



The Correlation between Breakfast Consumption and the Probability of Developing Alzheimer's Disease in Bangkok Population

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ABSTRACT: Alzheimer's disease, which is the most common form of dementia, is known to be widely prevalent in the worldwide population, including Thailand. The incidence of this illness in Thailand is increasing rapidly and is expected to reach a million by 2030 (Doungkaew & Taneepanichskul, 2014). We are concerned that this rise is caused by the trend during these modern days, where skipping breakfast is becoming more popular due to time constraints. Hence, we conducted a survey research by providing questionnaires to 180 individuals of all ages across Bangkok, asking for their frequency in consuming breakfast per week and their likelihood in having Alzheimer's. This was done through an online platform, Google Form. To test whether the two aforementioned variables are correlated with one another, Statistical Product and Service Solution (SPSS) program version 29 was used for data analysis. One-Way ANOVA (F-test) was used to determine the significance between age group and the risk of getting Alzheimer's. The result showed that age is a significant factor which can promote the illness. Age 41 and above tend to have a stronger probability in developing the disease because of the easier spread of a protein called tau-protein, which is involved in causing Alzheimer's disease (Wegmann et al., 2019). Pearson's correlation test has shown that there is a negative correlation between the frequency of breakfast consumption and the risk of developing Alzheimer's disease. This is likely due to low blood sugar levels and lack of beneficial nutrients contained in breakfast. In the future, we hope that this research could be beneficial to other people by raising awareness on this particular topic regarding the importance of frequency of breakfast consumption in reducing the risk of developing Alzheimer's disease.

KEYWORDS: Age, Alzheimer's disease, Breakfast, Breakfast consumption, Dementia

INTRODUCTION

Memory, reasoning, and behavior are all impacted by Alzheimer's disease, a form of dementia. Eventually, symptoms become bothersome enough to interfere with day-to-day activities. Initially, the disease destroys neurons and their connections in parts of the brain, such as the entorhinal cortex and hippocampus, which are involved in memory. Later on, it will affect areas in the cerebral cortex that are responsible for language, reasoning, and social behavior. Over time, other areas of the brain will be damaged and the person will lose their ability to live and function on their own. In the worst-case scenario, the disease is fatal (National Institute on Aging, 2017). It is not yet fully discovered what exactly causes Alzheimer's, but according to past statistics, it is known that age is the main risk factor. Alzheimer's mainly occurs in people who are 65 years or older (Guerreiro & Bras, 2015). The incidence of dementia doubles with every 6.3 year increase in age, from 3.9 per 1000 person-years at age 60-64 to 104.8 per 1000 person-years at age above 90 (Prince et al., 2015). Many researchers also believe that familial inheritance may play a big role in developing Alzheimer's disease as well (A. Armstrong, 2019). Each year, there are more than 10 million new instances of dementia worldwide. This means that one new case is happening every 3.2 seconds (Prince et al., 2015). The incidence in Thailand is also increasing significantly. It is estimated that the number of Alzheimer's patients will increase up to 1 million patients by 2030 from only approximately 600,000 in 2015 (Doungkaew & Taneepanichskul, 2014).

The pattern in breakfast consumption displays an opposite trend over time. Initially, breakfast was considered the most important meal of the day and was widely consumed by a large proportion of the population. However, due to the modernization of lifestyles and increased time pressures, there has been a noticeable shift in breakfast habits. Nowadays, people face busier schedules and rush to work or school. Some individuals may skip breakfast or opt for quick and convenient options on the go like sandwiches, protein shake and yogurt (Sproesser et al., 2019). This trend is particularly prevalent among urban dwellers and those with more demanding



lifestyles than those in rural areas (Ba et al., 2013). Nevertheless, it is essential to remember that breakfast remains a significant meal for many Thai people.

According to the evidence in the paper reported by Chikama H. in 2022, skipping breakfast could potentially cause an increase in the risk of developing dementia (Chikama et al., 2022). Furthermore, from our own and our peers' experiences, a lack of breakfast on certain days leads to slower brain functions on that day as well. We are concerned that this could potentially be a sign of Alzheimer's disease. Since this disease can affect people's daily life and even people around them. Additionally, it may be lethal at times. Hence, it is intriguing for us and crucial to discover whether lack of breakfast consumption can be another cause of Alzheimer's. If so, does this apply to the entire Thai population in 2023. This research is conducted to find the link between breakfast consumption and the likelihood of developing signs of Alzheimer's disease.

METHODS

A cross-sectional survey was conducted in the Bangkok population to assess the correlation between breakfast consumption and the probability of developing Alzheimer's disease. The survey research contains 22 questions which are categorized into 2 sections: 1) general information and 2) Alzheimer's disease assessment. True/false questions are being used in answering the second section of the survey. The questions were inspired from the Memory quiz created by "Alzheimer's research & prevention foundation", which is reproduced from the book "Brain Longevity" (Dharma Singh Khalsa & Stauth, 1999). The questions in this questionnaire were assessed by three specialists to obtain an Item-Objective Congruence (IOC) index of 1. Cronbach's Alpha was used to determine the internal reliability of the questions, where we obtained 0.721 (C.Howard, 2016). The survey was conducted using online questionnaires (Google form) given to people in Thailand during June 2023 through social media platforms, such as Line, Instagram and Facebook. The total respondents were 210, of whom 30 were excluded from the analysis due to the pilot testing. For statistical analysis, we used Statistical Product and Service Solutions (SPSS) version 29. One-way ANOVA (F-test), Independent sample t-tests were performed to test the mean difference between frequency of breakfast consumption and the probability of developing Alzheimer's disease.

INSTRUMENTS

General Information

1. Age
2. Gender
3. Congenital disease
4. Please fill in your congenital disease.
5. How often do you eat breakfast per week?
6. Which type of food do you most likely to consume for breakfast?
7. Do you normally eat breakfast alone or with others?
8. Do you normally prepare breakfast by yourself?

Alzheimer's disease

1. From time to time, I forget what day of the week it is.
2. Sometimes when I'm looking for something, I forget what it is that I'm looking for.
3. My friends and family seem to think I'm more forgetful now than I used to be.
4. Sometimes I forget the names of my friends.
5. It's hard for me to add two-digit numbers without writing them down.
6. I frequently miss appointments because I forget them.
7. I rarely feel energetic.
8. Small problems upset me more than they once did.
9. It's hard for me to concentrate for even an hour.
10. I often misplace my things, and when I find them, I often can't remember putting them there.
11. I frequently repeat myself.
12. Sometimes I get lost, even when I'm driving somewhere I've been before.



- 13. Sometimes I forget the point I'm trying to make.
- 14. It takes longer for me to learn things than it used to.

RESULTS AND DISCUSSION

Table 1: General Information

General information	Frequency	Valid Percent
Gender		
Female	114	63.3
Male	65	36.1
Non-binary	1	0.6
Age		
Under 15	8	4.4
16-18	30	16.7
19-24	6	3.3
25-30	7	3.9
31-40	14	7.8
41-50	55	30.6
51-60	38	21.1
61 and above	22	12.2
Congenital Disease		
Do not have	126	70
Have	54	30
Frequency of breakfast consumption per week		
Everyday	103	57.2
5 to 6 Days	23	12.8
3 to 4 Days	31	17.2
1 to 2 Days	13	7.2
Never	10	5.6
Type of foods normally consumed		
Cereal, Milk, Bread	21	11.7
Rice or Porridge, Soup, Eggs	103	57.2



Cooked meat or Meat alternatives	17	9.4
Salad, Fruits	2	1.1
Protein Shake, Yoghurt	13	7.2
Other	24	13.3
Number of individuals you eat breakfast with		
Zero	114	63.3
More than or equal to one	66	36.7
Preparation of breakfast		
By yourself	61	33.9
By others	119	66.1

Table 1 shows the personal details of the participants collected. Most of the participants were 114 females (63.3%), followed by 65 males (36.1%), and some participants preferred being non-binary (0.6%). Most of the participants were 41-50 years old 55 people (30.6%), followed by 51-60 years old 38 people (21.1%), 16-18 years old 30 people (16.7%), and others. Many of them do not contain any congenital diseases 126 people (70%), whereas a small portion of people contain congenital diseases 54 people (30%). Majority of the sample population eat breakfast every day (57.2%), 3-4 days (17.2%), and 5-6 days per week (12.8%) respectively. Most of the participants consumed rice or porridge, soup, and eggs :103 people (57.2%), followed by other types of food: 24 people (13.3%), and then cereal, milk, and bread: 21 people (11.7%).

Table 2: Descriptive Statistics (Mean and Standard Deviation)

	N	Mean	Std. Deviation
Probability of developing Alzheimer’s Disease	180	1.71	0.22
Frequency of breakfast consumption	180	1.91	1.239

Table 2 displays the mean score and the standard deviation of the probability of developing Alzheimer’s disease. The minimum score is 1, while the maximum is 2, where 1 is a very high chance of developing Alzheimer’s and 2 is a very low chance of developing Alzheimer’s. The probability variable’s mean is 1.71, while the standard deviation is 0.2233. This represents a low chance of developing Alzheimer’s in the sample population we have collected. The mean score and the standard deviation of the frequency of breakfast consumption is also shown in Table 2. The mean is at 1.91 where 1 is seven days per week and 5 is zero days per week. This indicates that most of our sample population often eat breakfast nearly everyday. The standard deviation is at 1.239.

Table 3: One-Way Anova Test; Age and the probability of developing Alzheimer’s disease.

	SS	df	MS	F	P-value
Between groups	2.56	7	0.365	9.864	<0.001
Within groups	6.37	172	0.037		
Total	8.93	179			



According to Table 3, there is a significant effect of age. The result from one-way ANOVA obtained a p-value of <math><0.001</math>, which this value is less than 0.05, as a consequence, there is a correlation between age and the probability of developing Alzheimer’s disease.

Table 4: The Pearson’s correlation coefficient between frequency of breakfast consumption and the probability of developing Alzheimer’s disease.

		Frequency of breakfast consumption	Probability of developing Alzheimer’s disease
Frequency of breakfast consumption	Pearson Correlation	1	-0.163*
	Sig. (2-tailed)		0.29
	N	180	180

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4 indicates Pearson’s correlation coefficient between the frequency of breakfast consumption per week and probability of developing Alzheimer’s disease. The results showed that the two factors have a significant correlation (correlation coefficient, $r = -0.163^*$), supporting our hypothesis that there is a negative correlation between frequency of breakfast consumption and the probability of developing Alzheimer’s disease.

The likelihood of getting Alzheimer’s disease and the frequency with which breakfast is eaten have, as expected, a negative correlation (Table 4). The rationale behind this is because bodily processes and overall hormonal health, such as progesterone, are impacted by breakfast (Braswell, 2022). Skipping breakfast can cause low blood sugar levels to be sent to the brain. Dementia or memory loss will thereafter develop as a result of brain cells gradually ceasing to function. Low blood sugars can damage the hippocampus, which is the memory center of the brain (Budson, 2021). Furthermore, the lack of breakfast can also imply that egg yolks, fish, or milk, which are the common components of Thai breakfast, are taken less too. These ingredients contain omega-3 fatty acids, which aid learning, memory, and cognitive well-being, and are known to reduce the risk of developing Alzheimer’s disease as well (Dighriri et al., 2022). Therefore, it is sensible that less consumption of these materials can increase the chance of developing Alzheimer’s disease.

Another obvious factor that is shown to be significant in promoting Alzheimer’s disease is age. In our result, we discovered that all ages from 41 and above have a higher chance of developing this disease (Table 3). This is due to the fact that certain molecules involved in the disease, called tau-proteins, can spread more easily and aggregate in the aging brain. From a research report by Wegmann in 2019, age will predisposes the brain tau misfolding and supports tau pathology’s propagation (Wegmann et al., 2019). Experiment from Wegmann in 2019 has also shown that as human tau is virally expressed in entorhinal cortex (EC) neurons of young and old mice and monitored the cell-to-cell tau protein spread by the process of immunolabeling, old mice displayed more spreading in the hippocampus and adjacent cortical areas (Wegmann et al., 2019).

CONCLUSION

We asked a group of volunteers in every age group in Thailand to answer the questionnaire about the correlation between breakfast consumption and the probability of developing Alzheimer’s disease in 180 Thai participants. The variables used in testing were age, frequency of breakfast consumption, and Alzheimer’s disease. We hypothesized that the frequency of breakfast consumption would correlate with the probability of developing Alzheimer’s disease.

The correlation coefficient was used to determine the hypothesis and the data analysis. Our result showed that there is a significant negative correlation between the frequency of breakfast consumption and the probability of developing Alzheimer’s disease. This indicates that the correlation is going in the opposite direction and can be concluded as the higher the frequency of breakfast consumption per week, the lower the probability of developing Alzheimer’s disease. In the future we would like to improve our



study by investigating in a larger scale of the sample population. We hope that this study could raise awareness in the topic regarding the importance of breakfast consumption in reducing the risk of having Alzheimer's disease.

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