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OPTIMIZATION OF FUTURISTIC DECISION PRIORITIES FOR CANCER CONTROL IN INDIA

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Cancer population is increasing with tremendous pace in our country. If the present state of disease continues due to lack of awareness, diagnostic and treatment facilities, inadequate human resources and ignorance about carcinogenic factors, then Cancer will be the biggest killer disease in near future. This paper presents an application of Multi Criteria Futuristic Decision Making (M.C.F.D.M.). Methodology to optimize futuristic decision priorities for control of Cancer Population from the face of India by the year 2020 A.D.

INTRODUCTION

The presence of Cancer in a country, characterized by a poor standard of health care development can set off a downward spiral of damage to hard-won gains in health and living standards. Cancer is not a new phenomenon and does not occur only in human beings. This disease have been observed in nearly all vertebrates. Histologically, cancer cell resemble the parent cell or tissue. Cancer encroach on and destroy the adjacent tissue, enabling them to penetrate the walls of blood vessels and lymphatic channels and thereby disseminate to other site to form secondary tumours. The transformation of normal cells to malignant cells is a complex process. Most malignant tumours are thought to be attributable to some environmental cause, relatively few to an inherited or constitutional risk; but there is interplay between these factors. Once started, the proccess does not require the continued presence of the carcinogen. It is rather a hit-and-run situation and evidence of the specific causative agent(s) is not usually found in the eventual malignant tumours.

According to Venkatesh *et al.* (1994) 60% of all new cancer in the world are found in developing countries. Most of them when diagnosed are incurable. 80% of all cancers are related to behavioral and environmental factors. The three most common cancer in India-oral, cervical and breast cancers not rely lend themselves to early detection, but can actually be prevented. Hence there is a need to promote education, awareness and early diagnosis. According to I.C.M.R. Reports (1989) in male cancer population the crude incidence rate of leading Oral cancer is 23%, and in female cancer population the crude incidence rate of Cervix cancer is 24%, Breast cancer is 20% and Oral cancer is 6%. According to Percy & Muir (1994) the 'International Classification of Disease for Oncology, Second Edition [ICD-O-2]' published by WHO in October-1990, would be very helpful in Cancer Research. ICD-O-2 after extensive training went into effect in the USA in 1992 and in Canada and other countries in 1993. Cancer Research in India has achieved an astonishing level of excitement and importance, but the ultimate measure of success is the alleviation of suffering and death by preventing or curing cancer. This paper presents an application of Multi Criteria Futuristic Decision Making (M.C.F.D.M.) Methodology to control Cancer Population by the year 2020 AD, by computing optimal futuristic decision priority weights to optimize Futuristic Decision Priorities and scenarios.

MATERIALS AND METHODS

Multi Criteria Futuristic Decision Making (M.C.F.D.M.) Methodology (Garg, 1995a) uses Futuristic Management Techniques and Multi Criteria Decision Making Mathematical Model. This Methodology can be used in solving any real life problem connected to society and individual such as social, economical, political, cultural, philosophical, technical, medical, life sciences, environmental etc. The proposed M.C.F.D.M. Methodology is a multi-criteria, multi-factorial, multi-level, multi-person, multi-dimensional futurologistic decision priority ranking approach.

To control cancer population by using M.C.F.D.M. Methodology, 669 members of Interdisciplinary Futuristic (IF) Group and 51 experts from Experts (EP) Group from different regions of India,

were selected by five members of Decision Making Group (DM) to analyze the multicriteria cancer problem with different ideational orientation. The experts of EP Group were divided into four Sub Groups accordings to their specialization (Sub Group A:6 Futurologists, Sub Group B : 21 Cancer Specialists, Sub Group C : 11 O.R. Specialists, Sub Group D : 13 Biologists). The Synthesis picture, resulting from the prognosis picture and optative picture, will help in clustering of scenarios by D.M. into a reasonable set of mutually exclusive and encompassing objectives, criteria, sub - criteria and alternatives etc. A brief Write-up about Goal of Research Study with technical data related to Goal, was prepared from the Cancer literature, and from personal experiences of Oncologists and Surgeons. Generated Scenarios were taken into consideration for developing DPQ for IF Group. Multiple criteria of cancer, in DPQ were rated and ranked by IF Group. Feedback of IF Group was analyzed by DM and stability reached after 2nd round. ISTQ was designed by DM for IF Group and w_i, i=1,2,...m were analysed from IF Group response. W_i and W_{ij} were calculated for $\hat{i}$ = 1,2,...m. Matrix A' and A" were formed from W_{ij} and $\hat{i}$ respectively to generate Matrix A. For different levels Ev.,λ_{max}, CI, CR with Overall Futuristic Priority Weights were computed. Finally Optimal Futuristic Priority Criteria was selected and Scenarios with Action Plan were recommended.

RESULTS AND DISCUSSION

The work on this Research Study was over after about 7 months. Three Cancer Specialists from Sub Group B and 5 Biologists from Sub Group D of EP Group and 69 participants of IF Group could not participate in this Research Study till end due to some unavoidable reasons. Table I gives the value of w_i^2 and w_i for objectives i, i=1,2,...7. RC Weights W_{ij}, for objectives $\hat{i}$, $\hat{i}$ = 1,2,...7 are shown in Table II. Calibrated PC Matrix A' for objectives $\hat{i}$ is shown in Table III. Matrix A with respective Ev., λ_{max}, CI, CR is given in Table IV. The Overall Futuristic Priority Weights and Sequence of Urgency (S.O.U.) for objectives are given in Table V. The results demonstrate that Awareness Programme (0.3754) is highly prioritized objective to control Cancer Population. The second prioritized objective is Root Causes of Cancer (0.2536) and the third prioritized objective is Cost Factor (0.1388). The analysis of Results indicates following Scenarios and Action Plan for achieving the goal.

Table I : w_i^2 and w_i

i	RCC	CF	DIAF	AP	TF	RCP	CT
w_i^2	4.186	3.011	1.917	6.599	1.368	0.882	2.691
w_i	4.108	2.855	1.718	6.489	1.112	0.831	2.352

Table II : W_{ij}

j/î	AP	RCC	CF	CT	DIAF	TF	RCP
AP	100						
RCC	63.307	100					
CF	43.997	69.499	100				
CT	36.245	57.254	82.382	100			
DIAF	26.476	41.821	60.175	73.044	100		
TF	17.137	27.069	38.949	47.279	64.726	100	
RCP	12.806	20.228	29.107	35.332	48.370	74.730	100

Table III : Matrix A'

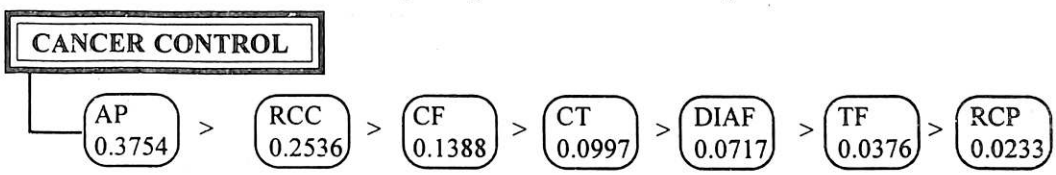
î	AP	RCC	CF	CT	DIAF	TF	RCP
AP	1	4.0	5.5	6.5	7.0	8.0	8.0
RCC		1	3.5	4.5	6.0	7.0	7.5
CF			1	2.5	4.5	6.0	7.0
CT				1	3.5	5.5	6.5
DIAF					1	4.0	5.5
TF						1	3.5
RCP							1

Table IV : Matrix A

î	AP	RCC	CF	CT	DIAF	TF	RCP	Ev.
AP	1	2.5	4.75	6.25	5.00	7.50	8.00	0.3754
RCC		1	3.75	4.75	5.00	6.50	7.25	0.2536
CF			1	2.25	3.75	5.50	6.50	0.1388
CT				1	2.75	4.75	5.75	0.0997
DIAF					1	3.50	5.25	0.0717
TF						1	3.25	0.0376
RCP							1	0.0233

$\lambda_{max} = 7.759$ **CI** = 0.1265 **CR** = 0.0958

Table V : Overall Futuristic Priority Weights with S.O.U. for Objectives



Glossary of Terms used : AP = Awareness Program; APC Matrix = Average Pairwise Comparison Matrix; CF = Cost Factor; CT = Curing Time; C.E.P. = Cancer Education Programme; DIAF = Diagnostic Factors; DM = Decision Making Group; DPQ = Delphi Questionnaire; EP Group = Expert Group; FB Weights = Feedback Weights; IF Group = Interdisciplinary Futuristic Group; PC Matrix = Pairwise Comparison Matrix; PCQ = Pairwise Comparison Questionnaire; RCC = Root Causes of Cancer; RC Weights = Relative Comparison Weights; RCP = Rehabilitation of Cancer Patients; RW Matrix = Relative Weight Matrix; SF Weights = Satisfaction Weights; TF = Treatment Factors.

- There is an urgent need for development of a sound, effective, powerful and user-friendly Cancer Education Program (C.E.P.) to control cancer in India by the year 2020 AD.
- C.E.P. with a view to influencing people's attitudes and changing their behaviour is therefore a central instrument in cancer control work. The goal of C.E.P. although difficult and ambitious, is attainable. The successful implementation of the C.E.P. in a country as large and diverse as India requires careful strategic planning, effective management and optimal use of available resources.
- C.E.P. should be designed for all groups of society and the opportunities for reducing the incidence of cancer should be open for each and every citizen of India.
- C.E.P. can never be seen as an isolated medical question. The information must be related to the social and cultural patterns which characterize the environment in which the individual lives. C.E.P. must also be aimed at Researchers, Decision Makers, Futurologists and other who designed the environment in the long and the short term.
- A strict action should be taken immediately to check the causes responsible for this fatal disease. A time bound Action Plan should be formulated for Indians to make them aware about the Root Causes of Cancer.
- For controlling Oral Cancer, priority attention should be given to check the increasing trend of Tobacco chewing and smoking. A systematic and impressive "Anti-Tobacco Campaign" should be carried out and manufacturing of Tobacco related products should be stopped immediately.
- In the case of Cancer of the Cervix, sexual habits play an important part in that the risk increases with the number of sexual partners and with the early commencement of sexual activity. To control Cervix Cancer, proper education should be given to females and males.
- The risk factors for Breast Cancer are long interval between menarche and menopause, obesity and high-fat diet, family history of Breast Cancer, geographic factor, etc. An understanding of these risk factors can help in the development of programmes directed towards the prevention of Breast Cancer.

- Generally the cost of treatment diagnosis, drugs, etc is very high for Cancer patients and it is generally beyond the reach of normal Indian citizen. Charitable Societies, N.G.Os and Social Workers should come forward to provide monetary help and fee nursing facilities.

- The life saving cancer drugs and treatment equipments should be manufactured in our country to reduce treatment cost.

This is the right time for taking an urgent step to control Cancer from the face of India otherwise there will be a "Cancer Quake" in near future.

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