

# Suspected Root Cause of Non-Communicable Diseases Epidemic

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**Abstract:** In recent times non-communicable diseases have attained epidemic notoriety. Indeed, every other day a new specialization is needed to treat a new ailment never heard before. Present study is based on observations and published data by various agencies worldwide and zeroed on to humble table salt taken by everyone every day in some form or the other. It is profoundly observed that role of micronutrients, macro-minerals and trace elements (MMTE) in unprocessed rock and sea salts has been largely disregarded in the physiology of human body. Table salt and fortified iodized salt appears to be root cause behind NCD epidemic. A new strategy for handling iodine deficiency disorder (IDD) needs to be evolved rather than feeding everyone with extra iodine resulting in iodine induced hyperthyroidism (IIH) along with precipitation of other diseases on account of stripping off of MMTE. Families who switched over to unprocessed rock salt reported marked improvement in general health and experienced reduced visit to hospitals and medical practitioners.

**Keywords:** Non-communicable diseases, IDD, IIH, Himalayan Salt, Sea salt.

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## 1. INTRODUCTION

Everyone desires ailment free good health. Despite best efforts of individual and the State for good health, sufferings of populace from newer ailments are increasing incessantly. Research institutions dedicated to medicine are sprouting and expanding world over day and night in search of alchemy and elixir for alleviation from these sufferings. A few decades earlier 'epidemic' was associated with communicable diseases like small pox, tuberculosis, cholera, and plague. Greater understanding of human physiology and advances in medicine appears to be of little help in controlling growing and spreading various non-communicable diseases. Diabetes, hypertension, hyperacidity, heart deceases like cardiovascular, angina pectoris, aortic stenosis, heart valve malfunction, atrial fibrillation, gallstone pancreatitis, or renal deceases like calculi, hypercalcaemia, IgA nephropathy, eye disorders and cancer which were earlier attacking middle age onwards are commonly attacking even at pediatric stage at an alarming rate.

As per American Cancer Society, childhood cancer incidence rates have slowly increased by 0.6% per year since 1975 and estimated 10,380 new cases in 2016 with 1,250 deaths. However, advances in treatment brought down death rate to almost 66% from 1969. Similarly, about 1,685,210 Americans were expected to be diagnosed with new cancer cases in 2016 with about 595,690 deaths that translate to about 1,630 deaths per day. Cancer is the second most common cause of death in US, exceeded only by heart disease and account for nearly 1of every 4 deaths. Besides several external factors such as tobacco, alcohol, and infectious organism, inherited genetic mutations and 'unhealthy diet' are also responsible.

Congenital anomalies, reproduction system disorder like endometriosis, sperm disorders, birth defects, etc. are also reaching epidemic stature.

## 2. OBSERVATIONS

An attempt has been made to analyze ailment data and correlate with explosion of many non-communicable diseases that have attained epidemic stage in recent times. The study is largely in the context of India and other nations in general.

Before early 1970s In India, handful of urban families had encountered diabetes or high blood pressure or cardiac problems or gall bladder stone or kidney stone. These diseases were not so common. Moreover rural populace hardly comes across any such disease despite surviving on not so rich diet. Their breakfast basket covered 3-4 thick (about 50-70 grams) Indian breads (called ROTI) with red chili and salt or steamed rice, lunch had steamed rice with lintel and dinner limited to one vegetable and 4-5 little lesser thick Indian bread. As time progressed towards 21<sup>st</sup> century so are these diseases and urban populace made to believe that these are due to more sedentary and luxurious way of life. Additionally city pollution, fast food, television and electronic games, etc. paly decisive role in inviting onslaught of these ailments compared to their rural counterparts. People have accepted it as the way of new urban life. Slowly, stories of sufferings of rural folks from countryside also started emerging despite the fact that there was no air or industrial pollution and non-existence of any fast food; moreover, their life style is far from sedentary.

There must be some reason for such epidemic despite the fact that some people being very health conscious do also suffer. It means there is something very serious in food which has changed in recent times and it is staple in the diet of urban and rural populace alike.

Agriculture is one of the traditional activities in India and still in the digital age and mechanization; it is labour intensive where farmers plough their fields with bullocks. Surprisingly, despite no genetic history of diabetes, these remote rural folks are slowly but steadily falling prey to these decease despite their lifestyle is not sedentary as compared to urban folks. Diabetes, obesity, and thyroid disorder in urban folks are almost catching up with white collar and blue collar, rich and hard working poor with same vigor. Even fisherman both sweet water and coastal whose staple diet is fish and seafood are untouched vis-à-vis vegetarian and non-vegetarians as well.

A recent study published on 17 August 2017 in the Lancet Respiratory Medicine reportedly claimed 3.6 million lives worldwide succumbed to chronic obstructive pulmonary disease (COPD) in 2015 an increase of 11.6% over 1990 whereas prevalence increased by 44.6% over the same period. The disease is attributed to air pollution and smoking.

Salt is the most consumed by human everyday so it must have dominant effect on well being of the body. Branded salts started making inroads in Indian market sometimes in early seventies of last century and iodized salt in mid eighties. Salt business in India is estimated to be of Rs 21.7 billion/year or US\$ 0.35 billion/year. There is variety of branded salts available in the market. Most branded salts are now made in factories and are processed for whiteness, cleanliness, free-flowing even in rainy season and granular. India consumes about 5.5 million tonnes of edible salt annually, of which 3.8 million tonnes is branded. The loose salt segment which is natural salt and accounts for a 35-40% market share, is shrinking steadily as branded salts market share grow at 7-8%, against the overall growth rate of 2%. Most of these branded salts contain more than 99% of NaCl fortified with of iodine and sometimes Iron also, along with anti-lumping agents; these branded salts don't contain any other mineral or trace elements found in unprocessed natural rock salt or sea salt which counts more than 70 (upto 88 in case of Himalayan rock salt) micronutrients, macro-minerals and trace elements (MMTE). Surprisingly, iodine fortification has not been standardized in India and varies significantly among various brands from 11.2 ppm to 46.6 ppm as reported in the Consumer Voice August 2013 issue published by Government of India.

US Food and Drug Administration identified 60 elements as essential nutrients. In June 2016, the US National Research Council labeled 29 of these listed elements as "Possibly" or "Probably" essential and beneficial to human health. Some of these elements are: Bromine, Boron, Chromium, Calcium, Copper, Fluoride, Iodine, Iron, Manganese, Magnesium, Molybdenum, Potassium, Phosphorus, Selenium, Silver, Sodium, Sulfur, and Zinc.

### 3. DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

Above observations force one to think what is common in the diet of urban and rural populace. Total populace has been categorized in following broad seven segments:

- (a) Rural farmers with mechanized faming,
- (b) Rural farmers with non-mechanized (manual) farming,
- (c) Urban white collar worker,
- (d) Urban blue collar worker,

- (e) Fisherman,
- (f) Vegetarians, and
- (g) Non-vegetarians.

A systematic analysis of food habits and food intake brings out one and only one fact that all these class of people have switched to branded salt fortified with Iodine as per the Government of India direct directives and subsequent ban on sale of sea salt.

Factory made salt contains only one element that is iodine whereas unprocessed natural salts contain numerous MMTE. These elements exist in minute concentrations but work with other minerals to maintain several body functions optimally. For example, Celtic Sea Salt or Himalayan rock salt contains more than 70 MMTE for the overall development and maintenance of the human body. Indeed functioning of many trace elements is not yet understood. Consumption of natural salt has been from time immortal and made the body evolve accordingly.

Commonly used iodized or non-iodized table salts devoid of MMTE like potassium and magnesium disturb body's electrolyte composition and pH value resulting in changes in biochemistry and electrobiochemistry. It is noticeable that over more than half century usage of synthetic salt fortified with iodine could not control IDD related diseases like goiter rather introduced IHD. In addition during same period there are increased instances of several NCD like hypertension, hyperacidity, diabetes, obesity, ICH, and cancer have been reported. Prevalence of these diseases in affluent urban populace overshadows the rural and deprived class of urban populace.

In present times good looking table salt has gradually replaced sea salt and rock salt from kitchen shelves. Table salt comes from salt mines or sea salt and goes through extensive processing that stripe off MMTE associated in the natural salts whose origin primarily is sea. As a result, the two types of salt differ in their components, taste and texture. The specific elements of sea salt or rock salt vary significantly depending on the geographic area of origin. For the sake of discussion we put salt in two categories – Processed Salt, and Unprocessed Natural Salt.

Role of MMTE found in the unprocessed salts which account for nearly 16% of the total volume is very significant and can't be disregarded. Processing of salt replaces this fraction of 16% of other minerals and trace elements simply by sodium and chloride. This explains excess intake of sodium in the normal course of eating. In 1990, Efrain Reisin published his findings in American Journal of Hypertension on excessive sodium ingress in human body leading to hypertension and obesity on account of three different pathophysiological mechanisms:

- (a) abnormal electrolyte transport across cell membranes, a defect that alters sodium/potassium exchange and also sodium/calcium exchanges, increasing the concentration of intracellular calcium ions that heightens vessel wall tension and the smooth muscle process,
- (b) increased sympathetic nervous system activity, and
- (c) Altered cellular sodium concentration that induces water logging in the peripheral arteriolar walls.

These mechanisms increase peripheral resistance and enhance arterial pressure. Early epidemiological studies documented a strong association between obesity and hypertension; and a greater incidence of high blood pressure and diabetes was reported in persons with upper body obesity (high waist/hip ratio).

In addition to natural sodium through salt, sodium aluminosilicate - an anticaking agent is added in the salt to avoid lumping of salt in rainy season, thus increasing overall sodium ingress.

Potassium is an important macro-mineral which is very critical for cardiovascular health. Potassium helps maintain a steady heartbeat and aids in transmitting nerve impulses; it's excess or deficiency leads to cardiac arrest. Together with chloride it also helps regulate acid levels in the body. It is totally absent in commonly marketed branded salts. For example, a quarter-teaspoon of Celtic sea salt contains 601.25 milligrams of chloride, 460 milligrams of sodium and 2.7 milligrams of potassium. Sodium and potassium ions makes exchange pump that functions to maintain the electrical charge within the cell. This is particularly important to muscle and nerve cells.

In nerve cells sodium potassium exchange pump generate sodium and potassium ions gradients. The sodium potassium pump is a well understood example of active transport. Sodium and potassium ions are pumped in opposite directions

across the membrane building up a chemical and electrical gradient for each. These gradients drive other transport processes in the human body. Moreover such gradients propagate electrical signals along motor and sensory nerves as well as neural networks. Action of nervous tissue requires Adenosine triphosphate (ATP), a biochemical way to store and use energy, to generate resting potentials. This energy is used to remove acid from the body.

Magnesium and calcium play essential roles in several chemical reactions in the body. Magnesium, for example, involve in the synthesis of RNA and DNA. Principal role of RNA is to act as a messenger carrying instructions from DNA for controlling the synthesis of proteins. Every cell contains DNA and thus, an imbalance in Magnesium can disturb cell functioning which might be the trigger cause for cell mutation. . Perhaps, high incidence of cancer in Western world is the result of synthetic salt free of magnesium. Magnesium chloride play vital role in cellular detoxification and tissue purification, on account of strong excretory effect on toxins through the pores of the skin. Magnesium chloride is easily assimilated and metabolized in the human body. Due to these properties magnesium is considered as nature's best relaxing agent. Calcium helps give structure to bones and teeth, in addition to regulating heartbeat, normal muscle and nerve function. Both are present in unprocessed natural salt at approximate concentrations of 0.16grams/kg and 4.05 grams/kg, respectively.

Sulfur is the third most common mineral in sea and rock salt with concentration as high as 12.4 g/Kg. Even though it is not considered an essential mineral, sulfur plays an important role in immune system and the detoxification of body. Every cell in body contains it, and it helps give structure to two amino acids. According to MIT (USA) researcher Stephanie Seneff, Ph.D., sulfur is the eighth most common element in the human body and is important for normal metabolism and heart health.

Iron (38.9ppm) and zinc (2.38ppm) are responsible in making of enzymes involved in body internal metabolism. Although phosphorus typically occurs in trace amounts in sea salt, it is actually an essential macro-mineral. Human body uses it as a structural component of bones, teeth and cell membranes, as well as for energy production.

Iodine is part of the thyroid hormone and aids in regulating your body's temperature. Iodine fortification process of natural salt is definitely helpful in Iodine deficient belt but does it also suit to non-deficient belt as well? Excess iodine interferes with normal functioning of thyroid gland and cause iodine induced hyperthyroidism (IIH). Perhaps this is the reason of substantially increased prevalence of thyroid disorder at relatively younger age group.

Manganese (0.27ppm) contributes to proper bone development, and it also aids in the metabolism of amino acids and carbohydrates. Zinc (2.38ppm) plays an important role in the development of new cells and in healing wounds.

**Conclusions:** In light of foregoing knowledge, it is increasingly evident that pH, electrolyte composition, micronutrients, macro and trace elements play vital role for maintenance of healthy body. Body maintains a typical electrolyte balance for various organs like brain, heart, digestive systems, reproductive systems, kidney, skin, hairs, etc. through blood, bile, and several other types of fluids. Processed table salt which is a major intake everyday deprives body of most essential MMTE that kick off many disturbances. Any chemical imbalance leads to cascading disturbances like sodium-potassium pump or electron-proton transport or cell membrane potential or RNA and DNA, all at the cellular level as well as electrode reactions of redox enzymes. .

This could be more plausible reason for NCD growing epidemic like obesity, diabetes, cancer, cardiac, pulmonary, infertility, and renal ailments despite improved understanding of body processes and tools developed over three-quarter of century.

These disturbances manifest into one or more diseases internally and make body susceptible to external biological or chemical attacks. Based on this premise, 54 families consisting of 276 members in varying age groups ranging from children to 88 years were advised to switch from branded salts to unprocessed rock salt over a period of 3 years. Consumption of unprocessed rock salt in India is not unusual; indeed Himalayan rock salt is considered as religiously pure and consumed on the occasion of religious fasting and rituals by Hindus. Interestingly, almost all the families reported improvement in general health and experienced reduced visit to hospitals and medical practitioners.

**Recommendations:** A new strategy to handle IDD needs to be evolved rather than feeding each and everyone with extra iodine resulting in iodine induced hyperthyroidism (IIH) along with other diseases getting precipitated on account of stripping off of MMTE. Development of an improved technology for extra fortification of iodine without stripping off of MMTE from natural salt is the need of hour.

**Limitations of Study:** Due paucity of funds, the study could not extended over larger geographical areas outside India.

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