

## Original Research

# Review of Melatonin and Results of Students Survey

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### ABSTRACT

#### Purpose

The objective of the survey is to evaluate the knowledge and opinion of Howard University College of Pharmacy first-year professional pharmacy students regarding the use of the sleep medication melatonin.

#### Methods

A survey questionnaire comprising 20 questions on melatonin was developed and response obtained from 42 students. Demographic data and responses were gathered and evaluated. Descriptive statistics were used to analyze the responses.

#### Results

Most of the respondents had adequate knowledge about melatonin ranging from 54.8 to 92.6%. There was no statistical difference when responses were analyzed based on the gender of the survey participants. To specific questions whether melatonin is associated with weight gain, can help with signs and symptoms of cancer, recommend sleep hygiene instead of melatonin, and whether melatonin is addictive, the majority (57.1%, 42.9%, 64.3% and 69.0%, respectively) provided the wrong responses.

#### Conclusion

More than half of the respondents had good levels of knowledge and opinion about melatonin, with the highest being 92.6% to a specific question on the use of melatonin. The students were only deficient in areas of melatonin being associated with weight gain, melatonin helping with signs and symptoms of cancer, recommending sleep hygiene, and melatonin causing addiction. There are significant differences between the age groups and whether those who work in healthcare area, or not in their response to some of the survey questions.

#### Keywords

Melatonin; Dietary supplement; Insomnia; Weight gain; Cancer; Light.

### INTRODUCTION

Melatonin, an endogenous hormone produced by the body, is mainly responsible for regulating sleep cycles.<sup>1</sup> Most exogenous melatonin is synthetically produced. It may also be produced from animal pineal gland. Darkness is thought to stimulate melatonin release, whereas light suppresses it.<sup>2</sup> Melatonin is used to treat insomnia, autism spectrum disorders (ASD), and to prevent jet lag. Its adverse effects range from nausea, vomiting, headache, tachycardia, irritability, dysthymia, worsening of depressive symptoms to morning grogginess.<sup>1,2</sup> Unlike most other sleep medications such as benzodiazepines, melatonin does not cause withdrawal or dependence symptoms.<sup>3</sup> Evidence is conflicting on its use for occasional insomnia.<sup>1,2</sup> Associations such as the American Academy

of Sleep Medicine (AASM) and the American College of Pharmacy state that sufficient evidence is lacking to support the use of melatonin in the general population for chronic insomnia.<sup>2</sup> A large Cochrane review of 9 trials reported night shift workers who took 3 to 6 mg of melatonin slept 24-minutes longer during daytime. Side effects did not differ from placebo.<sup>4</sup> There is no direct association between melatonin use and weight gain, although low-level of melatonin in the body may contribute to weight gain.<sup>5</sup> Lack of adequate sleep or inconsistent sleep patterns has been linked to a higher body mass index (BMI) and thus precipitating obesity.<sup>6</sup> The literature on melatonin has also been reviewed extensively as a possible candidate for adjuvant therapy in various cancer types, including breast cancer.<sup>7</sup>

Prior to recommending melatonin, good sleep hygiene has been encouraged to correct the causes of insomnia.<sup>1</sup> For most cases, a dose of 0.3 mg at bed time is sufficient to produce higher than normal physiological concentrations.<sup>2</sup> Melatonin tablets and/or capsules ranging from 0.2 mg to 20 mg are available. Smith et al<sup>8</sup> reported the use of 1 mg to 10 mg dose for short-term management of insomnia in a hospital inpatient setting. Although the authors noted lack of adequate documentation by providers on sleep quality, they reported adverse events such as daytime drowsiness, headache, and delirium in only 6 out of 200 patients.<sup>8</sup>

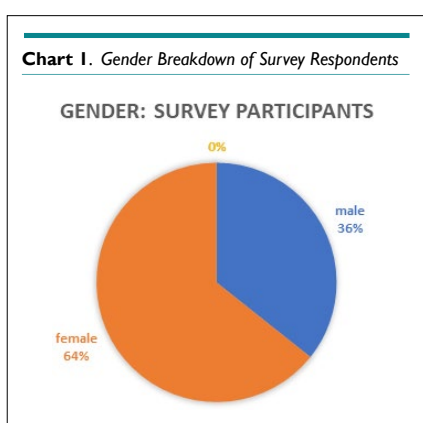
The current study was initiated to learn about the knowledge level and opinion of first year pharmacy students at Howard University (HU), Washington, D.C., USA regarding melatonin and its use. Compiling and analyzing the survey data is thought to help identify the strengths and needs of students in this area of knowledge.

## METHODS

A total of 45 professional first year pharmacy students at Howard University College of Pharmacy for the year 2021 participated in the survey. Forty-two (response rate of 93.3%) completed the questionnaire. The following demographic data were gathered: age, gender, education, residence, work-related items, and annual income. Twenty items were included in the questionnaire to collect the opinion and the knowledge level of the study enrollees about melatonin. A 4-point Likert scale (1=strongly agree; 2=agree; 3=disagree; 4=strongly disagree) was used to rate responses. The strongly agree and agree responses were aggregated as “agree” or “yes” responses, while the disagree and strongly disagree were lumped together as “disagree” or “no”. Mean Likert scores were calculated to place the levels of the responses. A two-tailed Fisher’s exact test was used to determine *p* values by comparing gender-based responses. The study was approved by Howard University institutional review board.

## RESULTS

A total of 42 students (15 male, 27 female) participated in the survey. About 41% are in the age range 24-26-years. Thirty-four of the participants (81%) had a bachelor’s degree before joining pharmacy school. In addition to attending pharmacy education at HU College of Pharmacy, most of the respondents (n=33, 78.6%)



**Table 1. Demographic Characteristics of Respondents**

Characteristics	Respondents (n, %)	95% CI (% range)*
<b>Age (years)</b>		
21-23	14 (33.3)	19.1-47.6
24-26	17 (40.5)	25.6-55.3
27-29	5 (11.9)	2.1-21.7
>29	6 (14.3)	3.7-24.9
<b>Gender</b>		
Male	15 (35.7)	21.2-50.2
Female	27 (64.3)	49.8-78.8
<b>Education</b>		
Some college	1 (2.4)	0.0-7.0
Associate Degree	1 (2.4)	0.0-7.0
BA/BSc	34 (81)	69.1-92.8
MSc	4 (9.5)	2.7-22.6
PhD/Professional	2 (4.8)	0.0-11.2
<b>Residence</b>		
Washington, D.C.	4 (9.5)	0.7-18.4
Maryland	13 (31)	16.9-44.9
Virginia	7 (16.7)	5.4-27.9
Other States	18 (42.9)	27.9-57.2
<b>Working Now</b>		
Yes	9 (21.4)	9.0-33.8
No	33 (78.6)	66.2-90.9
<b>Work Experience</b>		
Never worked	2 (4.8)	0.0-11.2
Short-term	3 (7.1)	0.0-14.9
Part-time	16 (38.1)	23.4-52.8
Full-time	21 (50)	34.9-65.1
<b>Type of Job</b>		
Pharmacy related	16 (38.1)	23.4-52.8
Other healthcare	12 (28.6)	14.9-42.2
Non-health related	13 (31)	16.9-44.9
Not applicable	1 (2.4)	0.0-7.0
<b>Annual Income</b>		
< USD 10,000	13 (31)	16.9-44.9
10,001-20,000	7 (16.7)	5.4-27.9
20,001-30,000	6 (14.3)	3.7-24.9
30,001-40,000	5 (11.9)	2.1-21.7
>40,000	11 (26.2)	12.9-39.5
<b>Years Worked</b>		
None	1 (2.4)	0.0-7.0
1-2	19 (45.2)	30.2-60.3
3-4	11 (26.2)	12.9-39.5
>4	11 (26.2)	12.9-39.6

\*CI=Confidence Interval; normal approximations of binomial exact values.

held jobs at the time of this survey. Many (n=18, 42.9%) of the students’ home states are outside of the Washington DC-Maryland-Virginia (DMV) metro area, while the rest are spread in these areas (Table 1 and Chart 1).

Thirty-nine respondents (92.6%) agreed melatonin is

taken by consumers for sleep; 35 (83.3%) agreed melatonin is a dietary supplement used for insomnia. Twenty-seven participants (64.3%) responded that melatonin also decreases depression. Thirty-two students (76.2%) agreed that melatonin causes headache, dizziness, sleepiness, and nausea as side effects. In an answer to a specific question whether melatonin is associated with weight gain, 24 (57.1%) agreed it is associated (Table 2).

In response to a further 15 questionnaire items on melatonin (Table 3), the majority agreed to each statement or question, except for four statements: to melatonin being associated with weight gain (n=18; 42.9% disagreeing vs n=24; 57.1% agreeing); the belief in sleep hygiene and not recommending melatonin (n=15; 35.7% agreeing vs n= 27; 64.3 disagreeing); to melatonin helping with signs and symptoms of cancer (n=18; 42.9% agreeing

**Table 2. Response Pattern of Survey Respondents (n=42) Based on Gender**

Survey Statement	Response [n, (%)]						LK (m±SD)	p*	
	SA	A	DA	TA	TDA				
Melatonin is mostly taken by people who want to sleep	<b>M</b>	6	8	1	0	14	1	1.57±0.63	1.000
	<b>F</b>	15	10	20	252				
		21	18	30	393				
		(50)	(42.9)	(7.1)	(0.0)	(92.9)	(7.1)		
Melatonin is used as a dietary supplement for insomnia	<b>M</b>	9	2	4	0	11	4	1.60±0.83	0.2252
	<b>F</b>	168		21	243				
		25	10	61	35	7			
		(59.5)	(23.8)	(14.3)	(2.4)	(83.3)	(16.7)		
Melatonin when taken as a sleep aid is known to decrease depression in patients	<b>M</b>	7	1	5	2	8	7	2.12±0.94	0.3252
	<b>F</b>	6	13	71	198				
		13	14	12	3	27	15		
		(31.0)	(33.3)	(28.6)	(7.1)	(64.3)	(59.5)		
Melatonin causes headache, dizziness, sleepiness, and nausea as side effects	<b>M</b>	4	6	5	0	10	5	1.98±0.78	0.4508
	<b>F</b>	8	4	41	225				
		12	20	9	1	32	10		
		(28.6)	(47.6)	(21.4)	(2.4)	(76.2)	(23.8)		
Melatonin is associated with weight gain	<b>M</b>	2	8	5	0	10	5	1.57±0.63	1.000
	<b>F</b>	59		121	1413				
		7	17	17	1	24	18		
		(16.7)	(40.5)	(40.5)	(2.4)	(57.1)	(52.9)		

Abbreviation: SA=Strongly agree; A=Agree; DA=Disagree; SDA=Strongly disagree; TA=Total agree; TD=Total disagree; M=Male; F=Female; LK=Likert score; m±SD=mean±standard deviation.  
\*p values ≥ are considered not significant.

**Table 3: Additional Questionnaire Items Used in the Survey**

- I feel confident in recommending melatonin to patients who have trouble sleeping.
- I believe getting used to melatonin as a sleep aid may lead to the development of tolerance and may not be a good idea.
- I believe melatonin, although a natural product, may cause problems if taken long term.
- I believe in sleep hygiene and do not recommend melatonin or any other sleep aid.
- I believe melatonin is a natural substance and can cause adverse effects if taken as a sleep aid.
- Do you agree that melatonin can help alleviate signs and symptoms of breast cancer?
- Do you agree that light can block the mechanism of melatonin when used in the management of breast cancer?
- Do you agree that the body naturally produces melatonin?
- Besides its use in breast cancer patients, melatonin improves jet lag symptoms.
- Melatonin, since it is produced in the body, should generally be a safe medication
- I believe that melatonin should have no known side effects since our body makes it.
- Natural substances such as melatonin should be safe in children.
- I believe taking additional supplements of melatonin may decrease the body's ability to crat more.
- Although natural, melatonin may have an addictive property if it is taken for a long time.
- I do not mind purchasing melatonin over the counter for myself or my family if the need arises.

vs n=24; 57.1% disagreeing) and to melatonin having no known side effects, since the body makes it (n=16; 38.1% disagreeing vs n=26; 61.9% agreeing) (Table 4). Analysis of the survey data revealed no statistical differences between male and female respondents across all 20 questionnaire items ( $p>0.05$ ) (Tables 2 and 4).

## DISCUSSION

Various reports have appeared in the literature evaluating drug knowledge of junior pharmacy students regarding selection of generic medicines,<sup>9</sup> and others in their later years of training on topics, such as pharmacovigilance and drug-drug interactions.<sup>10,11</sup> However, studies are lacking that evaluate in-coming first-year pharmacy students on their knowledge. To gauge the knowledge level of pharmacy students early on helps to identify the deficits in various knowledge areas. Thus, our survey took melatonin as an example to test the knowledge of students through administration of a survey questionnaire.

Nearly 80% of the survey items (16 out of 20) were answered correctly by more than 50% of the surveyed students for each item). There is no adequate evidence that melatonin is associated with weight gain; the reverse may be true considering melatonin indirectly my help with weight reduction if it is associated with lack of sleep.<sup>5</sup> However, the majority respondents (n=24; 57.1% agreed melatonin is associated with weight gain). Most sleep medi-

cations such as benzodiazepines cause some level of addiction,<sup>3</sup> so it is possible that the students had the impression that melatonin, as a sleep aid, may have similar addictive properties. Studies indicate that melatonin can help with signs and symptoms of cancer types such as breast cancer, prostate cancer, gastric cancer, and colorectal cancer.<sup>7</sup> Less than half of the respondents (n=18; 42.9%) agreed with the statement This study also found out a similar response pattern between the genders. Analysis of the survey data revealed no statistical differences between male and female respondents across all 20 questionnaire items ( $p>0.05$ ).

Fisher's Exact test was done to determine if there were any significant differences among the various groups in their response to the questionnaires. We found that age of the participants matters in their belief that melatonin, although a natural substance, can cause adverse effects when it is taken as a sleep aid (26-years or younger vs. older than 26;  $p=-0.05$ ). We also found a significant difference in participants' response, whether melatonin is associated with headache, dizziness, sleepiness, and nausea as a side effect, when the responses were evaluated on the basis of the type of work the participants had (those who work at healthcare related jobs vs. those in non-health related jobs:  $p=0.0085$ ). The participants who are confident in their knowledge significantly rated their agreement with melatonin as a naturally produced hormone compared to their counterparts ( $p=0.0281$ ).

**Table 4.** Gender Based Response Pattern to Items 1-15 from Table 3

Questionnaire Item*	Total Response (n, %)	Male (n, %)	Female (n, %)	LKS (mean±SD)	p
1	Agree (A)* 35(83.3) Disagree (DA)* 7(16.6)	11(26.2) 4(9.5)	24(57.1) 3(7.1)	1.90±0.79	0.2252
2	A 33(78.6) DA 9(21.4)	10(23.8) 5(11.9)	23(54.8) 4(9.5)	1.93±0.89	0.2417
3	A 33(78.6) DA 9(21.4)	12(28.6) 3(7.1)	21(50) 6(14.3)	2.00±0.80	1.0000
4	A 15(35.7) DA 27(64.3)	4(9.5) 11(26.2)	11(26.2) 16(38.1)	2.69±0.78	0.5055
5	A 30(71.4) DA 12(28.6)	12(28.6) 3(7.1)	18(42.8) 9(21.4)	2.12±0.80	0.4848
6	A 18(42.9) DA 15(57.1)	6(14.3) 9(21.4)	12(28.6) 15(35.7)	2.52±0.97	0.7674
7	A 29(69.0) DA 13(31.0)	11(26.2) 4(9.5)	18(42.8) 9(21.4)	2.14±0.87	0.7387
8	A 32(76.2) DA 11(33.8)	10(23.8) 5(11.9)	22(52.4) 5(11.9)	1.95±0.85	0.4508
9	A 23(54.8) DA 19(45.2)	7(16.7) 8(19.0)	18(42.9) 11(26.2)	2.38±0.88	0.5249
10	A 27(64.3) DA 15(35.7)	11(26.2) 4(9.5)	16(38.1) 11(26.2)	2.21±0.92	0.5055
11	A 16(38.1) DA 26(61.9)	4(9.5) 11(26.2)	12(28.6) 15(35.7)	2.67±1.00	0.3302
12	A 26(61.9) DA 16(38.1)	9(21.4) 6(14.3)	17(40.5) 10(23.8)	2.26±0.91	1.0000
13	A 25(59.6) DA 17(40.4)	9(21.4) 6(14.3)	16(38.1) 11(26.2)	2.21±0.81	1.0000
14	A 29(69.0) DA 13(31.0)	8(19.0) 7(16.7)	21(50.0) 6(14.3)	2.07±0.92	0.1635
15	A 36(85.7) DA 6(14.3)	13(30.9) 2(4.8)	23(54.8) 4(9.5)	1.86±0.84	1.0000

\*Agree (strongly agree+agree); disagree (disagree+strongly disagree), LKS=Likert Score;  $p\geq 0.05$  are not significant

## CONCLUSION

A survey carried out among the HU College of Pharmacy first-year professional pharmacy students revealed that more than half of the respondents had good levels of knowledge and opinion about melatonin, with the highest being 92.6% to a specific question on the use of melatonin. The students were deficient only in areas of melatonin being associated with weight gain, melatonin helping with signs and symptoms of cancer, recommending sleep hygiene, and melatonin causing addiction. There were significant differences between the age groups and among those who work in the healthcare area *versus* in other areas in their response to some of the survey questions.

## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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