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Mathematical Modelling Comparison of Growth Rate of Cancer Patients of H.P., Punjab, Haryana, Uttaranchal and Rajasthan Due to Water of Sutlej

Rajdip Kaur[1]* Ashwini Kumar Nagpal[2]

[1] TGT Mathematics, Govt. Model Sen. Sec. School, Gidderanwali, Fazilka, Punjab

[2] Professor Mathematics, Seth G. L. Bihani S.D. PG College, Sri Ganganagar, Rajasthan

Abstract – In these days, the money minded people use fertilizers for more & more production of crops. This scnerio to make impurities of soil and the soil makes water impure by the use of fertilizers as well as pesticides. The chemical used in fertilizers and pesticides such as arsenic and mercury, which mixes in water from soil in various ways, makes it impure. The water flows from H.P. to Punjab, Haryana and then Rajasthan, gets more and more polluted due to excess use of fertilizers in these states. The water comes from the river Sutlej in these states, which is used for drinking, irrigation and all other purposes. But due to mixing of such type of dangerous chemicals in water from the impure soil from farms makes the water poluted drinkable.

But, as the people are not aware of its dangerous effects and are going to drink it regularly, are affected by diseases like cancer. Our aim to mathematical modelling (statistical analysis) to show the growth rate of dangerous cancer is increasing day by dayas well as flow the water of Sutlej. We are going to understand through the graph and by the hypothetical test, is the thinking of these kind of possibilities are true or false.

Statistical analysis chi- square test is most helpful test to the deep study of like to these kinds of the experiments after collecting the data and it gives most accuracy of farthest study of statistical analysis, it might give an experimental thought to precaurance of this kind of instability. It may be helpful for the human beings to understand the flowance of the water is very dangerous from the farm (irrigated and ferilized soils). It respective the water flows through the mixture of impurities is harmful to the human being in the flow of their areas and it causes the cancer higher in the respective their flowence. We are regarding this preciption and try to understand the thinking of aim is true or false by using the hypothetical tests.

Keywords: Cancer, fertilization, Sutlej, irrigation, flow, water, flow of water, H.P., Himachal Pradesh, Punjab, Rajasthan, Haryana, Uttaranchal, Statistical analysis, chi- square, mathematical modelling, graphs, pie chart.

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INTRODUCTION

A growing rate of cancer patients is very high and is increasing year by year in Himachal Pradesh, Punjab, Haryana, Uttaranchal & Rajasthan and other states also due to impurities of water. As we seen the water is flowing down from one place to another place that makes it impure step by step and in the same scenario it is highly impure in the last point of the river.

We are going to make comparison of the H.P. then Punjab and then Rajasthan's scenario of cancer patients position in order to fluence of water of Sutlej. For this sake of, the administrator data of the all above states from2012 to 2015 is taken and is annoying to appreciate what distinction could be made by mathematical modelling. The scenario of bank of river Sutlej is established in citiesof Punjab, Haryana, Uttaranchal, H.P. and Rajasthan. Sutlej rises from beyond Indian borders in the Southern slopes of the Kailash peak nearMansarover pond from Rakas pond. It is the largest among thefive rivers of Himachal Pradesh. It enters Himachal at

Shipki at an elevation of 6,608 metres andflows in the South-Westerly direction through Kinnaur, Shimla, Kullu, Solan, Mandi and Bilaspur cities. Its path in Himachal Pradesh is 320 km. from Rakastal, with well-known tributaries, the Ropa, the Taiti, the Kashang, the Mulgaon, the Yula, the Wanger, the Throng and theRupi as right bank tributaries, whereas the Baspa, the Gayathing, the Tirung, the Soldang and theDulingare left bank tributaries. It leaves Himachal Pradesh to enter the plains of Punjab at Bhakhra,where the world's highest gravity dam has been constructed on this river. Its total catchment areain Himachal Pradesh is 20,000 sq. km, Then flows into the same another states of india namely Punjab, Uttarachal and Haryana in the sequence of this its flows after these states next to go in Rajasthan and then merges in some another country Pakistan and Bangladesh with respective ways.

REVIEW OF LITERATURE:

As per data provided by Indian Council of Medical Research, the cases of various types of cancer including kidney, pancreas, breast & blood cancer and related deaths are on the rise in the country. The increase in the number of cases may be recognized to elderly population of water due to impure and fertilized soil, noxious life styles. While Health is a State subject, the Central Government supplements the efforts of the State Governments for recovering healthcare together with prevention, analysis and cure of cancer.

Government of India had launched a broad National Programme for Prevention and Controlof Cancer, Diabetes, Cardiovascular Disease and Stroke (NPCDCS) in 2010 with focus on 3 sites namely breast, cervical and mouth cancer. From 2013-14 onwards, interventions under NPCDCS for prevention, early detection, diagnosis and treatment of cancer, which can be taken up upto District level, have been brought under the umbrella of National Health Mission, in this sequence whole the world and the states of india also likely to take in advancement and technical efforts to investigate the causes of cancer and their prevention, some medicines are also found to have preventions. But all the medicinal techniques are very complicated and painfull for the human being but the precautions are much needed to precure the cancer avoidence.

In addition, the Government has in the year 2013-14, approved a scheme for enhancing the Tertiary Care Cancer services in the country. Under this proposal, Government of India will support 20 State Cancer Institutes and 50 Tertiary Care Cancer Centres in different parts of the country. The maximum support inclusive of State Share for SCI is Rs.120 crores and for TCCC is Rs.45 crores. The Central and State share will be in the ratio 75:25, and for North East and Hill States this ratio would be 90:10. Government of India also provides cure of cancer through Central Government Hospitals/Institutions in different parts of the country such as All India Institute of Medical Sciences, Safdarjung Hospital, Dr. Ram Manohar Lohia Hospital, PGIMER Chandigarh. We are using the official data of the PGIMER from the recocginzed officials provided.

Incidence and mortality of cancer cases during the 2012 - 2015 are given below:

Estimated incidence cancer cases in India – (2012 - 2015)

States	2012	2013	2014	2015	Total
H P	2568	2625	2683	2741	10617
Punjab	10343	10563	10785	11011	42702
Haryana	9477	9734	9998	10268	39477
Uttranchal	3798	3916	4037	4160	15911
Rajasthan	25707	26429	27168	27922	107226
Total	51893	53267	54671	56102	215933

AIM OF THE STUDY:

As the water of river Sutlej flows from Himachal Pradesh to Punjab, Uttaranchal, Haryana, then it flows in Rajasthan and merge into Pakistan. Aim of our study is to prove whether the cancer patients in H.P are minor, ratio of cancer patients in Punjab is more than H.P., in Uttaranchal is more than Punjab, in Haryana is more than Uttaranchal and in Rajasthan is more than Haryana. It is because that in general observations we see that the water gets more and more impure as it flows from H.P. to other states in the above sequence. As H.P. is origin of water, so water seems to be pure there. But when it entres in the land of Punjab, some impurities such as mercury, arsenic, zinc etc. from pesticides & ferilizers used in farms and various chemical mixes in the water by the factories established in the sequence of all the near bank of river sutlej. So flow of respective state to state it goes on more and more polluted, which definitely increase the growth of cancer patients. One more fact is there that the water purifiers used on a wide range are also very dangerous, as it also removes the necessary minerals present in the water. It is a very large topic to discuss for the research scholars.

Aim of the study is the statistical analysis of the growing rate of cancer patients of some states. Our aim to study that how the water gets more and more impure when flows from H.P. to Rajasthan which cause dangerous diseases like cancer. So that we could know that what are the basic reasons behind the impurities of water and we could reduce these impurities by our combined efforts. So we could stay away from such type of dangerous diseases.

Following reasons are there behind the impurities of water in the order of their flow

1. In rainy season, the rain water in farms gets affected with the mixing of pesticides & fertizilers present in the plants & soil. This affected water when flows from farms to water sources, makes the water impure.

2. The roots of plants affected by harmful chemicals, which are quite deep upto the water level, also makes the water impure.

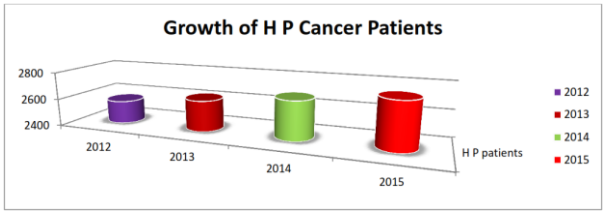
3. The waste chemicals from various chemical factories, when drained in the water sources, make the water impure.

4. Due to lack of well-established Sewage plants, this waste also merge into the water sources, makes the water impure.

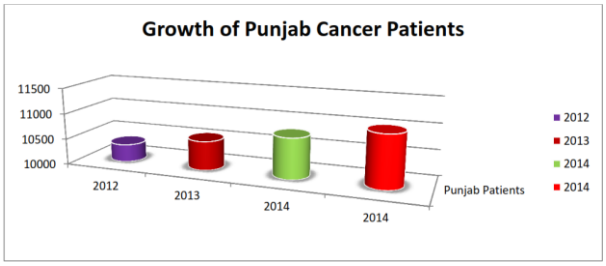
STATISTICAL ANALYSIS:

Our aim of the study is the statistical analysis and comparison of growth of cancer patients in H.P., Punjab, Uttaranchal, Haryana and Rajasthan. Firstly we see the year wise comparison of growth rate of each state, which goes on increasing as the water impurities, goes on increasing. The people whose imunity power is not strong, with continuous use of impure water got affected. So graph of year wise comparison will show the growth of cancer patients from 2012 to 2015. Secondly we will compare the growth rate of these states, which will show that growth of cancer patients goes on increasing from H.P to Rajasthan by the respective states in the above sequence, as we have discussed in the above.

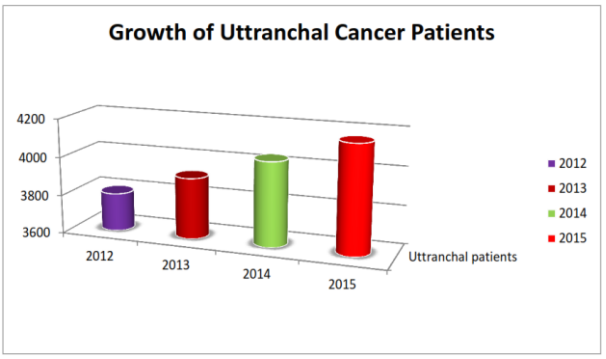
Year wise comparison of cancer patients of H.P.:



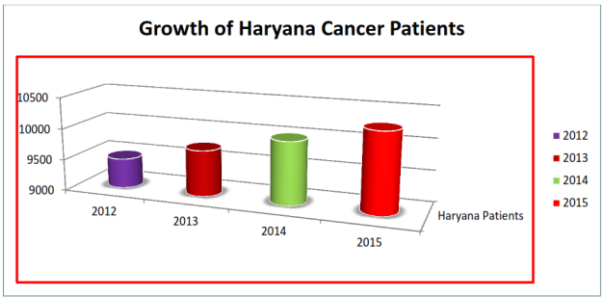
Year wise comparison of cancer patients in Punjab



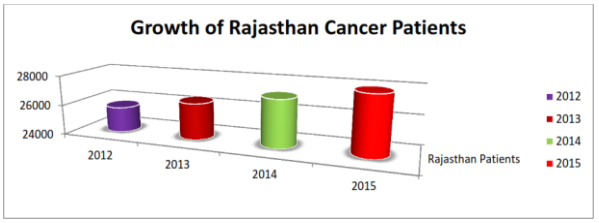
Year wise comparison of cancer patients in Uttaranchal



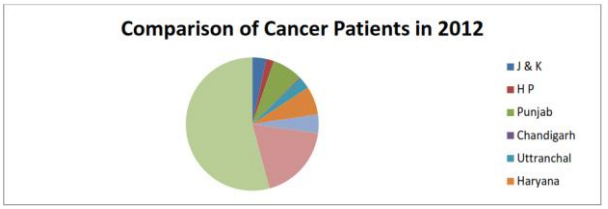
Year wise comparison of cancer patients of Haryana



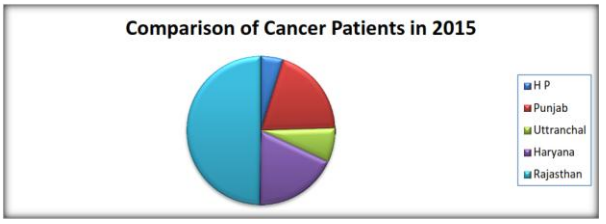
Year wise comparison of cancer patients in Rajasthan



Comparison of cancer patients of H.P., Punjab, Uttaranchal, Haryana & Rajasthan in 2012



Comparison of cancer patients of H.P., Punjab, Uttaranchal, Haryana & Rajasthan in 2015



Introduction of Chi-square test:

A chi-squared test symbolically $\chi 2$ test is any sampling distribution depends on null hypothesis H_0. In the standard applications of the test, the

observations are classified into mutually exclusive classes and it is always used on the basis of the actual or experimental values, and there is some theory, or say H_0, which gives the probability that any observation fails into the corresponding class. The purpose of the test is to appraise how likely it is between the observations and the H_0.of squared sample Test statistics that follow a chi-squared distribution arise from an assumption of independent normally distributed data, which is valid in many cases due to the central limit theorem. A chi-squared test can be used to attempt rejection of the null hypothesis that the data are independent.

Also considered a chi-squared test is a test in which this is asymptotically true, meaning that the sampling distribution (if the null hypothesis is true) can be made to approximate a chi-squared distribution as closely as desired by making the sample size large enough. The chi-squared test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories.

Suppose that n observations in a random sample from a population are classified into k mutually exclusive classes with respective observed numbers x_i (i = 1 to k), and a null hypothesis gives the probability $p_i$that an observation falls into the ith class. So we have the expected numbers $m_i=np_i$ for all i, where

$$\sum_{i=1}^{k} P_i = 1 \;\&\; \sum_{i=1}^{k} m_i = \sum_{i=1}^{k} x_i = n$$

Pearson proposed that, under the circumstance of the null hypothesis being correct, as $n\to\infty$ the limiting distribution of the quantity given below is theχ2distribution.

$$\sum_{i=1}^{k} \frac{(x_i - m_i)^2}{m_i} = \sum_{i=1}^{k} \frac{(x_i)^2}{m_i} - n = \chi 2$$

Pearson dealt first with the case in which the expected numbers mi were large enough known numbers in all cells assuming every x_i may be taken as normally distributed, and reached the result that, in the limit as becoming large, X^2followed the χ2 distribution with (k - 1) degrees of freedom.However, Pearson next considered the case in which the expected numbers depended on the parameters that had to be estimated from the sample, and suggested that, with the notation of mi being the true expected numbers and m'i being the estimated expected numbers, the difference.

$$\chi 2 - \chi' 2 = \sum_{i=1}^{k} \frac{(x_i)^2}{m_i} - \sum_{i=1}^{k} \frac{(x_i)^2}{m_i'}$$

will usually be positive and small enough to be omitted. In a conclusion, Pearson argued that if we regarded X'^2as also distributed as χ'^2 distribution with (k - 1) degrees of freedom, the error in this approximation would not affect practical decisions. This conclusion caused some controversy in practical applications.

χ2 Table with the Hypothetical and Experimental Values

O = Observative Values,

E = Expected Value

Observed value (O)	Expected value (E)	$(O-E)^2$	$(O-E)^2 / E$
2568	2551	289	0.1133
2625	2619	36	0.0135
2683	2688	25	0.093
2741	2758	289	0.1048
10343	10262	6561	0.6393
10563	10533	900	0.0854
10785	10811	676	0.0625
11011	11094	6889	0.6209
9477	9487	100	0.0105
9734	9738	16	0.0016
9998	9994	16	0.0016
10268	10256	144	0.0140
3798	3823	625	0.1635
3916	3925	81	0.2064
4037	4028	81	0.2011
4160	4134	676	0.1635
25707	25768	3721	0.1444
26429	26450	441	0.1667
27168	27148	400	0.0147
27922	27858	4096	0.1470
		$\Sigma\chi^2$ =	2.9677

CONCLUSIONS & RESULTS:

From the above calculation, we see that value of χ2 = 2.9677 < 30.433. So our hypothesis is accepted at 95% confidence level. Hence conclude our hypothesis that the flow of water causes more cancer due to more impurities mixed in water and it provide imnatural to the human being also conclude that the cancer may causes by the impurities of water.

In scenario of the comparison the years also shows that the human being has the strong immunity power are affected from this water takes a long time as compare to low immunity human being. It also conclude that the impure water is working slowly so the cancer patients are high day by day to less immunity power or in sequence of the immunities.

FURTHER STUDY:

We are preferred to study that the impure water can be purified by RO purifier, are also make the cause of cancer.

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Corresponding Author

Rajdip Kaur*

TGT Mathematics, Govt. Model Sen. Sec. School, Gidderanwali, Fazilka, Punjab