

## Original Article

# Burden of the central nervous system malignancies in Iran 2003

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### Abstract:

**Objective:** The policy makers and social managers need some criteria for building up the appropriate health status of the community and observe the equity and equality on it. They have to know the burden of diseases as a main determining factor for decision making, planning and programming. Disability adjusted life years (DALYs) is a criteria which shows the wasted life time due to early death and also wasted time due to disease morbidity and disability. Central nervous system malignancies are important especially in children and estimating the burden of these malignancies in Iran will enable the health policy makers to share the community sources, as appropriate.

**Material and Methods:** The estimation of burden of disease and risk factors was a national study that began on 2003 by the ministry of Health and Medical education (MOH&ME) after establishing cancer registry in the country. Here by we discussed about the burden of CNS malignancies as a part of this study. This study was performed by a special modeling and new software.

**Results:** Due to wasted life time of early death and morbidity, CNS malignancies are the third malignancy in Iran. Year waste in Iranian Population is 0.69 in each 1000 person.

**Key words:** CNS malignancies, Burden of disease, DALYs, Iran.

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### Introduction

Public health is a complex issue affected by many different determinants. Public health is not a stable status but as a dynamic situation affected by so many factors needs to be under supervision and management as the corner stone of suitable social and economical development of each community (1). Nowadays in the second half of 20th century, we need to have the exact information about death, incidence and prevalence of diseases, etiologies, and outcome to make appropriate decision. The traditional indicators are not enough to display the health status of the community. With these indicators we are not able to expend the limited sources for health in a equity manner

so we need to have a unit indicator based on different criteria of the community health for distribution of the possibilities (2). New indicators of health status of community can show the economical burden of death and disease and can describe this by a simple language for policy makers and managers (3, 4).

By focusing on the time as a unit to manage the wasting time due to disability, morbidity and mortality, we will able to show both the wasting time due to early death and disability in a simple criteria which is named DALY (3, 4). DALY is defined as a year which should be spent with health, but we waste it due to injury or disability resulted from disease or early death (3, 4). In fact

DALY is 1 year duration that displays the difference between a real health and a virtual health of population.

DALY was first used as a indicator in Global Burden of Disease study designed by World Bank, WHO, and Harvard Health school in 1998 and afterwards has been used in several studies in different countries (3, 4). Estimation of the burden of disease is a complex study; needs a good team work with economical support (4). We began this study in 2003 for making the politics in the ministry of health.

CNS malignancies as a usual malignancy in children need a special attention (5-7). Calculation of the burden of CNS malignancies among all other malignancies can enable the health policy makers to design the most appropriate program and save economical sources, with equity in health resource management (8).

**Material and methods:**

**Study population**

By using the last census in Iran in 1996, the population in each subgroup (Sex and age) was estimated.

The sources of study, Data collection, and disease modeling.

Incidence and mortality of CNS malignancies and the survival of patients are the most important data for calculating the burden of CNS malignancies. We used the mortality rate from the precious sources of Death registration (9) and estimated the incidence rate of CNS malignancies from the records of different malignancies in the cancer registration systems. We used the data of previous studies which were performed in Iran as well as other populations such as WHO reports, national cancer institute of United States, department of human services of Australia and GBD, and also the opinion of Iranian experts in this study. We used information about incidence, survival and mortality from different sources in order to have a homogenous information.

We used epidemiologic models and then designed a software program (Can Mod) which had a template for information about cancers. The incidence/mortality ratio in each cancer is related to survival of the disease. When the treatment of the disease is successful, this ratio rises. This ratio is different in different populations. We used expert panels to organize several earlier data

regarding Iranian population. These expert panels had a good knowledge from different populations and especially from Iranian population so they helped us to validate the available data. In the case of survival and cure rate of cancer patients, we did in the same manner. Data are summarized in table 1:

**Table 1**

Parameter	Result
Survival in the end of the first year	70%
Survival in the end of the third year	40%
The proportion of patients who cured	27%
The proportion of patients who had been treated	95%
Mean time of diagnosis and treatment	0.25 (year)
Mean time of survival after metastasis	0.75 (Year)
Mean time of terminal stage	0.1 (Year)

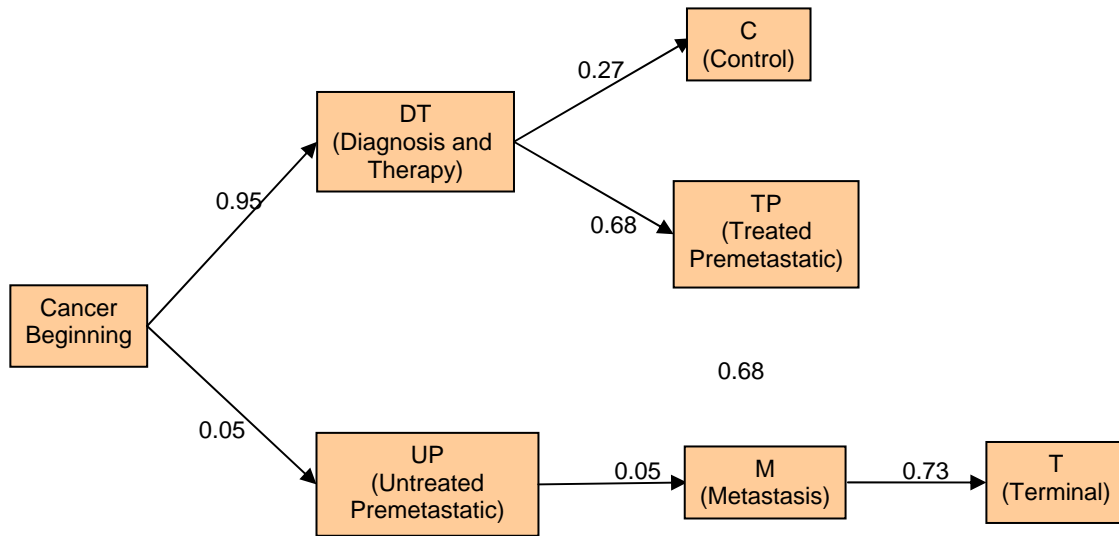
By using the rate of patients who were treated and cured, we determined the number of patients in each stage. We calculated the incidence/mortality ratio and compared the estimated incidence with the incidence in other cancer registries. With the help of designed models, the incidence of each disease in different age groups, the cure rate and mortality rate were calculated. In order to evaluate the burden of cancer, different stages of disease were assessed regarding the WHO guideline. (Fig 1)

By using the CanMod software and the number of patients, we calculated the average of each stage, disability and YLD of stages. YLL was estimated by the number of patients who had been died. Considering all above-mentioned parameters, we estimated the burden of cancer. We also calculated the waste years, disability in each age and sex group. We used all of the standard criteria according to GBD study.

**Results:**

The estimated incidence of CNS malignancies in Iranian population was 5.20 per 1000 individuals, mortality rate was 3.72 and the ratio of incidence to mortality was 1.40The total wasted years due to

**Figure 1**



early death and disability (DALYs) in Iranian Population due to CNS malignancies in 2003 was

450852, so the estimated wasted years per 1000 persons was 0.069. (Table 2)

**Table 2-** Wasted years due to early death of disability( DALY)s, wasted years due to early death (YLLs) and wasted years due to disability (YLDs) in Iranian population in 2003 due to CNS malignancies.

Indices	Male	Female	Total
YLLs Per 1000	0.72	0.60	0.66
YLDs Per 1000	0.04	0.03	0.03
DALYs Per 1000	0.75	0.62	0.69

**Table 3:** Wasted years due to early death of disability( DALY)s, wasted years due to early death (YLLs) and wasted years due to disability (YLDs) in Iranian population in 2003 by sex

Age	YLDs per			YLLs per 1000			DALYs per 1000		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-4	0.01	0.01	0.01	0.67	0.49	0.58	0.68	0.49	0.59
5-14	0.01	0.01	0.01	0.34	0.36	0.35	0.35	0.37	0.36
15-29	0.02	0.02	0.02	0.50	0.51	0.50	0.52	0.53	0.52
30-44	0.04	0.03	0.04	0.89	0.68	0.78	0.93	0.71	0.82
45-59	0.09	0.06	0.07	1.46	1.02	1.24	1.55	1.07	1.31
60-69	0.11	0.07	0.09	1.40	1.07	1.24	1.51	1.14	1.33
70-79	0.15	0.10	0.12	1.43	1.04	1.24	1.58	1.14	1.37
80+	0.42	0.25	0.33	2.06	1.35	1.70	2.48	1.59	2.03
Total	0.04	0.03	0.03	0.72	0.60	0.66	0.75	0.62	0.69

Table 3 shows that wasted years due to disability in every 1000 person (YLDs / 1000) in men ,women and both sexes are 0.040, 0.030 and 0.030, respectively. Wasted years due to early death in 1000 person (YLLs / 1000) were 0.72 in men, 0.600 in women and 0.66 in both sexes. Wasted years due to early death and disability in 1000 person (DALYS / 1000) in Iran were 0.75 in men, 0.62 in women and 0.69 in both sexes.

## Discussion

This study shows that the CNS malignancies are the third most common cancers wasted years due to early death or disability in Iran, after stomach cancer and Lymphoma. Wasted years due to early death or disability accounts for 0.69 in 1000 individuals. The incidence rate of these cancers was 5.20 and mortality rate was 3.72.

The great burden of CNS malignancies may have several explanations. CNS tumors are the second most common reason of death after CVA among neurologic diseases. Only 50% of patients with CNS malignancies are alive after one year. Primary CNS tumors are the cause of 20% of pediatric malignancies and about 25% of mortality due to malignancy in children. CNS malignancies account for a little percentage of neoplastic diseases but because of their higher incidence in lower age agroups they cause a high percentage of wasted years. For estimating DALY the 3 important factors should be evaluated. First, wasted time due to death in age subgroups. Second, Weight of disability in patients; and third, The value of age. Occurrence of the CNS malignancies in the young ages and the high incidence of morbidities such as hemiparesia , paraparesia, blindness and other disabling complications are the cause of high wasted times.

In this study, the comparison of DALY due to CNS malignancies among Iran, worldwide and eastern Mediterranean region revealed that the incidence is different in different geographic areas. The ratio is higher in Industrials countries than others. The highest incidence has been reported in Sweden with  $10 \times 10^{-5}$  and after that in U.S.A with  $8 \times 10^{-5}$ . In undeveloped countries such as Nigeria, the incidence is  $1 \times 10^{-5}$ . Our estimated incidence was about  $5.2 \times 10^{-5}$ , which is between the two mentioned marginal points.

Some of these differences are due to the quality of medical systems, technologic differences and

social factors, and some are due to environmental and racial differences. Table 3 shows that there is a peak in the incidence of YLL and DALY at age 4-5 years which is going to a gradual decrease until the age 15 years, and an increase thereafter. Some of these peak incidences are due to the high incidence of lethal CNS malignancies in the first years of life especially Medulloblastana, PNET and posterior fossa malignancies. There is a gradual increase in the incidence of Astrocytomas in the third and forth decades of life followed by Glioblastoma and Lymphoma. In the fourth, fifth and sixth decades, this is continued with metastatic brain masses in the last decades. Our findings show that DALY, YLL, and YLD are higher in the male patients Previous studies show that the primary brain tumors are more in male than in female sex (Odds ratio: 1.01-1.07). Regarding the high grade of DALY in the CNS, we need to decrease this level. Minimizing the risk factors such as radiation, infection, industrial materials, trauma, insecticides, chemical products and smoking as well as improving diet and economical status will reduce the incidence of burden of CNS malignancies. Among these, smoking and diet have a minimal effect on the CNS malignancies as in spite of GIS, GUT.

Noteworthy, the intervention is difficult because there are not some simple advises such as smoking cessation and changes in diet for prevention of these cancers. We don't know the perfect etiologies of the CNS malignancies, so we need many studies with powerful financial support, but we can say that one of the most important determinants is attention to the health of the environment which can be achieved through replacing the factories and industries from cities to other areas and stopping the entrance of chemical products such as chromium and vinylchloride to the environment.

Genetic and familial factors consist of only 5% of CNS malignancies, in some rare syndrome such as NF – 1 / NF -2 and NBCSS and Turcot's syndrome. In these cases genetic consultation and screening programs are useful. One of the important factors in DALYs of CNS is destroying effect of radiation on the brain cells. Radiation in the CNS can destroy tumoral cells, with neural cells and it can increase survival rate, but is associated with morbidities. Some new methods such as focused radiation (Gamma Knife) can

exclude some of these morbidities, but it has also some disadvantages such as excluding detection of risk factors.

### Suggestions:

- 1) Design a cancer registry system, review of this system, and prevention of parallel working and allocation of enough financial support.
- 2) Designing further studies which can evaluate the surveillance system and cost effective analysis and also evaluate these indices in different age subgroups of Iranian population.
- 3) Designing further studies which can detect etiologic factors and preventive methods in Iranian population.
- 4) If we find significant difference in studies we have to design new screening methods for our population

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