorts of things, and then getting the food industry to slowly reduce the huge

amounts of salt in the processed foods.

As you know, the global food industry is now moving into India and there is going to be a pandemic of cardiovascular disease with increasing salt intake, increasing sugar intake and increasing fat intake with less fruit and vegetables. We can prevent this pandemic occurring but it's going to need strong action by NGO's and the Government working closely with the food industry to force them to produce more healthy food. Out of all these actions, salt reduction is by far the easiest to do and is incredibly cost effective. So you need to start now in getting a coherent plan to reduce salt intake in India.

Thank you very much.

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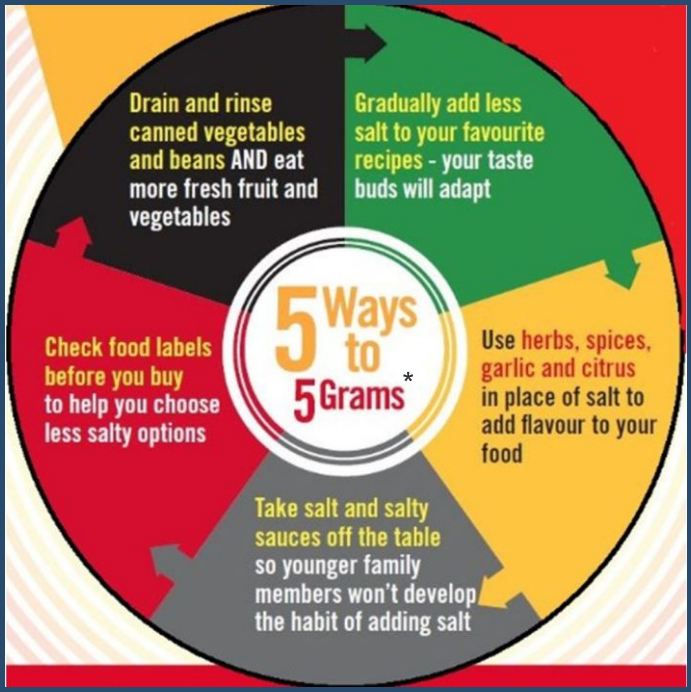

* WHO recommendation of salt intake from all sources is less than 5 grams per day.

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Flat # 1, 95/42, Rams Flat, 2nd Main Road, Gandhi Nagar, Adyar, Chennai 600020.
Phone: +91 44 64560090 / 24403655 E-mail: sapiensfoundation@yahoo.com
www.sapiensfoundation.org www.cystinosisindia.org www.sugarbp.org