Cost-Effectiveness of Temozolamide for Treatment of Glioblastoma Multiforme in India

Health Technology Assessment in India (HTAIn)
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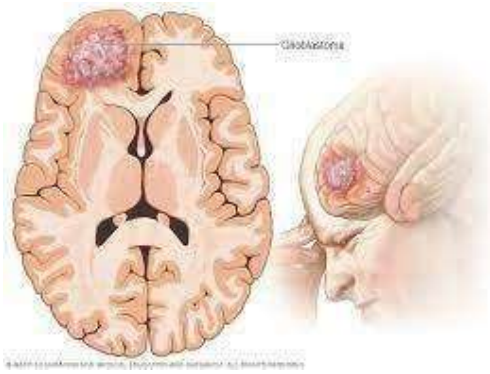
Policy Brief

Executive Summary:

Glioblastoma multiforme (GBM) is the most common and the most aggressive brain tumor in adults (1). The standard of care for patients with newly diagnosed GBM includes maximum possible safe resection followed by adjuvant radiotherapy (2).
Temozolamide has shown positive outcomes in patients with newly diagnosed GBM (3) , however it is an expensive in drug in resource-limited countries like India. Therefore, its assessment for value for money is important.
We undertook this study to estimate the incremental cost per QALY gained in patients with newly diagnosed GBM in India, who received temozolamide in addition to adjuvant radiotherapy as compared with radiotherapy alone. Incremental cost per QALY gained with a given treatment option was compared against the next best alternative, and assessed for cost-effectiveness.



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The use of temozolamide incurs an incremental cost of ₹212,020 INR (138,127-401,466) per QALY gained, which has a 4.7% probability to be cost-effective at 1-time per capita Gross Domestic Product (GDP) threshold. In case the current price of temozolamide could be decreased by 90%, the probability of its use for GBM being cost-effective increases to 80%.

Policy Recommendations:

- At current prices, temozolamide is not cost-effective for treatment of patients with GBM in India.
- The use of temozolamide incurs an incremental cost of Indian national rupee 212,020 (138,127-401,466) per QALY gained.
- Temozolamide can only be cost-effective with a 90% reduction in drug price.

Background and Gap in Literature:

The addition of concomitant temozolamide to radiation followed by 6 months of maintenance temozolamide in patients with newly diagnosed GBM has been reported to improve the median overall survival (OS) by 2.5 months and the progression-free survival (PFS) by 1.9 months (3). Temozolamide has been shown to be cost-effective in developed countries like United States, the United Kingdom, Mexico, and Canada, but at the same time, the drug has been shown to be cost-ineffective in China. This is due to the fact that the high-income countries have a higher willingness to pay (WTP) threshold as compared to the developing countries. There have been several methodological limitations in the above cost-effectiveness studies. For example, Lamers et al (4) and Uyl-de Groot et al (5) reported outcomes in terms of life years (LYs) and not quality-adjusted LYs (QALYs) gained. In the study by Wu et al, (6) discounted rates were not applied in view of short survival associated with patients with GBM. Several cost-effectiveness analyses (6) have estimated outcomes up to what has been reported in trials—either until 2 years or 5 years of onset of disease. Life-term consequences have not been assessed robustly. Therefore, we aimed to assess the cost-effectiveness of temozolamide in the context of low- and middle-income country such as India.

Aims and Objective

This policy brief addressed the policy question of the cost-effectiveness of concomitant temozolamide with radiation and maintenance temozolamide for 6 months of treatment for GBM in India. The study was conducted by the HTAIn Resource center at PGIMER, Chandigarh.

Intervention and control arms:

1. Temozolamide at 75 mg/m2 once daily concomitant with radiation for a period of 6 weeks, followed by 4-weekly six cycles of maintenance temozolamide
2. Adjuvant radiation without concomitant or maintenance temozolamide.

Methods and Approach

We undertook this cost-effectiveness analysis (CEA) using a societal perspective, which accounted for both health system and patients' costs. We compared the costs and consequences associated with patients who received temozolamide in addition to adjuvant radiotherapy as compared to radiotherapy alone. Our methodological principles are consistent with the Indian reference case for conducting economic evaluations used by the agency for Health Technology Assessment in India (HTAIn).

The analysis was performed under the following components:

1. A Markov model with three health states—PFS, progressive disease (PD), and death—was developed. Patients with newly diagnosed GBM entered the model at the age of 50 years.
2. A cycle length of 1 month was considered appropriate based on the maintenance treatment cycles. Lifetime horizon was considered in the model.
3. Market prices were obtained to estimate the per cycle cost of temozolamide drug (7).
4. Cost of treatment and management of complications were estimated using the data from the National Health System Cost Database and Indian studies (8,9).
5. The data of OS and PFS as reported in the European Organisation for Research and Treatment of Cancer (EORTC)-NCIC trial at a 5-year follow-up were used for our analysis (10).
6. Utility values for the GBM health states reported by Garside et al (11) were used in our analysis.

Results:

- The incremental cost per QALY gained was ₹212,020 INR (138,347-401,466) ($2,963; 95% CI, 1,927 to 5,602).
- There is a 4.7% probability for temozolamide to be cost-effective at the willingness-to-pay threshold equally to the per capita GDP (Fig 1).
- However, decreasing the price of temozolamide by 90% increases the probability of temozolamide to be cost-effective to 80% (Fig 2).

Parameters	Temozolamide	No Temozolamide
Lifetime costs per patients (in ₹)	181,235 (156,274-210,458)	105,502 (88,762-122,978)
LYs	1.85 (1.67-2.08)	1.26 (1.15-1.42)
QALYs	1.45 (1.21-1.73)	1.12 (0.92-1.33)
Incremental cost per QALY gained (in ₹)	212,020 (138,127-401,466)	-

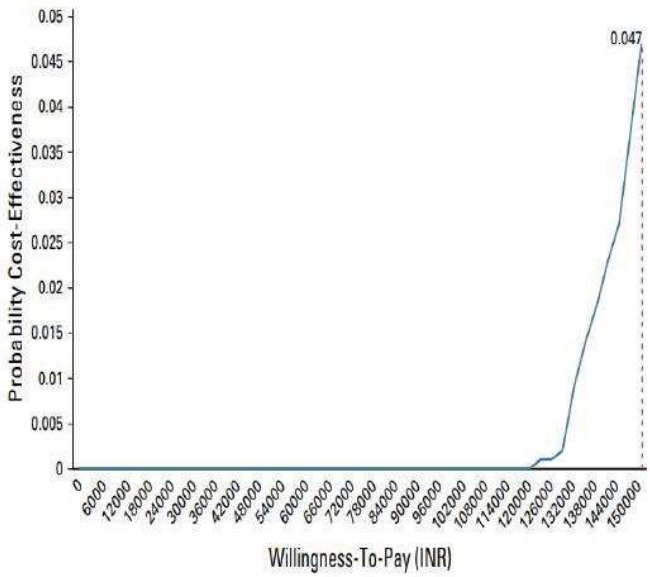

Figure 1: Probability of temozolamide use being cost-effective at varying willingness-to-pay thresholds.

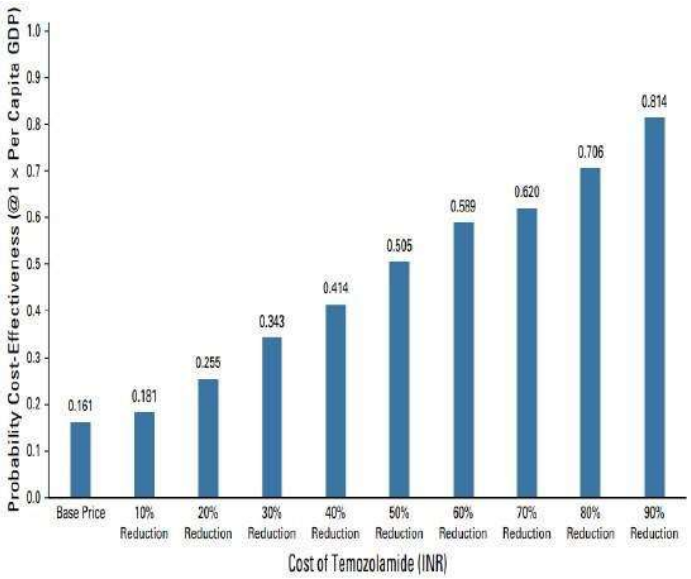

Figure 2: Price threshold analysis: Temozolamide

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