Knowledge of COVID-19 and Health Literacy Among Patients Seeking Care in an Emergency Department

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Abstract

Background

As the US continues to experience a daily increase of COVID-19 cases, there is an urgent need to identify ways to improve individuals' knowledge of COVID-19 to achieve effective prevention. To examine whether the knowledge of COVID-19 was associated with the general health literacy among patients in an emergency department, and to demonstrate whether patients' primary source of COVID-19 information was associated with their COVID-19 knowledge.

Methods

A sample of adults was collected in an urban ED. Patients' knowledge of COVID-19 was measured by the agreement to 10 statements. Health literacy was measured by the Brief Health Literacy Screen (BHLS). Participants were also asked about their primary source of COVID-19 information, sociodemographics, comorbidities and familiarity with the healthcare system at baseline. Bivariate and multivariate analyses were conducted.

Results

The average COVID-19 knowledge score was 7.09 (range 0-10) and BHLS score, 11.09 (range 3-15). About 43% obtained the information primarily from TVs, radios and newspapers, and 1/3 from social media and circles. The group with the primary source being internet searches and sites had the highest average COVID-19 knowledge score of 7.78. The BHLS and COVID-19 knowledge scores were positively correlated in both bivariate and multivariate analyses. Education and income levels were statistically significant in the multivariate regression.

Conclusions

To better prevent further increases in COVID-19 transmission, community-based interventions can be more cost-effective when targeting sociodemographic groups that have lower general health literacy. In particular, individuals of low educational and with low income levels should be prioritized.

Background

COVID-19 has changed Americans' health behavior in a dramatic way. New scientific discoveries, along with an abundance of information and misinformation have created confusion in public understanding of COVID-19. For example, the CDC did not encourage wearing face masks at the start of the pandemic but reversed that decision in April by stating masks do have some level of benefit and should be worn by the public.[1, 2]

It is well established that a lower level of health literacy is associated with worse health outcomes.[3-5] One particularly important role of health literacy is to improve patients' ability to understand the prevention,

treatment, and prognosis of infectious diseases which leads to more effective personal prevention strategies and coping mechanisms. A study from 2016 showed that a low health literacy with infectious diseases, such as tuberculosis, malaria and influenza, was associated with decreased protective behaviors and understanding of antibiotic usage.[6] The same study also demonstrated that patients with a lower health literacy score were less likely to be currently vaccinated and less likely to receive future vaccine as compared to patients with a higher health literacy score. Additionally, in a study focused on outpatient antibiotics prescribed in emergency departments (EDs) , patients with low health literacy had a decreased number of prescriptions filled at 3 days.[7]

As the US continues to experience a daily increase of COVID-19 cases, there is an urgent need to identify ways to improve individuals' knowledge of COVID-19 to achieve effective prevention. If a better COVID-19 knowledge is associated with an overall higher level of health literacy, then community interventions to prevent COVID-19 transmission among low health literacy individuals could be much more cost-effective than targeting the general population. This is particularly relevant to communities with limited resources. Because the current understanding of COVID-19 is very limited, there are no studies that have addressed this important question. The primary objective of the current study was to examine whether better knowledge of COVID-19 was associated with patients' overall health literacy among patients seeking care in an ED. The secondary objective was to demonstrate whether patients' primary source of COVID-19 information was associated with their COVID-19 knowledge.

Methods

A convenience sample was collected in an urban ED of an annual average volume of 80k. Approval from the local IRB was obtained prior to the start of the study. The duration of the study was a 6-week period from 05/25/2020 to 07/05/2020. Written consents were obtained. A total of 252 participants completed the study, exceeding the minimal sample size of 220 calculated by the initial power analysis using a beta of 99%. A commercial online platform, Qualtrics^{XM}, was used for data collection from a survey. The inclusion criteria were 1) currently seeking ED care; 2) 18-89 years of age; and 3) Glasgow Coma Scale (GCS) of 15. Patients aged 17 years or younger, psychiatric patients and trauma activations were excluded. Patients in ED rooms who met the inclusion criteria were briefed with a verbal description of the study and the study flyer was given. Participants could choose between completing the survey online on their phone or computer at any time during the study period and completing the survey in the room while waiting for care to be completed with the assistance of a data collector who helped the patient utilize a tablet device.

Patients' knowledge of COVID-19 was examined by answers to whether they agreed to a mix of 10 correct and incorrect statements about COVID-19 that included basic epidemiology, prevention, diagnosis, treatment and prognosis. The total number of correct answers was used as the COVID-19 knowledge score.

1. COVID-19 or the novel coronavirus is a bacterial infection.

2. You can get COVID-19 through contact with an infected person.
3. Face masks, and frequent hand washing or use of hand sanitizer can prevent getting COVID-19
4. You don't have COVID-19 if you don't have any symptoms.
5. Fever, cough, and shortness breath are the most likely symptoms of COVID-19.
6. People with chronic health problems, such as high blood pressure, diabetes, heart disease and kidney disease, are more likely to get COVID-19 and die.
7. All COVID-19 patients require treatment of antibiotics.
8. COVID-19 vaccine is available now in the US.
9. More than half of people who had COVID-19 died.
10. COVID-19 is more deadly among young persons and children.

Health literacy was measured by the Brief Health Literacy Screen (BHLS) that has been demonstrated to have good concordance with several commonly used instruments measuring health literacy, REALM, S- and TOFHLA.[8-10] BHLS has been tested in a wide variety of clinical settings including EDs, and can be self-administered.[11-13] The BHLS uses three questions with each question scored on a 5-point Likert scale: always (1), often (2), sometimes (3), rarely (4) and never (5). The summation represents the final BHLS score.

1. How often do you have problems learning about your medical condition because of difficulty understanding written information?
2. How confident are you filling out medical forms by yourself?
3. How often do you have someone help you read hospital materials?

Because there were diverse sources of information about COVID-19, participants were asked about their primary source of COVID-19 information. The replies were grouped into 4 categories: social media and social circle of family and friends, internet sites and searches, 3rd-party reports (TVs, radios and newspapers), and scientific sources (CDC and professional journals).

Patients' sociodemographic information was also collected: age, gender, race, education level, employment status, household income and primary language spoken at home. The frequency of ED visits in 2019 and the frequency of outpatient clinic visits in 2019 were collected to gauge participants' familiarity and interaction with the healthcare system at the baseline prior to the COVID-19 pandemic, whether they had a primary care provider (PCP), and whether they had any comorbidities (hypertension, hyperlipidemia, diabetes, heart diseases, chronic kidney disease, stroke and liver diseases).

Statistic software Stata (StataCorp, College Station, TX) was used for analyses. Distributions of the COVID-19 knowledge and BHLS scores were first examined. Descriptive statistics of the primary source of COVID-19 information, participants' sociodemographics and familiarity and interaction with the healthcare system were reported. Bivariate analysis between the COVID-19 knowledge score and each independent variable was conducted. A multivariate regression was conducted to examine the

independent associations of BHLS and the primary source of COVID-19 information and the COVID-19 knowledge score, respectively, controlling for the confounding of patients' sociodemographics and familiarity and interaction with the healthcare system.

Results

Figures 1 and 2 depict the distributions of the COVID-19 knowledge and the BHLS scores. Descriptive statistics of variables of interest are reported in the second column of Table 1. The average COVID-19 knowledge score was 7.09 (range 0-10) and BHLS score, 11.09 (range 3-15). About 1/3 of the participants indicted that their primary source of information on COVID-19 was social media and social circle of family and friends. In contrast, 43% obtained the information primarily from TVs, radios and newspapers. Approximately 17% and 8% reported the primary source as Internet site/searches and scientific sources, respectively.

Approximately 16% of the sample were elderly (65+) and slightly over half were females. Hispanics and other racial minorities consisted of about 45% and 15% of the sample, respectively. Only about 15% did not finish high school. Approximately 32% were unemployed. Slightly over 40% of the participants had an annual household income <$25,000. Only about 7% of the participants reported that the primary language spoken at home was not English. Slightly over 2/3 had a primary care provider. More than half had at least one chronic disease. Approximately 13% and 31% had >5 visits to ED and outpatient clinics, respectively, in 2019.

Results from bivariate analyses are reported in the 3rd and 4th columns of Table 1. The results demonstrated statistically significant ($p<0.05$) correlations between COVID-19 knowledge and BHLS as well as COVID-19 knowledge and the primary source of COVID-19 information. A higher BHLS score was correlated with a higher COVID-19 knowledge score. The group with the primary source being internet searches and sites had the highest average COVID-19 knowledge score of 7.78, whereas the one with the primary source of TVs, radios and newspaper had the lowest average score of 6.73. Bivariate analyses showed that the COVID-19 knowledge score was significantly ($p<0.05$) associated with patients' race and ethnicity, education level, employment status, household income and whether patients had a primary care provider.

The results from the multivariate analysis are shown in Table 2. Even after controlling for the confounding variables, BHLS was still found to be statistically significant ($p=0.02$). However, the primary source of COVID-19 information was no longer significant. In contrast to the results from bivariate analyses, participants' employment status, race and whether patients had a primary care provider were no longer statistically significant after controlling for confounding variables. Compared to patients who did not graduate high school, those with an education level higher than high school had a significantly higher COVID-19 knowledge score by 1.61 ($p<0.01$). No significant difference was found between high school graduates and those who did not graduate high school. Lastly, lower income was associated with a lower COVID-19 knowledge score by 0.67 ($p=0.02$).

Discussion

There are several limitations in the current study. First, the convenience sample consists of only ED patients. The results may not be representative of the general population who do not seek ED care. A second concern is that despite the pertinence and accuracy of BHLS, further research using other measurements of health literacy is warranted. Third, this is a pilot study based on a relatively small sample size, although the sample size was larger than the minimum obtained from the power analysis. Certain trends, like the relationship between the primary language spoken at home, or race with COVID-19 knowledge, could have shown to be statistically significant if a larger sample had been obtained. Lastly, the data collected were from a single urban tertiary hospital in a city with about 1/3 of the population being Hispanic. The generalizability of the conclusions to other areas of the US could be limited.

This study found that even after controlling for patients' characteristics, patients with better general health literacy had better knowledge of basic epidemiology, prevention, diagnosis, treatment, and prognosis of COVID-19. This is in line with findings from studies of other infectious diseases that patients with lower health literacy had worse knowledge of antibiotics, decreased immunization rate and health screenings.[4, 6, 14] Reading comprehension, education level, English proficiency, and cultural differences were identified to be common additional contributing factor to health literacy.[15]

Despite these similarities, the ways the public acquire the knowledge of COVID-19 are distinctly different from those for other infectious diseases in the past, as COVID-19 is presented in a completely different epidemiological, cultural, technological, and even political context. The public have been exposed to some aspects of COVID-19 daily, as information and misinformation about COVID-19 permeate all media sources. Additionally, the drastic change in society with a near-nationwide shutdown and all individual lives being disrupted to some level created a unified front combating the transmission of COVID-19, making the efforts more focused than those for other infectious diseases in recent US history. Consequently, it is not surprising to find that overall, the participants of the current study had a good knowledge of COVID-19.

Furthermore, even after controlling for confounding variables, this study found that ED patients with low income and those with lower education had a lower level of COVID-19 knowledge. Similar findings were demonstrated in an outpatient setting. In a recent study of adult outpatient clinic patients with at least 1 chronic condition, researchers found that blacks, the poor and those with low health literacy were less worried about COVID-19, less likely to believe that they would become infected and felt less prepared for an outbreak.[16] It is very concerning that recent studies, however limited in number, identified that the same subpopulations had higher mortality and hospitalization rates of COVID-19.[17, 18] This is consistent with prior studies that demonstrated lower education and income resulted in poor outcomes in other diseases.[15, 19-21] It is likely that the worse health outcomes of these disadvantaged subpopulations are the result of the lack of effective COVID-19 prevention and coping strategies stemming from the inadequate COVID-19 knowledge. This is further complicated by the already existing barriers to medical care for these patients. Therefore, identifying ways to improve the COVID-19 knowledge within these

subpopulations should become an integral part of any community-based interventions to better prepare the public for the pandemic and decrease the health disparities.

Various interventions have been shown to be effective for other diseases in the past, such as simplified wording during media presentations, numerical charts, addition of images and increased funding to media sources.[22-24] Applying similar strategies to COVID-19 education should yield similar favorable results. For examples, one study demonstrated the effective use of infographics of COVID-19 on websites and social media.[25] In addition to improving the format of the information, targeting the social media platforms that are mostly frequently used by the disadvantaged subpopulations to disseminate the information of COVID-19 can be highly effective. However, as the World Health Organization (WHO) noted, “infodemic” of COVID-19 presented a significant challenge to the local, national and global public health management as there was over-abundance of information and misinformation.[26]

Conclusions

COVID-19 presents a unique opportunity in that the current nationwide attention to this single disease is arguably higher than any other disease in recent time. To better prevent further increases in COVID-19 transmission, community-based interventions can be more cost-effective when targeting sociodemographic groups that have lower general health literacy. In particular, individuals of low educational levels and with low incomes should be prioritized. Less technical presentation of COVID-19 information and the targeting of specific media formats and platforms can significantly benefit individuals of lower socioeconomic and lower educational levels.

Abbreviations

CDC: Centers for Disease Control and Prevention

ED: emergency department

GCS: Glasgow Coma Scale

BHLS: Brief Health Literacy Screen

REALM: Rapid Estimate of Adult Literacy in Medicine

S-TOFHLA: Short-form Test of Functional Health Literacy in Adults

Declarations

Ethnics approval and consent to participate

This study is approved by the IRB of Texas Tech University Health Sciences Center in Lubbock, Texas. Written consents were obtained from each participant.

Consent for publication

Not applicable

Availability of data

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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None

Authors' contributions

All authors have read and approved the manuscript.

CB contributed to conceptualization, data collection, analyses and writing

SG contributed to conceptualization, data collection, analyses and writing

BP contributed to conceptualization, data collection, and writing

JH contributed to conceptualization, data collection, and writing

KTX contributed to conceptualization, data collection, analyses and writing

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Tables

Table 1 **Descriptive Statistics and Bivariate Analyses (N=252)**

	Proportion or Mean (std.) – Full Sample	Mean COVID Knowledge Score in Subgroup	p value for Bivariate Analyses*
COVID Knowledge Score	7.09 (2.17)	—	—
BHLS Score	11.09 (3.21)	—	<0.01
Primary Source of Information for COVID			<0.05
Social Media and Social Circle of Family and Friends	32.14%	7.25	
Internet Sites and Searches	17.46%	7.77	
3rd-Party Reports (TVs, Radios and Newspapers)	42.86%	6.73	
Scientific Sources (CDC and Professional Journals)	7.54%	6.89	
Age			0.96
<= 40 yo	40.48%	7.06	
41-64 yo	43.25%	7.09	
65+	16.27%	7.17	
Gender			0.89
Male	42.06%	7.11	
Female	57.94%	7.08	
Race and Ethnicity			<0.01
Non-Hispanic White	40.48%	7.67	
Hispanic	44.84%	6.87	
Other races	14.68%	6.19	
Education			<0.01
< High School	15.08%	5.89	
High School	53.17%	6.81	
> High School	31.75%	8.13	
Employment			0.02
Full Time	42.46%	7.45	
Part Time	11.11%	6.79	

Retired	14.68%	7.49	
Unemployed	31.75%	6.54	
Household Annual Income			<0.01
>= $25,000	59.52%	7.63	
< $25,000	40.48%	6.30	
Primary Language Spoken at Home			0.53
English	92.86%	7.12	
Other Languages	7.14%	6.78	
Have Primary Care Provider			<0.01
No	30.16%	6.33	
Yes	69.84%	7.42	
Any Comorbidities			0.85
No	45.44%	7.06	
Yes	55.56%	7.11	
Annual ED Visits in 2019			0.53
0-2	75.40%	7.17	
3-5	11.90%	6.70	
>5	12.70%	7.00	
Annual Outpatient Clinic Visits in 2019			0.47
0-2	43.25%	6.97	
3-5	25.40%	6.98	
>5	31.35%	7.34	

*: p value of the bivariate analysis of the COVID knowledge score and the independent variable

Table 2 Multivariate Analysis Results (N=252)

	Est.	p value	95% CI
BHLS score	**0.108**	**0.02**	(0.017, 0.198)
Primary Source of Information for COVID			
Social Media and Social Circle of Family and Friends			
Internet Sites and Searches	0.361	0.34	(-0.375, 1.097)
3rd-Party Reports (TVs, Radios and Newspapers)	-0.467	0.13	(-1.073, 0.139)
Scientific Sources (CDC and Professional Journals)	-0.095	0.86	(-1.138, 0.949)
Age			
<= 40 yo			
41-64 yo	0.047	0.88	(-0.552, 0.646)
65+	-0.091	0.87	(-1.139, 0.957)
Female (vs. Male)	-0.353	0.19	(-0.876, 0.171)
Race and Ethnicity			
Non-Hispanic White			
Hispanic	-0.055	0.86	(-0.667, 0.556)
Other races	-0.773	0.06	(-1.564, 0.018)
Education			
< High School			
High School	0.549	0.17	(-0.228, 1.326)
> High School	**1.605**	**0.00**	**(0.726, 2.484)**
Employment			
Full Time			
Part Time	-0.522	0.23	(-1.386, 0.341)
Retired	0.159	0.75	(-0.837, 1.156)
Unemployed	-0.258	0.45	(-0.930, 0.415)
Income <$25K (vs. >=$25K)	**-0.666**	**0.02**	**(-1.241, -0.090)**
Non-English Spoken at home (vs. English)	0.796	0.14	(-0.258, 1.849)
Any Comorbidities (vs. Not)	0.037	0.90	(-0.561, 0.635)
Have PCP (vs. Not)	0.466	0.14	(-0.156, 1.088)

Annual ED Visits in 2019			
0-2			
3-5	0.020	0.96	(-0.782, 0.822)
>5	0.039	0.93	(-0.841, 0.918)
Annual Outpatient Clinic Visits in 2019			
0-2			
3-5	-0.089	0.79	(-0.743, 0.566)
>5	0.590	0.09	(-0.090, 1.270)

Figures

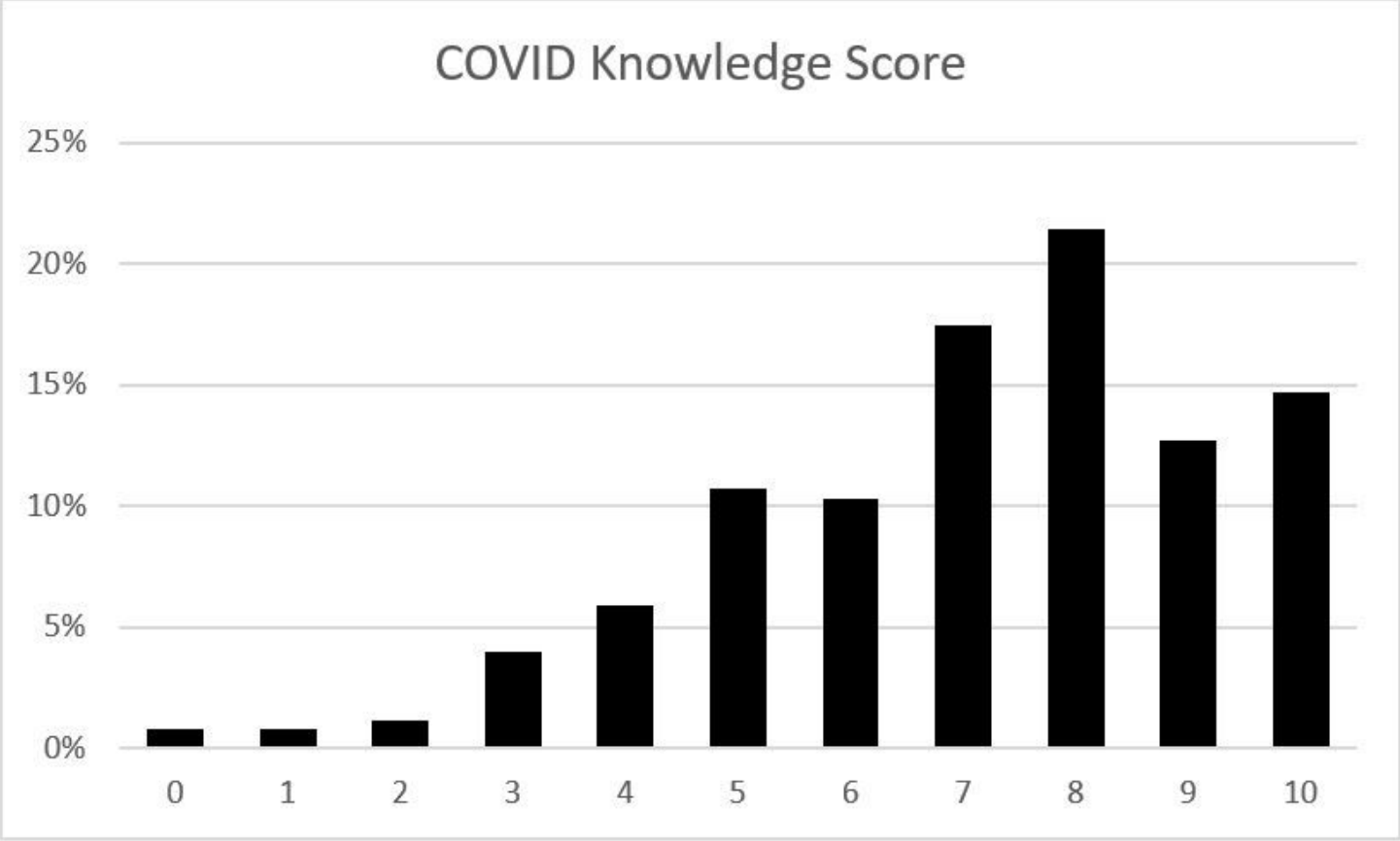

Figure 1

COVID Knowledge Score(N=252)

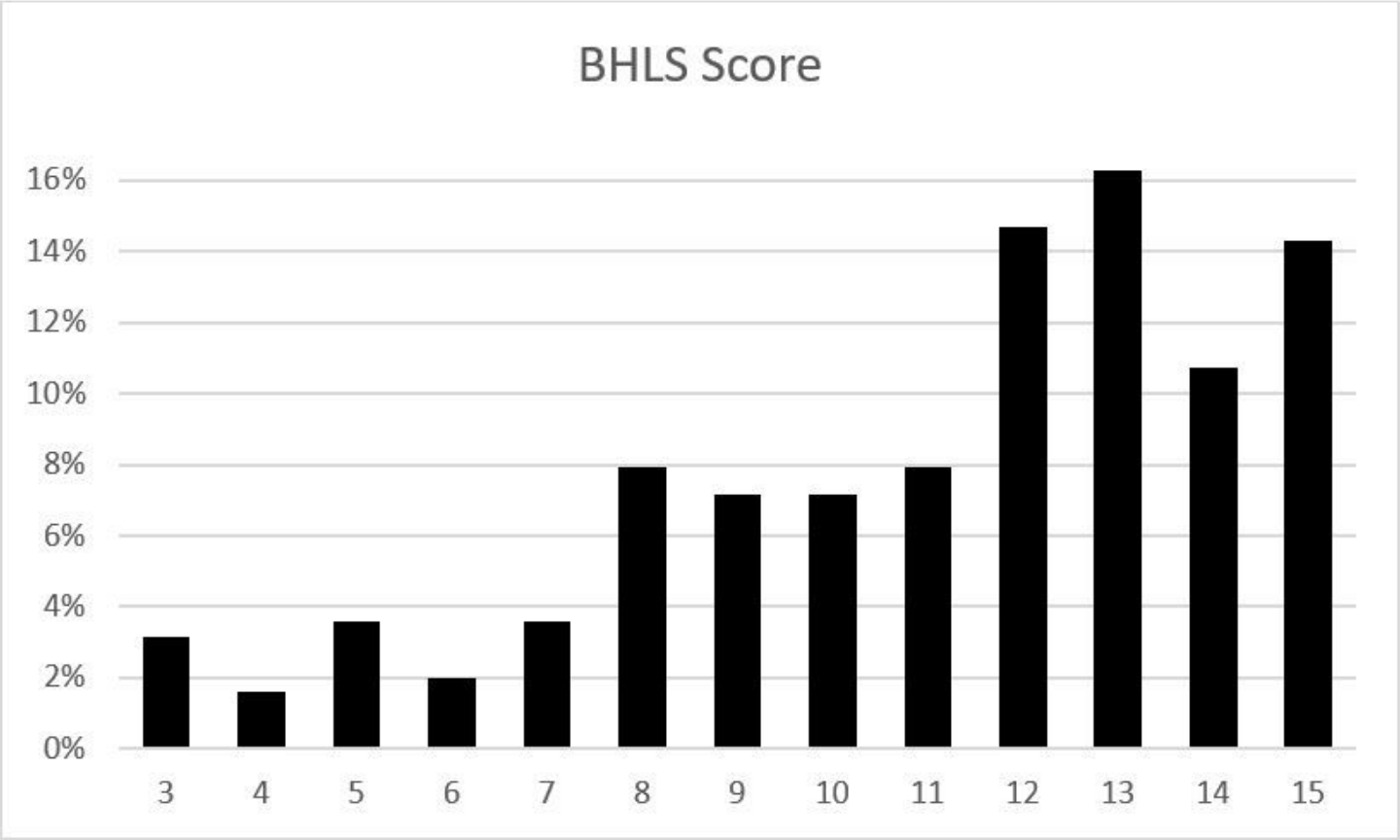

Figure 2

BHLS Score (N=252)