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Original Article

DEATH ECONOMICS: A STUDY OF CREMATION COST ON HOUSEHOLD AND HUMAN BURIAL ON ENVIRONMENT

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ABSTRACT

Human being on average spends 30.9 years (United Nations, 2018) on Mother Earth. In his entire life he is supported by nature in terms of food, oxygen and water to name a few. At time of his death it is one's obligation to go back to the nature. Broadly there are two ways devised by human being cremation or the earth burial. The present paper wishes to study the impact of cremation on regional air quality and health risks for surrounding residents within the 100 meter area of the Nigambodh (Kashmere Gate) crematorium ground by using the difference and difference technique (DID). Also, it tries to analyze the impact of cremation cost among the rural and urban households in the light of income inequality and increased number of person in a family. Lastly, it focuses on the opportunity cost of burial land (a scare resource with alternative usage). But due to the ongoing Covid19 pandemic it is very difficult for a researcher to do the field survey so I am restricting my study with the available sources of secondary data.

Keywords: Cremation Economics, Air Pollution, Health Risks, Income Inequality, Burial Land Opportunity Cost

"Death is certain for the born, and re-birth is certain for the dead; therefore you should not Feel grief for what is inevitable"

-Bhagwat gita

INTRODUCTION

Human being on average spends 30.9 years United Nations (2015) on Mother Earth. In his entire life he is supported by nature in terms of food, oxygen, and water to name a few. At time of his death it is one's obligation to go back to the nature. Broadly there are two ways devised by human being cremation and burial. When a human body is cremated on an average it emits 30-40 kg of solid particulate matters and releases many harmful gases such as carbon dioxide (CO2), sulphur dioxide (SO2), nitrogen dioxide (NOx), Carbon monoxide (CO), Particulate matters (PM), Mercury (Hg) etc. which leads to air pollution and causes various respiratory, immunological and neurological disorders. On the other hand, burial is more economical and environmental friendly approach. When a body is buried it becomes food for the creatures below land in the soil and once it is completely decomposes it helps to make the soil stronger. Ideally, it is considered as a process of giving back to nature. But this is successful only till the time there are ample number of trees in the city and population and death rate is not too high. Any disruption in the cycle will lead to

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Transparency: The authors affirm that this manuscript presents an honest, accurate, and transparent account of the study. All essential aspects have been included, and any deviations from the original study plan have been clearly explained. The writing process strictly adhered to established ethical standards.
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imbalances in nature and causes negative consequences in long term. With the increasing predominance of Christianity in Europe after the fifth century C.E., cremation was gradually abandoned in favor of earth burial as a symbol of Christ. In India from the time of the Rig Veda, written during 2000 B.C., Hindus have cremated the dead and there is widespread interest in cremation instead of earth burials due to: Spread of infectious diseases, Religious Belief, Scarcity of Burial Land and Public Hygiene etc. One passage from the Rig Veda addressed to Jataedas!, the fire that burns that corpse, goes. It mentioned that how cremations along the ghats in India caused smoke, smell and became cause of health hazard for Britishers Arnold (2017). The cost of cremation at that time was not more than ₹10. But in the present scenario it is very difficult for the vulnerable section of the society to meet the monetary requirement of the last ritual of their loved ones.

It is one of the largely neglected sources of pollution with various social, religious and psychological aspects. As, a person usually hesitates in adopting the modern eco-friendly methods of cremation and burial because of his sentiments and cultural beliefs. This leads to the stigma in the death care industry and heavily impacts the environment. In the amidst of the Covind19 pandemic such studies plays an important role. Proper introspection and encouragement is required for an in-depth analysis of the present topic. As, per the latest MOH data we have lost more than three lakh lives due to this pandemic and almost 86% of the bodies were cremated which gradually increases the level of air pollution and adversely impacts the environment.

REVIEW OF LITERATURE

This section will determine the significance of the proposed study in relation to the extent studies that have already been made in the context of the issue under analysis. As the title of the present study is "Death Economics: A study of cremation cost on household and human burial on environment" literature survey has been made examining various studies compiled under distinctive heads. Thereby review of literature in this section includes studies examining the impact of cremation and human burial on the regional air quality and health risks on the rural and urban Households. Furthermore, the study tries to highlight the focuses on the opportunity cost of burial land. And An attempt has been made to arrange the studies in the chronological order.

IMPACT OF CREMATION ON ENVIRONMENT

Hawley et al. (1999) examines the crisis in cremation with 1000 addicted prisoners patients in Victoria where 700 patients are addicted on methadone and 300 on naltrexone but there is no maintenance program for methadone. There is no facility for needle exchange and they do not allow naltrexone to continue. This eventually leads to the death of prisoners and a crisis situation in Melbourne Centre with the emission of toxic compounds like nitrogen, carbon, sulphur etc. This exposure leads to respiratory disorder and witness the sudden death of 580 prisoners and all the dead bodies were cremated which results into emission of approximately 1200 Nm3/h for harmful gases and soil leaching.

Arnold (2017) argues that until the 1870S cremation was widely regarded in the West as inhumane and shows the evidences of Hindus' "heathen" ways and "barbaric" customs. It is possible that the rite of sati, or self-immolation, by which a Hindu widow was burned on the funeral pyre of her husband added to the sense of horror and repugnance that cremation engendered. Despite the outlawing of sati by the English East India Company many negative associations remained attached to cremation. Before the 1860s Hindu cremation was unregulated by state agency, occurring in places, usually close to a river or by the sea, where the ashes could be immersed in water and preferably in sacred rivers, such as the Ganges. Although the burning of the dead was attended by relatives and friends of the diseased, as well as by priests and the attendants who provided wood and other necessities, the sites themselves were unpoliced and unbounded.

Tunga (2018) stated that cremation is an integral part of modern Indian culture but it is not only confined to India. Countries like USA, UK, Russia, China, and Japan also practice this traditional method. Cremation can be traced back to ancient times however it has recently gained popularity in its modern form due to the cessation of negative religious connotations. It has been recognized that cremation releases large quantities of atmospheric mercury from dental amalgams that can cause negative health effects such as neurological, immunological, heart and reproductive disorders. But still there is a rising popularity of cremation worldwide. The comparative rates are shown below:

USA—3.56% in 1960 but 40.62% in 2010

Canada – 5.89% in 1970 but 68.4% in 2009

UK – 34.70% in 1960 but 72.44% in 2008

Japan – less than 95% in 1960 but 99.85 % in 2008 (highest in the world) China – 48.50% in 2008 from less than 30% in 1930

Green et al. (2014) critically examined emerging concern related to the health risk associated with the emission of hazardous air pollutants from crematories. The presence of silver–mercury amalgams in bodies results in airborne emissions of mercury; and the combustion of essential materials. It also analysis the impacts to ambient air and potential health-risks arises due to emissions of trace pollutants from a proposed crematory. It also discusses a method with three steps, First, to estimate the amount of PCDD/Fs and Hg emitted from the proposed facilities. Second, to modeled the dispersion of the assumed emissions of PCDD/Fs and Hg into

ambient air to determine levels of exposure to these chemicals. Lastly, we compare the predicted impacts with health-based guidelines, in order to determine whether these impacts would be acceptably small.

Figure 1

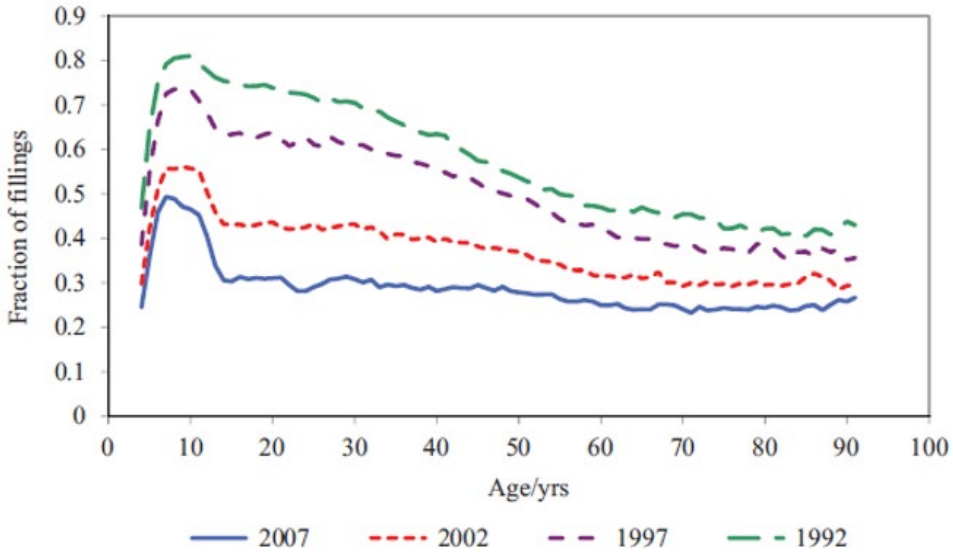


Figure 1 Cremation, Air Pollution and Fraction of Fillings
Sources: Green et al. (2014)

Table 1

Type of Exposure	Concentration (ng/m³ Hg in air)	Regulatory/Scientific Agency
Health-based exposure limits/guidelines for workers	1,00,000	OSHA (2007)
	50,000	NIOSH (1992)
	25,000	ACGIH (2001)
Health-based exposure guidelines for the general population	300	USEPA (1995a)
	200	ATSDR (1999)
	100	Virginia DEQ (2012)

Sources: Green et al. (2014)

Mari et al. (2010) stated that PCDD/Fs compounds are formed during combustion processes when chlorinated products such as plastic are burned. These compounds possess carcinogenic properties and are bioaccumulating organic pollutants. In crematories, these plastics may be present as prosthetics or as part of the container. The body also contains a percentage of chlorine, and thus cremation produces PCDD/Fs. The reports about PCDD/F emissions from crematories in the world are really limited.

IMPACT OF HUMAN BURIAL ON THE ENVIRONMENT

Although burial is in a decreasing trend it has certain environmental impacts associated with it like embalming fluids leading to ground water contamination, decomposition of corpses leading to toxic elements being released, coffin with preservatives apart from economic aspects like land usage etc.

Chiappelli (2008) in his paper stated that embalming Fluids have seen a transition from arsenic and mercury to formaldehyde due to environmental concerns. However, even this chemical is toxic and carcinogenic in nature. Despite the casket, these chemicals inevitably leak into the groundwater reserves and can be highly toxic for the environment. Embalming can become a necessity at times when the body must be preserved such as preservation of bodies for educational purposes, when an open casket funeral is desired, when the bodies need to be transported for long distances as in the case of martyred soldiers or when the viewing of the body is for a longer period as in the death of a pope. However, in today's modern age of science, there exist many alternatives to

preserve it without embalming. Freezing is the most viable alternative for preventing decomposition in the short term. Other alternative is packing the body with dry ice and placing the body in a waterproof pouch with lime.

Fiedler (2012) Decomposition of the cadaver after burial leads to disintegration of bodily elements such as protein, fat, mineral, water and carbohydrate leading to formation of different toxins or substances. Fat decomposition results in the production of adipocere. This leads to interruption of natural decomposition process and delay the post-mortem release of elements, thus preventing immediate soil and groundwater contamination, although posing a problem for the municipalities as graves cannot be used again after the standard resting time.

Guttman (2012) Ammoniacal nitrogen and nitrate are the major inorganic pollutants from decomposing buried corpses, which can have negative effects on humans and the environment. Nitrate can cause cancer, reproductive problems and methemoglobinemia, which is especially deadly in babies and can also negatively affect the environment by causing eutrophication, decreasing species diversity and potentially reducing crop and other plant growth.

IMPACT OF COVID 19 ON ENVIRONMENT

Due to the ongoing pandemic there is a dramatic change in the lives of the human being. They are facing restricted personal interaction worldwide which leads to the decrease in industrial activities, road traffic and tourism etc. and is consider as a blessing for the environment. This leads to the improvement in the air and the water quality and helps in wildlife blooming. But the dark side of the story is due to this pandemic we have lost more than three lakh peoples and most of them are cremated which leads the emission of various hazardous gaseous suspended particulate. On an average cremating a dead body takes 5-6 hours and usages approximately 400-500kg of wood which extrapolate the environment and releases carbon dioxide (CO_2), sulphur dioxide (SO_2), nitrogen dioxide (NO_x), Carbon monoxide (CO), Particulate matters (PM), Mercury (Hg) in large numbers. In the light of the present pandemic situation present paper tries to analyze the evidence-based insight that how the Covid 19 has impacted the environment.

MISCELLANEOUS STUDIES - CREMATION COST ON HOUSEHOLD

Banks (1998) makes an attempt to study the impact of funeral and cremation costs on U.S. household. It fascinates the study with dismal science of the death care industry where the average funeral cost is over 5,000 dollars. With 2.3 million deaths per year, an aging baby boomer population and lack of consumer information becomes apparent and gain the importance of this industry. In 1993 American spent an estimated $ 9.7 billion to $ 17.1 billion on funeral, cremation and cemetery services. That amounted to $ 4,217 to $7,434 per deceased, exclusive of expenditure on complementary goods such as flowers, burial cloth and newspaper notices. In comparison, the average consumer of health-care industry spends $1.776 during the same period (U.S. Bureau of the Census, 1995). This makes an episode of death within a household of far greater monetary significance than an episode of illness. Much like an episode of illness, an episode of death has significant distributional effects on the incomes of U.S. households.

Figure 2

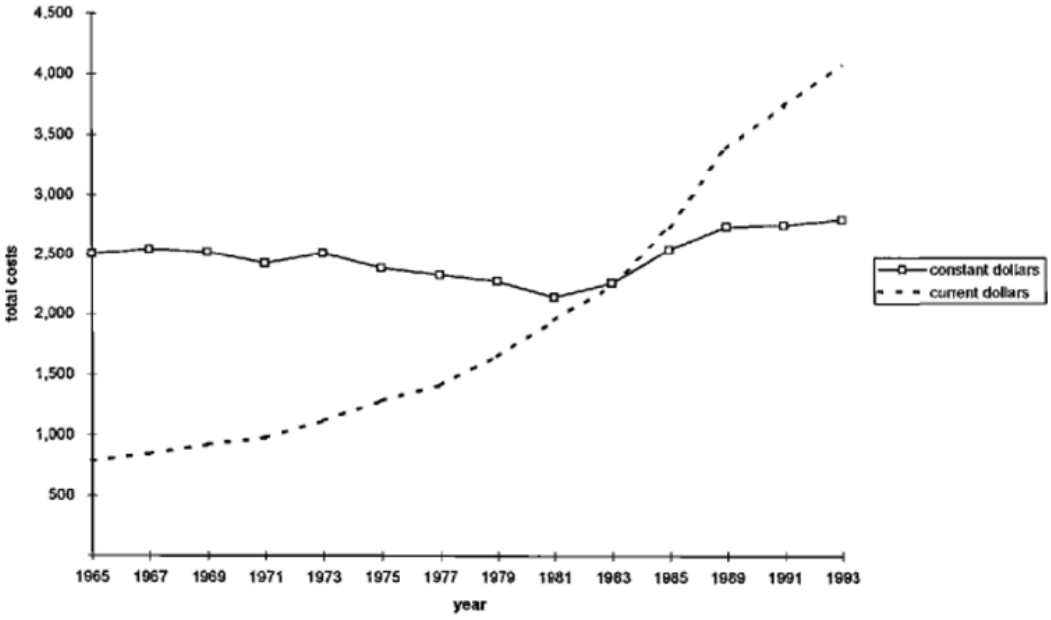


Figure 2 Banks (1998)

Figure 3

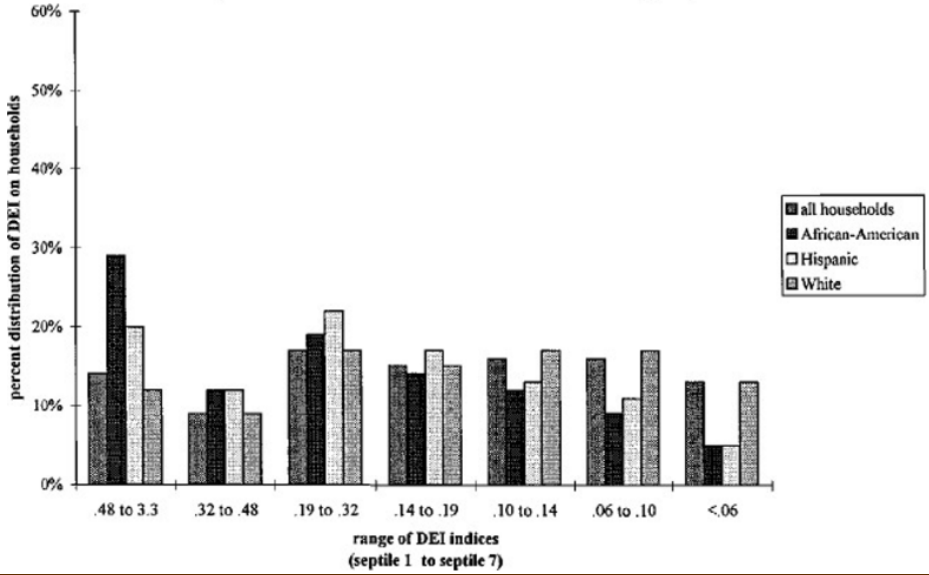


Figure 3 Distribution of Death Economic Impact (DEI) on Household
Source: Statistical Abstract of the United States, 1995

The figure shows that 41 percent, 32 percent and 21 percent of African, American, Hispanic and white households fall within this category. If an episode of death were to occur these household could expect to spend 32 to 330 percent of their incomes on funeral services or cremation services. This data includes economic cost of disposing human bodies it includes both the necessary charges such as fees for acquiring a death certificate and potential unavoidable expenses such as luxury caskets. One traditional burial can cost a family up to $10,000 per member.

Brief Review of Literature

Q1. What is already known in your area? What is the seminal work in your area of research?
From the point of view of environmental aspects, existing literature describes the toxic emissions from cremation and contaminations due to burials; its impact on the environment and the possible alternatives. The seminal work in our field is reports on mercury emissions and measure of graveyard soil contamination and papers analyzing these reports.

Q2. What is not known or what are the gaps in the existing body of knowledge?
One of the major gap found in the existing literature was that while understanding the consumer behavior on choosing the alternative methods over the traditional ones, the reason for lack of rational decisions could not be understood. This requires an idiosyncratic approach while such studies were not found in the scholarly databases.

Q3. What are the unanswered questions? Due to lack of extensive data on emissions and their various impacts in all the diverse nations, a generalized view could not be formed about the same.

Q4. What theories have been put forward relevant to your area of research?
Various alternatives to traditional methods of human corpse disposal are being presented and this is an emerging field where conceptualized theory are being experimented upon and their applicability is being looked upon.

Q5. What suggestions have been made for further research?
Suggestions for further research include studies conducted in geographically distinct areas so that the samples provide a holistic view of causes and effects in this field.

Q6. What research methods (qualitative and quantitative) have been employed by other researchers in the field?
Most of the researches done on the field are a combination of exploratory, descriptive and explanatory research methods. Nomothetic explanations have been more commonly used. This field lacks the presence of idiosyncratic explanations.

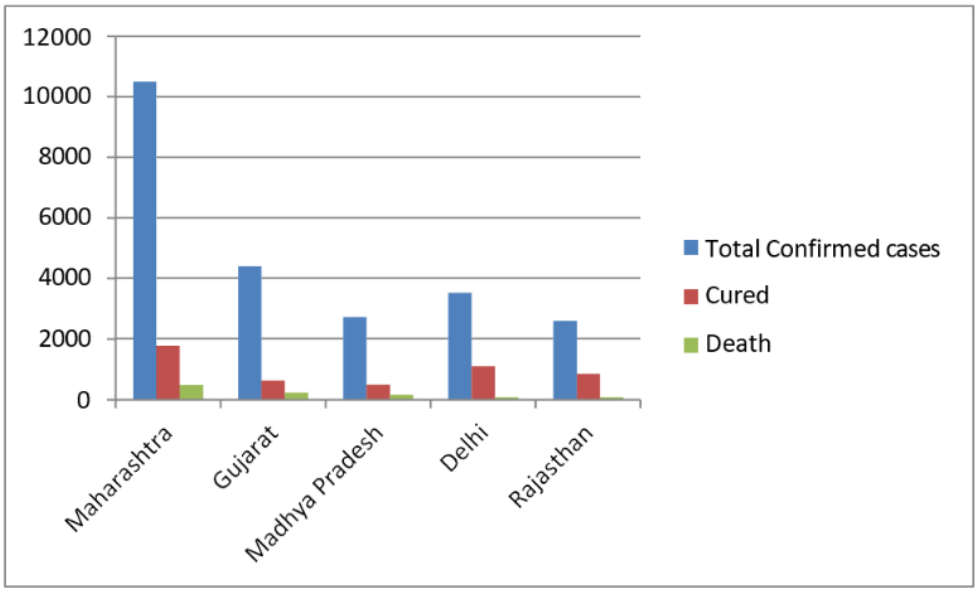
DATA ANALYSIS

This paper tries to analyze the effect of cremation and burial on the environment and to facilitate this purpose we will use the state wise Covid 19 taken from Ministry of Health and Family Affairs. It has 32 observations including different states and the union territories with four variables i.e. states, total no. of confirmed cases, cured cases and the total death.

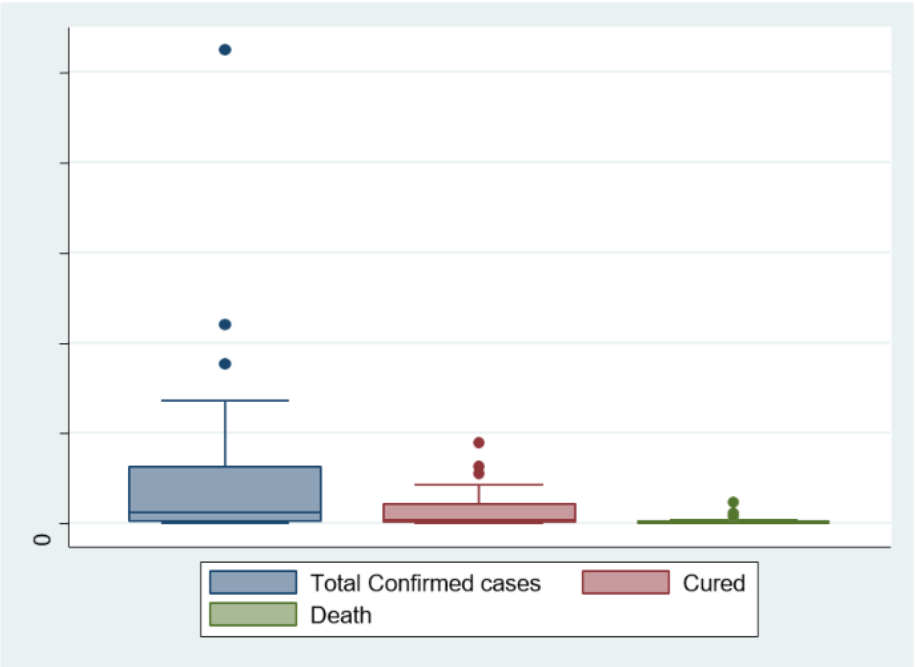
The descriptive statistics of the data is shown below where the data has 32 observations and three variables namely, Total number of confirmed cases, cured cases and the total death in the respective states or union territories of India. The average value of the total confirmed cases with the minimum and the maximum value of 1 and 10498 will be 1092.875 and the standard Deviation is 2075.891. The average value of the cured cases is 283.2813 and the standard deviation is 427.3122 and the average value of total death is 36 and the standard deviation is 89.23221.

Variable	Obs	Mean	Std. Dev.	Min	Max
TotalConfi~s	32	1092.875	2075.891	1	10498
Cured	32	283.2813	427.3122	0	1773
Death	32	36	89.23221	0	459

Below is the bar chart showing the total number of confirmed cases, total cured cases and the total no. of death in the top five states namely Maharashtra, Gujarat, Madhya Pradesh, Delhi and Rajasthan. In all the five states total number of confirmed cases and higher than the total number of cured cases and the total number of deaths.



Boxplot shows the difference between the Interquatile range (Q3-Q1) of the total number of confirmed cases, total cured cases and the total number of deaths in India during the ongoing pandemic. The dots outside quartile range shows the outlier. Each of the three cases are witnessing outliers in there respective categories. Also, in each of the three cases the mean (Q2) is not symmetrically distributed.



The figure below shows the scatterplot matrix of the state wise data of covid 19 including the total number of confirmed cases, total cured cases and the total number of deaths, where it shows that the total number of confirmed cases and the total number of cured cases shows a higher variations than the total number of deaths.



CONCLUSION AND POLICY SUGGESTIONS

"While we are doing the rituals for the dead, we should take care that we're not affecting the survival of future generations."

- Merging the dead with the living - Just by organ donation and making the dead useful (Rumble,2014)
- Alterations in legislation of the budget allocated for cremation grounds
- Shifts in perspective i.e. movement toward chemical-free methods – Green/Natural Burial, Alkaline and electrical Hydrolysis.

- Incorporation of vegetation in cemeteries
- Improved research into promotion of alternative measures.

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