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Review of phosphatidylserines health benefits in Parkinson's disease and students survey

LaNisha Potts, Alvina Okafor, Ayona Shelton and Bisrat Hailemeskel *

Clinical & Administrative Pharmacy Sciences, College of Pharmacy, Howard University, Washington, USA.

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Abstract

The goal of this study is two folds: to conduct a literature review of the beneficial use of phosphatidylserine in Parkinson's Disease (PD) and to determine the knowledge base and opinion of pharmacy students. The literature search that was conducted revealed there are only very few clinical studies found that show the beneficial effect of phosphatidylserine in PD. The students' survey conducted was among 42 first-year professional pharmacy students. The goal was to gain insight into if they had knowledge of the supplement phosphatidylserine in PD. The survey data was analyzed using SPSS software. Results show that the participants have limited overall knowledge of the topic. The results from the opinion questions also varied highly among the participants. Demographic factors of age, educational level, and work experiences affected the outcome significantly. For example, the higher the age, education level, and number of years worked the more likely the participant believed phosphatidylserine would help with the treatment of PD. A few studies have shown the use of supplements is beneficial for cognitive disorders; however, none are showing the knowledge status of this usage amongst healthcare professionals. Based on studies reviewed, phosphatidylserine may be beneficial in slowing the progression of PD. That may be one of the reasons for the students' limited knowledge shown in this study.

Keywords: Phosphatidylserine; Parkinson's Disease; Pharmacy; Students; Survey Introduction

1. Introduction

Parkinson's disease (PD) is a progressive neurological disorder that also affects body movements. This disease is not curable, however, there are medications available to help with the symptoms. Some of the symptoms include tremors, which are the most common, slowed movement also known as bradykinesia, and ridged muscles. Patients may also experience impaired posture and balance, loss of automatic movements, such as blinking or swinging their arms as they walk, or speech/writing changes.¹ PD is when the nerve cells in the brain that produce dopamine, a chemical messenger or neurotransmitter, break down or die. This decrease in dopamine causes all the symptoms of Parkinson's. The direct cause of Parkinson's is unknown, however, there are other factors that play a role in its development. Some factors that may contribute to the cause of Parkinson's are genetics, environmental triggers, the presence of Lewy bodies, or alpha-synuclein, which is a protein found in Lewy bodies [1].

Phosphatidylserine is a fatty substance produced in the body called phospholipids. It is found in the cells in the brain and plays a significant role in keeping your mind and memory sharp. This is taken to prevent memory loss and boost your brainpower. Studies have shown this supplement treats symptoms of Alzheimer's disease as well as Multiple sclerosis.² In the early studies, phosphatidylserine was made from the brain cells of cows, but with the concern of mad cow disease, scientists now use plant sources [2].

* Corresponding author: Bisrat Hailemeskel

Polyunsaturated fatty acids (PUFAs) are said to play a part in several processes of the nervous system. PUFAs increase synaptic development and functionality, have effects on synaptic integrity and plasticity, as well as contribute to neuroplasticity and enhancement of cognitive activity. [3] Phosphatidylserine mainly consists of DHA, which is one of the main classes of PUFAs.

An older publication was found that studied the interaction between dopamine and phospholipids in the substantia nigra of ten patients with PD and nine control subjects. The authors reported that there were no differences in the total content of phospholipids. [4] However, in Parkinsonian patients without previous levodopa treatment, the amount of sphingomyelin was increased, and the amount of phosphatidylethanolamine and phosphatidylcholine decreased. Levodopa treatment corrected these values to the level of controls, whereas the amount of phosphatidylserine was decreased. It is concluded that changes in phospholipids are reflections of the deficiency of dopamine and loss of dopaminergic neurons in the substantia nigra of patients with PD.

A randomized, double-blind, placebo-controlled trial was conducted to see if DHA fatty acids and vitamin E help improve the Unified PD rating stage (UPDRS). After the 12 weeks of intervention, the patients receiving the omega-3 fatty acids and vitamin E had a significant improvement in UPDRS ($p=0.02$). [5] According to James Parkinson, GI dysfunction may also contribute to developing PD. There are studies conducted that suggest probiotics may also help improve PD symptoms and occurrence. [6] Much of the public has no knowledge of what PD entails or that herbal supplements may be able to help treat the symptoms.

Phospholipid is a safer supplement that is available in drug stores. In a large, multicenter study of nearly 500 geriatric patients over a six-month period, the administration of phosphatidylserine together with other drugs that they were taking failed to show any pharmacological interactions, as no clinical signs and symptoms were evident. [7] The only contraindications with other drugs to date are blood thinners, such as Coumadin and heparin-phosphatidylserine may enhance their effects. [8]

Given the emergence of the safer soybean lecithin-derived phosphatidylserine and the evidence building to support its role in brain health, we can consider this phospholipid a dutiful soldier in the battle against age-related cognitive decline. Moreover, a younger population may take advantage of phosphatidylserine's ability to fight stress, improve mood and sharpen mental faculties, while resting assured that this vital brain nutrient also plays a hand in preventing the damage done by passing years.

The focus of this study was to determine if healthcare providers have knowledge of using phosphatidylserine to aid with PD as well as if they have knowledge of the supplement itself. Experimental and clinical studies showed Phosphatidylserine can influence cerebral changes that have contributed to the symptoms of senile dementia of Alzheimer's type. [9,10] We will determine how much this supplement is used by the public and if they are aware of the health benefits it proclaims.

There are limited clinical studies testing the efficacy and effectiveness of phosphatidylserine for the improvement of cognitive functions; however, we were not able to find published literature that showed whether patients and/or healthcare providers have the knowledge base to recommend this supplement. Therefore, one of the goals of this study, besides conducting a literature search for clinical reviews, is to conduct a survey to determine the opinion and knowledge of professional students enrolled in the College of Pharmacy.

2. Methods

This study enrolled 42 incoming first-year professional pharmacy students from Howard University College of Pharmacy with a 93.3% response rate. The survey was distributed to students as a take-home assignment. All questions, demographics, and responses were analyzed using Qualtrics. The survey questions consisted of 8 demographic questions and 10 questions using the Likert scale (strongly agree to strongly disagree). Demographic data, including age, gender, state of residence, work experience, annual income, and education were collected through the survey. All results were analyzed using IBM SPSS and statistical analysis was completed using crosstab and chi-square Pearson analysis, with a p-value of less than 0.05 considered significant.

3. Results

A total of 42 participants completed the survey. Participants were asked to complete demographic, knowledge, and opinion-based questions. Table 1 shows the basic demographic data. Most of the individuals surveyed were females

between the ages of 24 – 26. The majority had bachelor’s degrees and lived in areas outside of DC, Maryland, and Virginia.

Table 1 Gender, age, education, residence

| Demographics | Group | N (percent) | Mean (Std. dev.) |
|--------------|--------------|-------------|------------------|
| Age | 21 – 23 | 14 (33.3) | 1.022 |
| | 24 - 26 | 17 (40.5) | |
| | 27 – 29 | 5 (11.9) | |
| | >29 | 6 (14.3) | |
| Gender | Male | 15 (35.7) | 0.485 |
| | Female | 27 (64.3) | |
| Education | Some College | 1 (2.4) | 0.633 |
| | AA | 1 (2.4) | |
| | BA/ BSC | 34 (81.0) | |
| | MSC/ MA | 4 (9.5) | |
| | PHD/ PROF | 2 (4.8) | |
| Residence | WDC | 4 (9.5) | 1.068 |
| | MD | 13 (31.0) | |
| | VA | 7 (16.7) | |
| | Other | 18 (42.9) | |

Table 2 shows the income and work-related data. The majority included participants with pharmacy related jobs. Many of the participants reported having an annual income of more than \$10,000 and half of the participants worked full-time jobs.

Table 2 Job type, income, work experience

| Demographics | Group | N (percent) | Mean (Std. dev.) |
|-----------------|---------------------|-------------|------------------|
| Job Type | Pharmacy related | 16 (38.1) | 0.897 |
| | Other healthcare | 12 (28.6) | |
| | Non-healthcare | 13 (31.0) | |
| | NA | 1 (2.4) | |
| Income | < \$10,000 | 13 (31.0) | 1.617 |
| | \$10,001 - \$20,000 | 7 (16.7) | |
| | \$20,001 - \$30,000 | 6 (14.3) | |
| | \$30,001 - \$40,000 | 5 (11.9) | |
| | >\$40,000 | 11 (26.2) | |
| Work Experience | Never worked | 2 (4.8) | 0.816 |
| | Short term | 3 (7.1) | |
| | Part-time | 16 (38.1) | |
| | Full time | 21 (50.0) | |

Participants were given 5 knowledge-based questions to answer. The data for correct answers were compiled. Many of the participants answered the knowledge-based questions accurately with scores over 50%.

Table 3 Responses to knowledge-related questions

| Survey statement | Total Responses | | Mean (Std. dev) |
|--|-----------------|--------------|-----------------|
| | Correct | Incorrect | |
| Phosphatidylserine is a natural chemical found in most foods. | 15 (35.71) | 27 (64.29) | 2.17 (0.79) |
| Phosphatidylserine is used for PD. | 30 (71.43) | 12 (28.57) | 2.12 (0.67) |
| Patients may develop mad cow's disease from using Phosphatidylserine | 21 (50) | 21 (50) | 2.43 (0.94) |
| Phosphatidylserine increases acetylcholine in the body. | 31 (73.81) | 11 (26.19) | 2.05 (0.82) |
| Phosphatidylserine is a supplement that can be used in children. | 24 (57.14) | 18 (42.86) | 2.31 (0.82) |
| Average | 24.2 (57.62) | 17.8 (42.38) | |

Abbreviations: S. agree – strongly agree, S. disagree – strongly disagree, std. dev – standard deviation.

Over half of the participants correctly answered the knowledge-related questions regarding the background information of the supplement phosphatidylserine. Although the passing score is shown to be 70%, it shows the inadequate knowledge base among the study participants. The participants did not know the supplement was not found in foods. However, phosphatidylserine may be found in meat and fish. Only small amounts are found in dairy products and vegetables, except for white beans and soy lecithin.¹¹

The question with the highest correct answer was one that states its benefits for the treatment of PD. Israeli researchers conducted the effect of the supplement on PD. The findings were very encouraging and give us a reason to believe that phosphatidylserine can have a beneficial effect on a variety of degenerative diseases of the brain, including Parkinson's.¹²

Table 4 Responses to opinion-related questions

| Survey statement | S. agree/ Agree | Disagree/ S. Disagree | Mean (Std. dev) |
|--|-----------------|-----------------------|-----------------|
| I have heard of and know about phosphatidylserine. | 14 (33.34) | 28 (66.67) | 2.79 (1) |
| I believe dietary supplements such as phosphatidylserine are beneficial for illness including PD. | 24 (57.15) | 18 (42.86) | 2.38 (0.96) |
| I don't believe using supplements such as Phosphatidylserine is strong enough to treat a chronic disease such as PD. | 29 (69.05) | 13 (30.95) | 2.1 (0.79) |
| I believe natural substances such as Phosphatidylserine may be safe to be used along with prescription drugs for the treatment of PD | 26 (61.9) | 16 (38.09) | 2.33 (0.79) |
| I feel comfortable recommending Phosphatidylserine to my patients with PD | 19 (45.24) | 23 (54.76) | 2.6 (0.96) |

Abbreviations: S. agree – strongly agree, S. disagree – strongly disagree, std. dev – standard deviation.

The students were split in half based on their answers regarding the relationship between phosphatidylserine and mad cow disease. As it is known, most phosphatidylserine supplements were previously made from cow brains. This raised concerns about transmitting animal diseases, such as mad cow disease, to humans. However, as of when this study was conducted, there aren't any cases of this happening, but most products now come from soy and cabbage.

Over 70 percent of participants answered correctly the question that refers to the relationship between phosphatidylserine and acetylcholine. That is a correct statement. Phosphatidylserine can increase a chemical in the body called acetylcholine. We know that acetylcholine plays a big part in many important body functions. However, we must be careful when using some medications, called anticholinergic drugs, that block the effects of acetylcholine in the body. Taking phosphatidylserine may decrease the effects of anticholinergic drugs.

A little over half of the participants answered the question related to the use of the supplement in children. Clinical studies have shown supplementing children’s diets with phosphatidylserine improves various aspects of memory and learning. Improvements have also been observed in behavioral issues, such as inattention, hyperactivity, and impulsiveness. [10]

More than half of the study participants have not heard of the supplement phosphatidylserine however they believed it would help with PD. Similar studies reveal there may be some cognitive benefits with using phosphatidylserine while having memory deficits. [11] The participants didn’t believe it would completely treat the disease but believed it would help as an adjunct medication to normal prescription drugs. Phosphatidylserine has not been studied as a treatment for PD or any other cognitive dysfunctional disease; however, it is being studied as a supplement for added benefits in addition to prescription medication. The participants were fairly split in the middle for feeling comfortable enough to recommend phosphatidylserine to others.

Table 5 Demographic characteristics that affected the outcome

| Descriptor | Statements | P-value |
|-----------------|--|---------|
| Age | Believe phosphatidylserine may be safe to use with prescription drugs | 0.001 |
| Education level | Do not believe phosphatidylserine is strong enough to use solely for PD | 0.041 |
| Education level | Believed dietary supplements such as phosphatidylserine are beneficial for illnesses including PD. | 0.041 |
| Years Worked | Believed dietary supplements such as phosphatidylserine are beneficial for illnesses including PD. | 0.013 |

The older the group of participants the more likely they are to believe the supplement is safe to use with prescription drugs for the treatment of PD. Older populations tend to believe in vitamins and other supplements in helping with managing or preventing further disease states. The higher the education level the more likely the participants are to use phosphatidylserine for PD; however, they don’t believe it should be used as monotherapy. Higher education levels also feel the supplement is beneficial for other illnesses in addition to PD. Those study participants who have worked for an increased number of years also believe the supplement phosphatidylserine is beneficial for illnesses in addition to PD.

4. Discussion

Over half of the students have general knowledge regarding the use of phosphatidylserine for PD (N=30; 71.43%). The majority of the participants in this study were females between the ages of 24-26. Most of the participants who have bachelor’s degrees are not currently working but have part-time working experience. The participants reside in various states and have had various work types. The question that asks if you can develop mad cow’s disease has split the class down the middle. Over half of the class knew that the supplement could increase acetylcholine (N31;73.81%) as well as over half of the participants correctly answered when they were asked if phosphatidylserine was found in foods. (N27;64.29%).

Overall, the limited knowledge seen in this study may be due to the fact the participants are in their first-year pharmacy school and have not been exposed to much knowledge related to supplements for PD. Although the majority of the participants had not heard of or knew about phosphatidylserine (N= 28; 66.67%), more than half (N= 26; 61.90%) believed it would be safe to use along with a prescription. It is very interesting to see that many of the participants (N= 29; 69.04%) don't believe using supplements would be strong enough to treat chronic diseases such as Parkinson's, but also more than half (N= 24; 57.14%) believe dietary supplements such as phosphatidylserine are beneficial for illnesses. It’s reassuring to see that only a little more than one-third (N= 19; 45.24%) feel comfortable enough to recommend phosphatidylserine to their patients with PD since they don’t know much about it.

5. Conclusion

Phosphatidylserine is used for PD, Alzheimer's disease, and normal age-related decline in memory and thinking skills besides other illnesses, but there is no good scientific evidence to support most of these uses. That may be one of the major reasons we found limited knowledge among the survey participants. The limitation of the study includes a small number of participants, all first-year pharmacy students, and not enough human-based clinical trials for review. This would have had better results once PD is discussed and there are more participants. Other studies show the treatment of PD passes through a balanced diet, rich in biomolecules potentially useful to reduce the symptoms of PD due to contrasting the mechanisms responsible for neurodegeneration. A balanced diet and the use of food supplements based on vitamins, antioxidants, or elements with anti-inflammatory and neuroprotective properties can effectively act as a complement to normal pharmacological therapies.

Compliance with ethical standards

Disclosure of conflict of interest

The study was approved by the Howard University IRB and done as a part of a course. Therefore, there was no need to obtain informed consent from all individual participants included in the study.

References

- [1] Mayo Clinic Staff. Parkinson's Disease. Patient care and health information. 2020 Available at Parkinson's disease - Diagnosis and treatment - Mayo Clinic. Accessed on 10/22/21
- [2] Miller, Kelli. Phosphatidylserine. WebMD Medical references. Available at Phosphatidylserine: Uses and Risks (webmd.com). Accessed on 10/22/21
- [3] Avallone R, Vitale G, Bertolotti M. Omega-3 Fatty Acids and Neurodegenerative Diseases: New Evidence in Clinical Trials. *Int J Mol Sci.* 2019;20(17):4256. Published 2019 Aug 30. doi:10.3390/ijms20174256
- [4] Riekkinen P, Rinne UK, Pelliniemi TT, Sonninen V. Interaction between dopamine and phospholipids. Studies of the substantia nigra in Parkinson disease patients. *Arch Neurol.* . 1975;32(1):25-7. Doi:10.1001/archneur.1975.00490430047006
- [5] Taghizadeh M, Tamtaji OR, Dadgostar E, et al. The effects of omega-3 fatty acids and vitamin E co-supplementation on clinical and metabolic status in patients with Parkinson's disease: A randomized, double-blind, placebo-controlled trial. *Neurochem Int.* 2017;108:183-189. doi:10.1016/j.neuint.2017.03.014
- [6] Gazerani P. Probiotics for Parkinson's Disease. *International Journal of Molecular Sciences.* 2019; 20(17):4121. <https://doi.org/10.3390/ijms20174121>
- [7] Cenacchi T, et al. Cognitive decline in the elderly: a double-blind, placebo-controlled multicenter study on efficacy of phosphatidylserine administration. *Aging (Milano)* 1993 Apr;5(2):123-33.
- [8] Amenta F, et al. Treatment of cognitive dysfunction associated with Alzheimer's disease with cholinergic precursors. Ineffective treatments or inappropriate approaches? *Mech Ageing Dev* 2001 Nov;122(16):2025-40.
- [9] Mark Kaddumukasa, Angelina Kakooza, Martin N. Kaddumukasa, Edward Ddumba, Levi Mugenyi, Martha Sajatovic, Elly Katabira, "Knowledge and Attitudes of Parkinson's Disease in Rural and Urban Mukono District, Uganda: A Cross-Sectional, Community-Based Study", *Parkinson's Disease*, vol. 2015, Article ID 196150, 7 pages, 2015. <https://doi.org/10.1155/2015/196150>
- [10] Fünfgeld EW, Baggen M, Nedwidek P, Richstein B, Mistlberger G. Double-blind study with phosphatidylserine (PS) in parkinsonian patients with senile dementia of Alzheimer's type (SDAT). *Prog Clin Biol Res.* 1989;317:1235-1246.
- [11] Miranda, Dalva T. S.Z.; Batista, Vanessa G.; Grando, Fernanda C. C.; Paula, Fernanda M.; Felício, Caroline A.; Rubbo, Gabriella F. S.; Fernandes, Luiz C.; Curi, Rui; Nishiyama, Anita (Dec 2008). Soy lecithin supplementation alters macrophage phagocytosis and lymphocyte response to concanavalin A: a study in alloxan-induced diabetic rats. *Cell Biochemistry and Function.* 26 (8): 859–865.

- [12] Israeli Researchers Find Food Supplement Can Help Fight Parkinson's Disease. Obtained from: <https://www.haaretz.com/2013-04-04/ty-article/.premium/oyster-extract-saves-rats-from-parkinsons/0000017f-dbc7-df62-a9ff-dfd784680000>. Access Date: 3/31/2023.
- [13] World Health Organization, 'The Lancet child development in developing countries series. Obtained from: http://www.who.int/maternal_child_adolescent/documents/lancet_child_development/en/ Accessed 3/31/2023.
- [14] Kim HY, Huang BX, Spector AA. Phosphatidylserine in the brain: metabolism and function. *Prog Lipid Res.* 2014;56:1-18. doi:10.1016/j.plipres.2014.06.002.
- [15] Ciulla M, Marinelli L, Cacciatore I, Stefano AD. Role of Dietary Supplements in the Management of Parkinson's Disease. *Biomolecules.* 2019;9(7):271. Published 2019 Jul 10. doi:10.3390/biom9070271