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Effect of Meat Consumption on Prevalence of Alzheimer's Disease

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Abstract: Meat has become a prominent portion in nutritional diet across continents. Just this year world has consumed more than 13 crore tons of meat, according to The World Counts and this number is increasing with every second passing by. The major meat consuming countries are United States of America(USA), European Region, Latin America and Australia. Same countries top the chart when it comes to Alzheimer's disease (AD) prevalence. AD is a neuro-degenerative condition that is caused by accumulation of β amyloid plaques and neurofibrillary tangles leading to progressive mental degradation causing dementia as its major symptom. Meat on cooking forms Heterocyclic Amines (HCA) that after consumption can generate Reactive Oxygen Species (ROS) that are known to cause oxidative stress and hyper-phosphorylation of tau proteins accelerating this neuro-degenerative condition.

Keywords: Meat consumption, Reactive Oxygen Species, Alzheimer's Disease, Heterocyclic Amines

I. INTRODUCTION

Meat has become a prominent portion of the meal. According to NGC, meat consumption of an average non vegetarian increased from 7% in 1961 to 9% in 2011 i.e. 93 grams in 1961 to 173 grams in 2011. While meat consumption increased from 30.7 kilograms per capita to 41.3 kilograms per capita and will tend to rise to 45.3% by 2030, statistically explains FAO. The major meat consuming countries are United States of America, Europe, Latin America and Australia.

The same countries top the charts when it comes to prevalence of Alzheimer's disease (AD). AD is a neuro-degenerative condition that is caused by accumulation of β amyloid plaques and neurofibrillary tangles, leading to progressive mental deterioration causing dementia as its major symptom. Consumption of meat can be a major factor inducing oxidative stress leading to AD.

Keywords Meat consumption, Reactive Oxygen Species, Alzheimer's Disease, Heterocyclic Amines

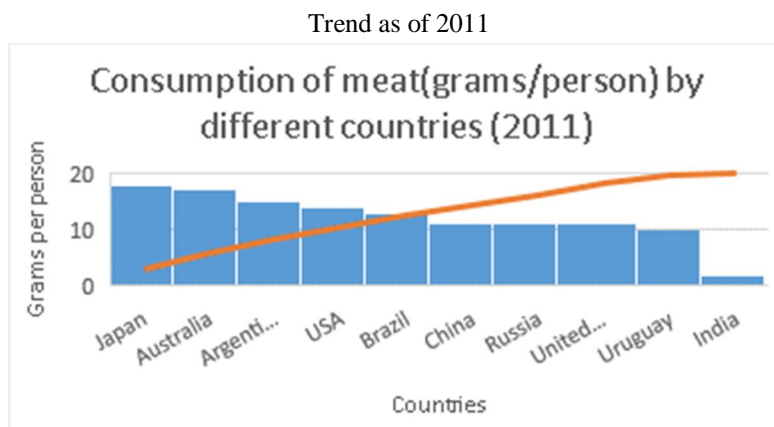
II. BACKGROUND

According to The World Counts 130,873,729 tons of meat is already consumed globally this year and this number is increasing with every second passing by. It is observed that the countries with highest meat consumption rate also have high prevalence rate of Alzheimer's disease(AD).

III. METHODOLOGIES

Global Statistics of meat consumption was studied taking, prevalence of AD into consideration.

A. Meat Consumption

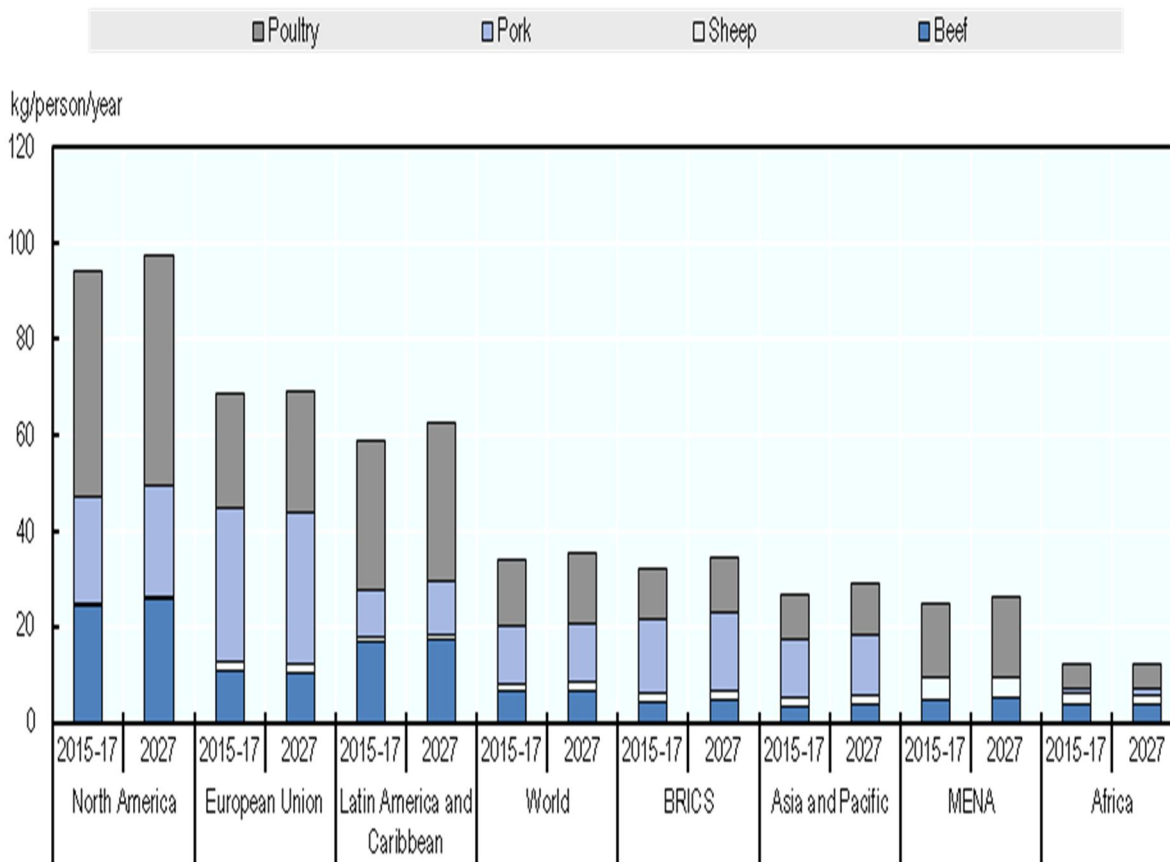


©NGC, 2011 data

According to FAO meat consumption stats 2011, Japan was leading followed by Australia, Argentina and USA.

Trend as of 2018

According to FAO stats (2018) meat consumption is highest in North America followed by European Union, Latin America and Asia. [5]



©Source: OECD/FAO (2018), “OECD-FAO Agricultural Outlook”

B. Reactive Oxygen Species And Oxidative Stress

Meat contains fat, protein and iron, all of which takes part in oxidation processes. Post oxidation it generates a hydroxyl radical and a hydroperoxyl ion. These free radicals are often termed as Reactive Oxygen Species (ROS) that are highly unstable as they initiate chain of oxidative reactions. [1] Cooking of meat (frying, barbeque, baking) can also generate Heterocyclic amines (HCA) that can also lead to production of ROS resulting in oxidative stress. [2] This oxidative stress can damage brain membrane phospholipids which can be significant for AD as it can affect brain neurons and glial function causing neuro-degeneration. [3] Hence, formation of β amyloid plaques and neurofibrillary tangles. These β amyloid plaque mediated oxidative stress causes hyper-phosphorylation of tau proteins leading to AD. [4].

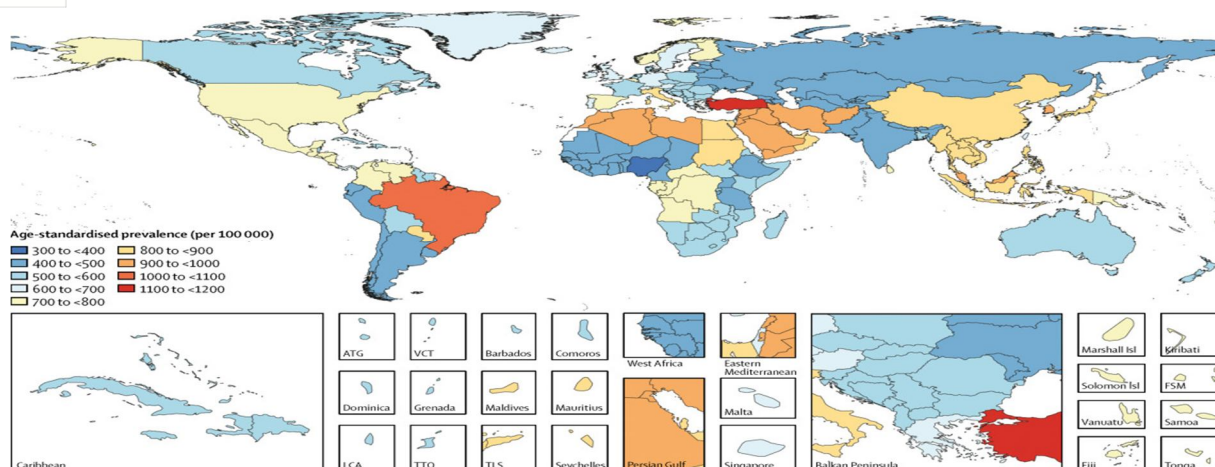
C. Alzheimer's Disease (AD)

AD characterized by accumulation of β amyloid and intracellular deposition of neurofibrillary tangles of hyper-phosphorylated tau protein. [6] Leading to progressive mental deterioration causing dementia as its major symptom.

D. AD Prevalence around the world

Estimated 46.8 million people worldwide lived with dementia in 2015 and this number is believed to be close to 50 million people in 2017. This number will almost double every 20 years, reaching 75 million in 2030 and 131.5 million in 2050, says Alzheimer's disease International. [7]

The global number of people living with dementia more than doubled from 1990 to 2016. [8]

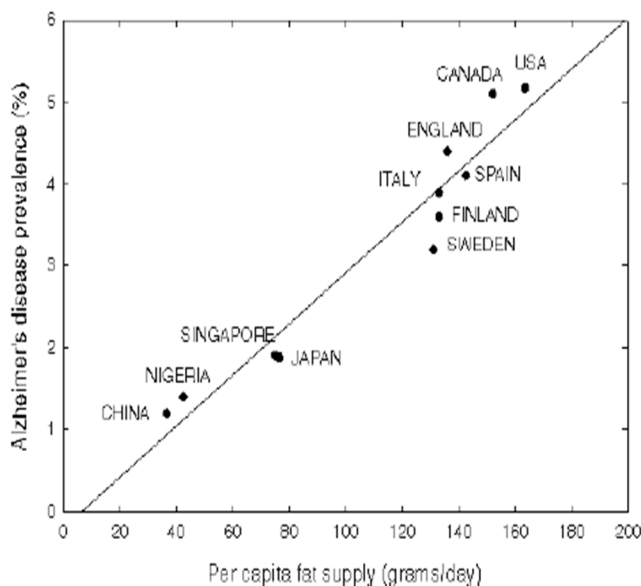


©Global Burden of Disease Study 2016 [8]

E. Alzheimer's Prevalence In Major Meat Consuming Countries

- 1) **United States:** Alzheimer's disease affects an estimated 5.7 million Americans. It is the sixth leading cause of death among all adults and the fifth leading cause for those aged 65 or older. [9]
- 2) **Europe:** Prevalence of AD in Europe was estimated to be 5.05% (men-3.31% and female- 7.13%) [10]
- 3) **Latin America and Caribbean:** Alzheimer's affect more than 3.4 million people in the region of Latin America and Caribbean. [11]
- 4) **India:** Rural India validates for lowest rates of Alzheimer's in the world because their diet has more of grains and beans than meat. [12]

AD Trends in different countries vs fat supply
Alzheimer's disease prevalence (65+) vs. fat supply



[13] Grant, William. (2014). Grant Alzheimer 1997.

IV. CONCLUSION

Americans, Europeans and Latin Americans consume meat as a major portion in their diet while most of Asians (esp. Indians) have more grains and beans than meat in their diet thus accounting for low AD prevalence while US, Europe and Latin America's- 5.7 million, 5.05% and 3.4 million populations respectively suffer from some sort of dementia which accounts for one of the highest prevalence of AD in world concluding that consumption of meat can cause oxidative stress that can lead to Alzheimer's disease.

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