EPH202

Quantifying the Economic Burden of Undiagnosed Sleep Apnea in India's Productive Population: A Health Economic Modelling Approach

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INTRODUCTION

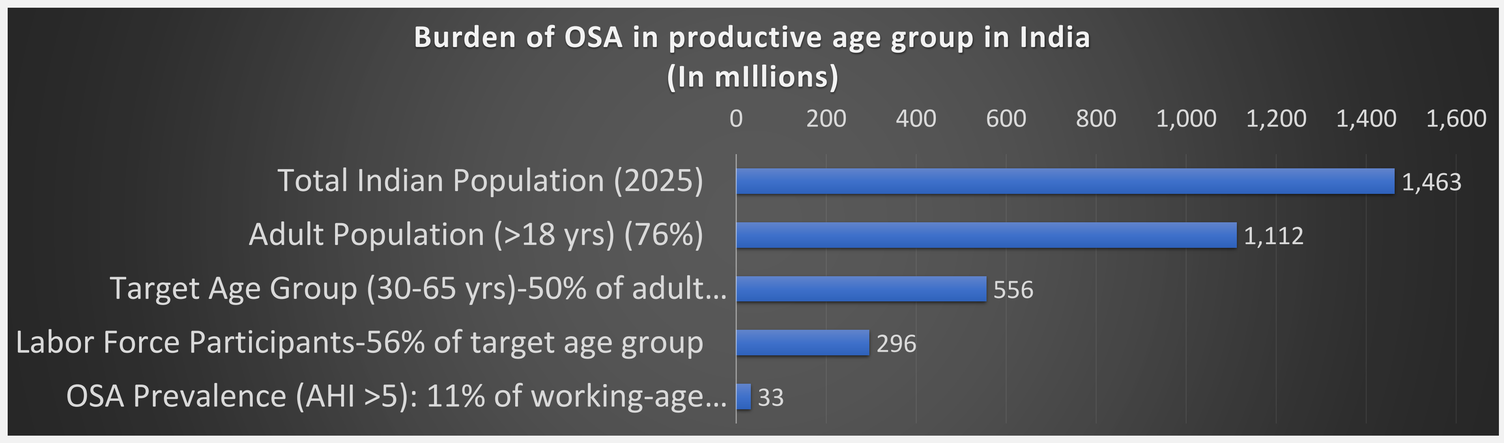
- Obstructive Sleep Apnea (OSA) is a highly prevalent but underdiagnosed condition among India's productive population, leading to lost output, higher accident risk, and avoidable healthcare costs (Suri et al., 2023; Kirk et al., 2023).
- In India, over 85% of working-age adults with OSA remain undiagnosed, driving costs from absenteeism, early retirement, hospitalizations, and reduced GDP contribution (Goyal et al., 2025; Punjabi et al., 2020).
- This study models the economic burden of undiagnosed OSA on the Indian labor force and evaluates the ROI of early diagnosis, to support efficient payer and policy action.

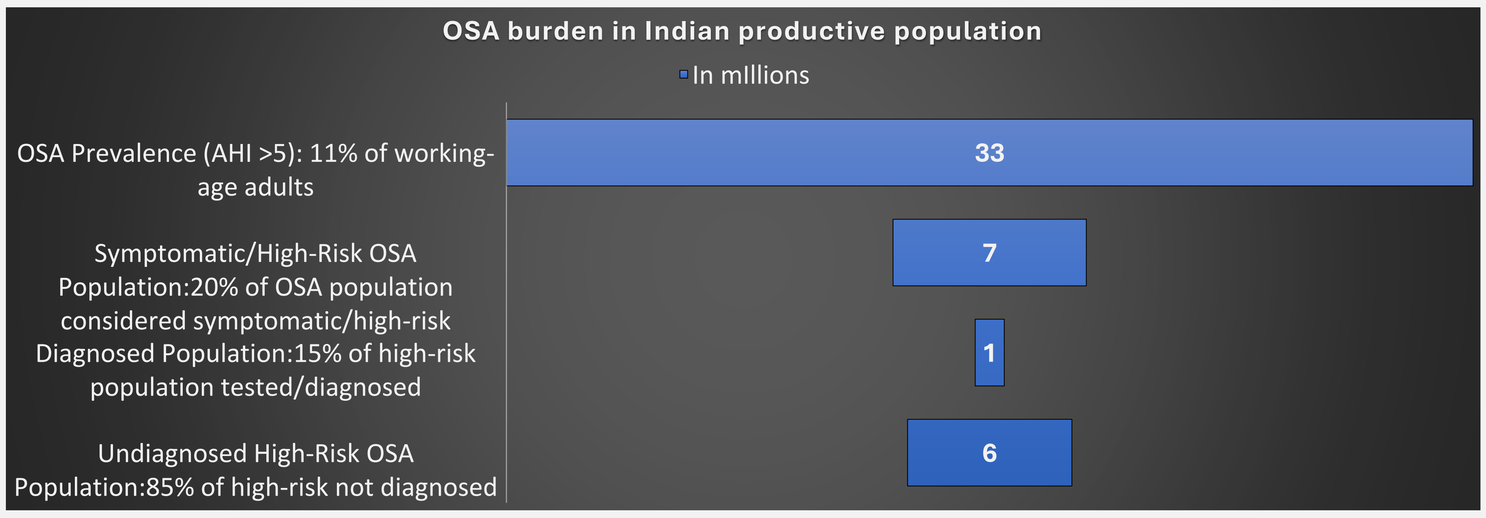
METHODS

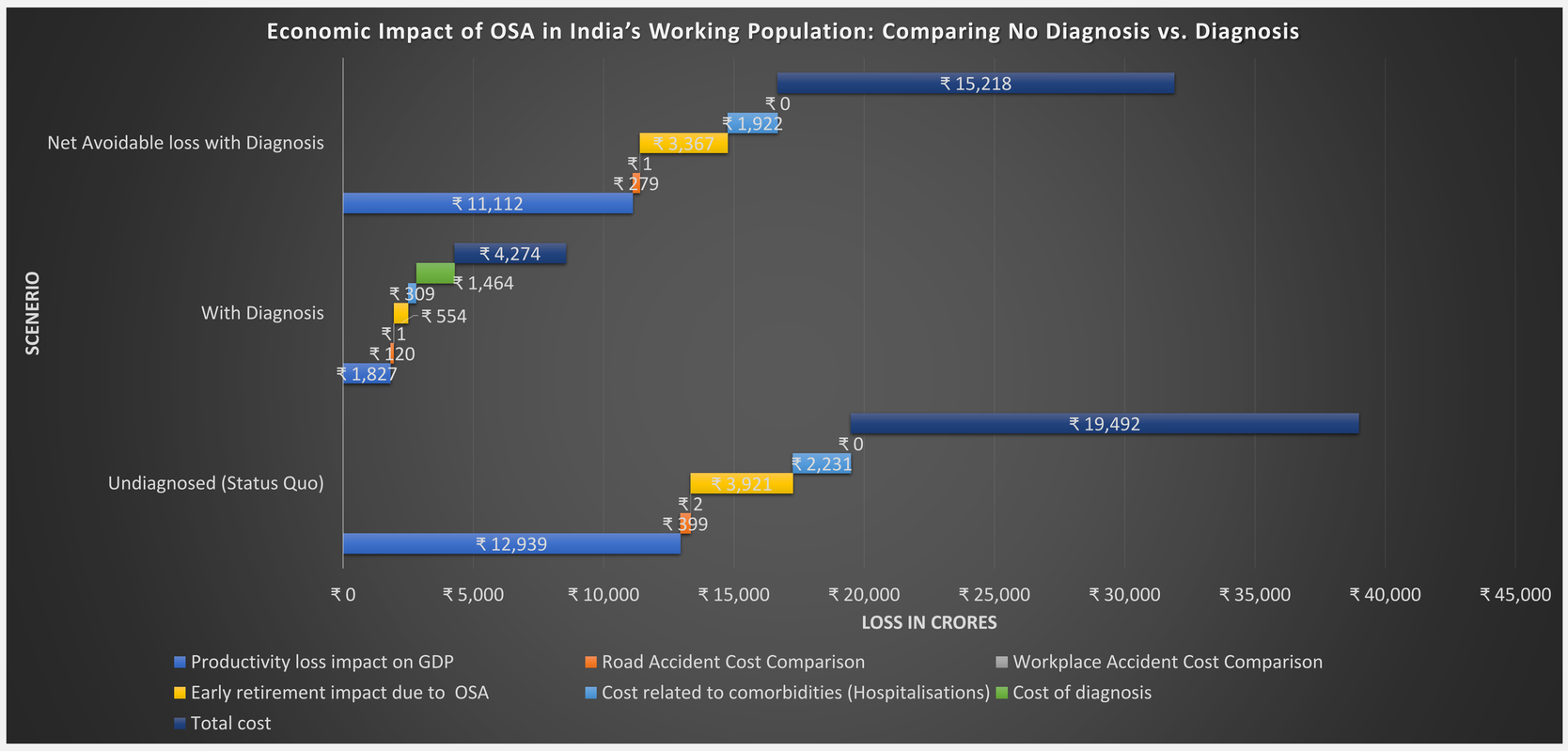
- Built an Excel-based model to estimate the economic burden of OSA among India's working-age population (30–65 years).
- Compared diagnosed vs. undiagnosed scenarios across 5 domains: productivity loss, road accidents, workplace injuries, early retirement, and hospitalizations.
- Incorporated age-specific prevalence, workforce participation, and GDP-linked productivity loss using national data.
- Applied real-world treatment effects (e.g., 17.3% improvement in productivity, 70% accident risk reduction) to diagnosed group
- All costs modeled in 2025 INR from a societal perspective

Parameter	Value / Assumption	Source
Population (India, 2025)	1.46 billion	Worldometers (2025)
Adults (≥18 years)	76% of total population	GoI (2023)
Productive age group (30–65 yrs)	50% of adults ≈ 555.9 million	WHO India Demographics (2023)
Labor Force Participation Rate	56%	PIB (2024)
Adjusted employment (after 5% unemployment)	295.76 million	Forbes India (2024)
OSA prevalence (adults)	11%	Suri et al. (2023)
Diagnosed share	15%	Assumption
Severity distribution	Mild: 45%, Moderate: 31%, Severe: 10%	BLESS Cohort Study (2024)
Diagnosis cost (per patient)	₹ 15,000	Somnos Sleep Clinic (2024)
GDP per worker	₹ 10,02,774	PIB (2023–24)
Cost per road accident	₹ 3,60,000	Times of India (2020)
Cost per workplace injury	₹ 23,500	IJOEH (2024)
Hospitalization cost (severe OSA)	₹ 2,84,482	Private Hospital Median Data
Hospitalization cost (moderate OSA)	₹56,896 (20% of severe)	Derived from above

RESULTS







Per Capita, System-Level, and Macroeconomic Benefits Estimated from Base Case Scenario

Economic metrics	Netsavings	Interpretation
per capita cost savings	₹ 23,388	Diagnosing one person with OSA from the high-risk group saves the economy approximately netsavings annually
Clinical ROI (Treated patients assuming 50% adherence)	₹ 3,11,839	Every high-risk individual who is successfully diagnosed and treated for OSA yields return to the system through avoided costs and productivity recovery.
Per Worker Productivity Gain	₹ 17,078	Each OSA diagnosis potentially addsin productivity per working individual.
Health System ROI Per Diagnosed Person:	₹ 19,693	This shows that for every person diagnosed, the system saves in hospital/comorbidity-related costs.
Economic Burden as % of GDP	0.07%	Percentage of national GDP lost annually due to undiagnosed OSA.
GDP savings vs baseline (%)	0.05%	Portion of GDP recovered annually by diagnosing and treating OSA in high-risk groups (e.g., 15% coverage level). Reflects the economic gain from reduced losses.
Total Addressable Economic Opportunity (crores)	₹ 15,218	Total potential savings if all OSA cases in India are diagnosed.
Break-Even Diagnosis Rate	6,25,969	Minimum number of diagnoses required to offset total diagnosis cost.
Accidents Averted per 1,000 Diagnosed	7.48	Number of accidents prevented for every 1,000 people diagnosed.
Accidents Averted Annualy	7,303	
Cost saved annualy from Accidents (Crores)	₹ 280	

CONCLUSION

Undiagnosed OSA poses a substantial yet preventable economic burden on India's productive population. Targeted diagnosis of high-risk individuals can yield strong economic returns and reduce GDP losses. Policymakers should integrate OSA screening into national and employer health strategies to optimize productivity, safety, and fiscal outcomes

ACKNOWLEDGEMENTS: This study was funded by ResMed, and all authors are employees of ResMed