
ORIGINAL ARTICLE

Mental health and lifestyle behaviors of students in a doctor of chiropractic program

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ABSTRACT

Objective: Health professional students' mental health and lifestyle behaviors may impact their personal health as well as their clinical practice. The objective of our retrospective study was to see if there were changes in students' mental health and lifestyle behaviors during their doctor of chiropractic program (DCP).

Methods: In 2019, we identified health center files for 198 students who graduated from our DCP between 2015 and 2016, of which 69% ($n = 137$) contained Health Insurance Portability and Accountability Act (HIPAA) consent forms granting permission for file review. From each of these files, we extracted mental health and lifestyle behavior data that students self-reported at the beginning and end of their DCP. Data were analyzed with descriptive statistics, paired t test, sign test, and McNemar's chi-square test.

Results: The majority of our students reported drinking alcohol, engaging in regular exercise, and not smoking at the beginning and end of our DCP. Comparing pre and post data, there was a statistically significant increase in water, fruit, and vegetable consumption along with an increased proportion of students reporting eating junk food and drinking 1 or more servings of caffeine ($p \leq .002$). The proportion of students reporting anxiety or depression decreased between the beginning and end of our DCP ($p = .002$).

Conclusion: This study provided information about student mental health and lifestyle behaviors at 1 DCP. We recommend future studies use validated questionnaires across multiple DCPs. There also may be a need for intervention research to decrease DCP student alcohol use.

Key Indexing Terms: Education; Chiropractic; Health Behavior; Health Risk Behaviors

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INTRODUCTION

Lifestyle behaviors can reduce risk for the first and second leading causes of death in the United States, heart disease and cancer.^{1–3} Lifestyle behaviors of health professional students may impact not only their personal health, but also their academic and professional success. Self-reported academic consequences of medical student alcohol or drug use, for example, include missed classes, poor test performance, and memory loss.⁴ Ten percent of medical students report driving while under the influence,⁴ which can jeopardize licensure. Several studies also indicate an association between medical students' lifestyle behaviors and their patient interactions including their attitudes towards counseling patients on preventive health strategies.^{5–8}

Specific to health habits and lifestyle behaviors of chiropractic health professional students, prior research has suggested that chiropractic students may become less physically active as the time demands of their curricular program increases, and that students prone to binge-drinking (5 or more drinks in 1 occasion) may increase those behaviors over the long-term course of their intensive curricular program.⁹ Binge drinking may be a coping mechanism for anxiety, stress, and depression,¹⁰ conditions commonly reported among chiropractic students in Canada.^{11,12} Conversely, chiropractic students may also be more likely to use nutritional supplements.¹³

We were interested to learn about the health and lifestyle behaviors of students at Life Chiropractic College West, as well as whether our students might exhibit changes over time. An increase of negative behaviors could reflect an unhealthy response to the pressures of a demanding curriculum, whereas a tendency toward adopting more healthy behaviors may be a positive outcome of

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students' learning more about health during their time in chiropractic school. Specifically, our study aims were to see if there was an appreciable change over time in the mental health and lifestyle behaviors of DCP students, as self-reported in their wellness questionnaires (WQ) during their time as a student patient in our college teaching clinic.

METHODS

Each student attending our chiropractic college is paired in their first year with a senior intern working in the school's health center to provide them with chiropractic health care. As a student patient, the student is asked to periodically complete a WQ with general questions about one's health habits and activities including diet, exercise, sleep, tobacco, caffeine and alcohol use, as well as questions about stress, anxiety, and depression. WQ information is gathered from student patients during periodic re-evaluations (approximately every 12 weeks) by their interns throughout their 3–4 years in the program to guide the course of their care as patients. The data are collected in their patient files for purposes of patient care and teaching, not originally for research purposes. The WQ was developed by clinicians in our college teaching clinic. Though their health expertise gives face validity to the questionnaire, the WQ has not yet been tested for construct validity or reliability. A sample WQ is available as an online appendix to this article (Appendix 1).

Sample and Data Extraction

A total of 199 students graduated from our DCP between 2015 and 2016. The Health Insurance Portability and Accountability Act (HIPAA) protects patient health information in the United States, and we had HIPAA authorization to manually review 160 of these student patient files. In each patient file, we identified multiple WQ forms that were completed near the earliest time of the student's matriculation into the college, and those forms completed nearest to the date when the student patient graduated (a period of approximately 4 years). From each student patient file, we collected data from 4–6 WQ forms (2–3 of the oldest, and 2–3 of the most recent forms out of an approximate total 10–12 WQs in the file), to construct a comprehensive dataset representing earliest and latest data entries separated by 2 years or more. Our final dataset contained WQ information on 137 students who had graduated and had student patient files containing at least 2 wellness questionnaires with measurable self-reported data from the beginning and near the end of their time in the DCP.

Patient Protection

In addition to using data that were not initially intended for research purposes, we only used files of students who had graduated from our DCP. We extracted only non-identifiable information from the completed WQ patient forms and assigned an anonymized case identification number to the data extraction sheets so that deidentified data could not be associated with any particular patient during analysis. Age and gender were excluded to further

protect student identity. This research was exempted from review by the Life Chiropractic College West institutional review board.

Variables

We extracted data from the WQs for the following mental health variables for 137 students: average level of stress, general state of well-being, and general outlook and attitude on a scale of 0–10. For the well-being and general outlook variables, 10 indicated the “best” (highest) level of well-being and general outlook and 0 was the “worst” (lowest) level. For the stress variable, 10 indicated the “worst” (highest) level of stress and 0 was the “best” (lowest) level of stress. We also had 2 dichotomous mental health variables: anxiety or depression (yes or no) and under treatment for anxiety or depression (yes or no).

For lifestyle behaviors, we included the following variables measured on a continuous scale: weekly frequency of alcohol consumption; weekly frequency of exercise; nightly hours of sleep; and the number of daily meals, sweets, fast food servings, 1/2-cup servings of fruit, 1/2-cup servings of vegetables, 8-ounce cups of caffeine, and 8-ounce glasses of water. In addition to these continuous variables, we had 8 dichotomous yes/no lifestyle behavioral variables: skipped meals, eat junk food, change in appetite, food intolerance, alcohol consumption, tobacco use, exercise, and restful sleep.

To compare our results to a research study of California pharmacy and medical students, we created a combined ordinal variable for daily fruit and vegetable servings with 3 levels (<4 servings, 5–7 servings, and 8 or more servings).¹⁴ We also created a dichotomous variable for fruit and vegetable consumption for 8 or more servings and 7 or less servings as well as a dichotomous variable for caffeine consumption (<1 as “no” and 1 or more as “yes”).

Statistical Analysis

We used STATA 15IC (StataCorp; College Station, TX, USA) for descriptive and inferential statistics and excluded missing answers from the analyses. For our analyses comparing pre- and post-WQ continuous variables, we used paired *t* test and the sign test since the difference between pre and post was not normally distributed for several variables based on Shapiro–Wilk and Kolmogorov–Smirnov tests. We compared pre- and post-WQ categorical variables with McNemar's chi-square test. We used Bonferroni correction to account for multiple hypothesis testing and set our alpha level to .002.

RESULTS

From our 137 files, not all data were complete, and the number of paired data that we had differed for each of our variables. For example, 136 students had paired data for their self-perceived general well-being while only 83 students had paired data on the number of times they drank alcohol per week and only 36 students had paired data on whether they were receiving current treatment for anxiety or depression.

Table 1 - Student Average Mental Health and Lifestyle Behaviors at the Beginning and End of a Doctor of Chiropractic Program

Variable (Number of Students With Paired Data for the Variable)	Mean Score at the beginning of DCP (95% CI)	Mean Score at the End of DCP (95% CI)
General well-being* (136)‡	7.85 (7.65, 8.07)	8.72 (8.54, 8.91)
General outlook & attitude (101)	8.39 (8.02, 8.76)	8.93 (8.65, 9.2)
Average level stress (135)	5.15 (4.78, 5.52)	4.54 (4.12, 4.97)
Meals/d* (136)‡	3.28 (3.13, 3.43)	3.06 (2.93, 3.18)
Daily servings fruit* (131)‡	2.11 (1.89, 2.33)	2.55 (2.32, 2.77)
Daily servings vegetables* (133)‡	2.8 (2.54, 3.06)	3.85 (3.57, 4.13)
Daily servings sweets (113)	0.73 (0.58, 0.88)	0.61 (0.48, 0.73)
Daily servings fast food (114)	0.15 (0.06, 0.24)	0.19 (0.09, 0.3)
Daily servings water‡ (132)	6.9 (6.23, 7.59)	7.57 (7.08, 8.06)
Daily servings caffeine (126)	1.16 (0.95, 1.4)	1.22 (1.07, 1.37)
No. of times drank alcohol/wk (83)	1.83 (1.4, 2.6)	1.89 (1.5, 2.23)
No. of times exercised/wk (115)	3.67 (3.4, 3.97)	3.66 (3.3, 4.02)
Hr of nightly sleep (136)	6.8 (6.65, 6.98)	6.93 (6.8, 7.06)

CI = confidence interval; DCP = doctor of chiropractic program.

* $p \leq .002$ for difference in means (paired t test); ‡ $p \leq .002$ for difference in median (sign test).

We observed statistically significant changes at alpha level .002 for the average difference between pre- and post-data for the following variables: well-being (increased 0.87 points; 95% confidence interval (CI): 0.62–1.12; $P < .001$); daily meals (decreased 0.23; 95% CI: –0.1 to –0.36; $P = .002$); daily fruit intake (increased by 0.44 servings; 95% CI: 0.18–0.69; $P = .002$); daily vegetable intake (increased by 1.05 servings; 95% CI 0.76–1.34; $P < .001$); and water consumption (increased by 0.66; 95% CI: 0.02–1.29; $P < .001$). (Table 1)

We also found statistically significant differences in the proportions of students responding *yes* to 1 or more cups of daily caffeine (proportion increased by 0.14; 95% CI: 0.05–0.23; $P = .001$); consuming 8 or more $\frac{1}{2}$ cup servings of fruit and vegetables (proportion increased by 0.15 (95% CI: 0.06–0.23; $P < .001$) and eating junk food (proportion

increased by 0.29; 95% CI: 0.18–0.4; $P < .001$) (Figure 1). The proportion of students who reported having anxiety or depression decreased by 0.13 (95% CI: –0.21 to –0.05; $P = .002$).

DISCUSSION

The majority of students in our study reported participation in regular exercise; no smoking; and high general states of well-being, outlook, and attitude at the beginning and end of the DCP. There was a statistically significant increase in water, fruit, and vegetable consumption between the beginning and end of our DCP, along with an increased proportion of students reporting eating junk food and drinking 1 or more servings of caffeine. Though we cannot generalize the results of this explorato-

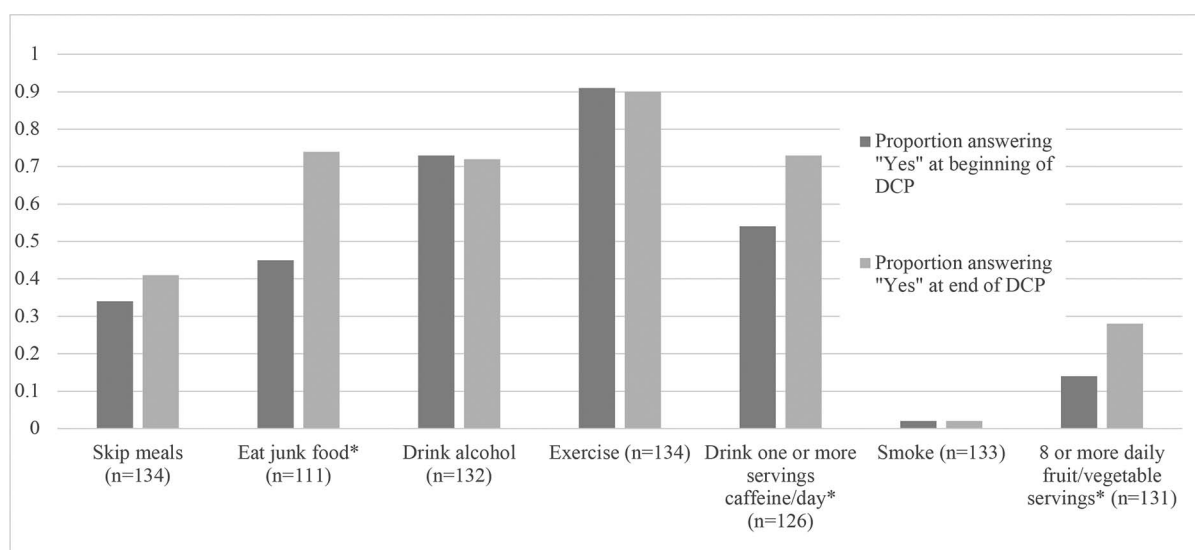


Figure 1 - Student lifestyle behaviors at the beginning and end of a doctor of chiropractic program (DCP). * $p < .002$; McNemar's chi-square test.

ry study of students from 1 DCP, it is interesting to compare our results to other studies assessing mental health and lifestyle behaviors in health professional students.

In a cross-sectional study of Canadian chiropractic students, the “one-week prevalence of moderate to extreme symptoms was 19.0% (95% CI: 13.0–25.0) for depression and 32.6% (95% CI: 24.7–40.3) for anxiety.”¹¹ In our study, we found about 20% of our students reported anxiety or depression in their WQs at the beginning of our DCP. However, this was reported in less than 10% of WQs at the end of the program. Similarly, in a longitudinal study of Canadian chiropractic students, investigators found that students were least likely to report depression in their 4th year of the program.¹²

Spegman et al reported higher levels of average stress (on a scale of 0–10) in their sample of chiropractic students than we found in our study; however, they were looking at students in the second year of their program, which is the same time that Kingsinger et al found students to be most vulnerable to depression.^{12,15} The average stress levels Spegman et al reported for 7th and 8th quarter students, respectively, were 6.43 (SD = 1.89) and 5.48 (SD = 1.74).¹⁵ We found that our students reported average stress of 5.16 (SD = 2.18) at an early point in the DCP and 4.5 (SD = 2.5) at a late point in the program, but this difference was not statistically significant. Another interesting finding by Spegman et al was an inverse association between chiropractic intern stress and perceived confidence, with 8th quarter students who reported feeling more “stressed out” more likely to report feeling less confident as an intern.¹⁵

Frank et al observed “78% of medical students reported drinking alcohol in the past month, 34% excessively.”⁶ They defined excessive drinking as “at least one occasion on which ≥ 5 drinks consumed or > 2 drinks/d on average in men or > 1 drink/d on average in women.”⁶ Regular use of alcohol in medical school has also been associated with physician alcohol abuse.¹⁶ Furthermore, student alcohol use may be associated with patient care.^{5,6} The study by Frank et al with senior medical students found those who abstained from alcohol or drank nonexcessively were more likely to provide frequent alcohol counseling to patients.⁶ Though we did not include information on the number of drinks in our study, our findings were similar to Frank et al in that about 3/4 of our students reported drinking alcohol and that there was not a statistically significant change in this proportion over the course of the DCP.

Current dietary guidelines from the US Department of Agriculture recommend Americans consume a minimum of seven 1/2-cup servings of daily fruits and vegetables for adults ages 19–59 (for a 1600-calorie diet; 9 servings for a 2000-calorie diet).¹⁷ We reviewed 2 studies that found an association between medical students’ fruit and vegetable intake and their attitudes towards providing patient nutritional counseling.^{5,8} Specifically, Duperly et al found 5th-year Colombian medical students who consumed 5 or more daily servings of fruits and vegetables were more likely to agree or strongly agree that it is important for physicians to counsel patients on this behavior.⁵ Whipps et

al found that osteopathic students in Ohio who ate 3 or more vegetables per day and 2 or more fruits per day had higher pediatric dietary counseling scores (including agreeing with “physicians have a responsibility to promote eating a healthy diet with their patients”) compared with students who had lower levels of vegetable and/or fruit intake.⁸ Specific to chiropractic students, DuMonthier et al found students with vegetarian diets (compared to students who reported heavy meat consumption) were more likely to rate as important that chiropractors educate patients on healthy behaviors and to model healthy behaviors.⁹

In 14% of our reviewed files, students reported meeting fruit and vegetable dietary guidelines at the beginning of the DCP, which is similar to the 15% of Ohio osteopathic students meeting these guidelines in a 2019 study by Whipps et al⁸ and higher than the 10% reported by California pharmacy and medical students in the study by Bergeron et al.¹⁴ By the end of our DCP, 30% of our students reported meeting these guidelines. We also observed 76% of our students reported eating 5 or more daily fruit/vegetable servings at the end of their DCP, compared to 40% of 5th-year students consuming this amount in a study of medical students.⁵ One possible explanation for the higher level of fruit and vegetable consumption among our students at the end of their program is that they receive 50 hours of basic and applied nutrition throughout the curriculum. This is over twice the number of hours Bergeron et al reported for medical students; however, students surveyed by Bergeron et al reported lack of time as the biggest barrier to a healthful diet, not lack of knowledge.¹⁴ Interns in their 3rd to 4th year at our DCP often report difficulty with time management, which could perhaps explain the increase in fast food consumption we observed in our study at the end of the program compared to the beginning.

Our study only assessed the self-reported health and behaviors of our chiropractic students, and we cannot directly link their behaviors as students to their actual patient care practices. Other research has reported that health professional students who are inattentive to managing their own stress,¹⁵ alcohol use,^{5,6} and nutrition^{5,8,9} are also less likely to promote healthy behaviors for stress management, alcohol, and nutrition for patients in their clinical practices. In which case, programs aimed at improving the mental health and lifestyle behaviors of health professional students may also “pay forward” to the benefit of their prospective future patients. One example of an intervention that could be added to a DCP is a behavioral change project, such as the one implemented by Northwestern University Feinberg School of Medicine with 343 second-year medical students.¹⁸ At Feinberg, students had to complete a 12-hour, 6-week “Health Living” course during which they formulated a behavior change plan. They began by selecting a personal behavior to change (exercise, nutrition, sleep, personal habits/hygiene, study/work habits, or mental/emotional health) and then they monitored their current behavior; researched this behavior; set a personal goal; tracked progress; and finally self-assessed their success. The conclusion of the study asserted that, “completing a behavior change plan is

a valuable and effective exercise that enables medical students to practice the strategies and skills and experience the obstacles of changing health behavior.”¹⁸

Strengths and Limitations

In this study, we were able to collect data on a wide variety of mental health and lifestyle behaviors for 137 chiropractic students. A strength of our study is the longitudinal design and our collection of data from students at the beginning and end of their doctor of chiropractic program. We were not able to include 20% of initially identified student patient files (n = 198) because the files did not contain HIPAA consent for review. Of the HIPAA-authorized files that we accessed (n = 160), we dropped another 15% of those cases because their WQ forms were too incomplete to be included in this study. This may have introduced a source of sampling bias into our study, since students who refused HIPAA consent for their files, or who did not complete their WQ forms, may have had different mental health status and or different lifestyle behaviors than students who did provide HIPAA consent or who had more complete WQ data.

There may also have been reporting bias in our data as the WQ has not been tested for validity or reliability. The question with the most incomplete data was about receiving treatment for anxiety or depression. This suggests students may not have felt comfortable accurately answering all of the questions. They also may have answered in a way they thought was socially desirable, rushed through the forms, or copied answers from their previous WQs. We do not have details for how the interns communicated about these forms to their student patients and different instructions may have created additional bias.

Another limitation of our study is we did not collect data on student demographics or other variables that may be associated with their mental health and lifestyle behaviors. For example, 1 study of medical students in Poland found during examination study periods students decreased exercise and consumed more sweets and coffee.¹⁹ We do not know what students’ academic loads were at the time they completed their WQs nor if these differed between the early and late WQ collection periods.

Next Steps

For our retrospective study, we used data from completed WQ forms that could be accessed from our archived store of patient records and provided basic health behavior information from our students as chiropractic patients at an early timepoint vs late timepoint in their DCP. Our study findings and the literature we reviewed in our discussion highlight the importance of addressing lifestyle behaviors among health professional students. Attempting to compare our results to previous studies demonstrated the need to edit our college’s wellness questionnaire to better align with state and national public health surveys. This would allow for easier research comparison as well as improved case management and ability to address Healthy People 2030 objectives.²⁰

We are also interested in collaborating with other DCPs to assess students’ mental health and lifestyle behaviors using validated surveys such as Southern Illinois University’s Core Alcohol and Drug Survey.²¹ The prospective collection of new student survey data with a prevalidated survey would be an extensive undertaking. This would pose multiple additional challenges with logistics and compliance such as recruiting students’ voluntary participation to complete the survey on their own time or setting aside valuable classroom time (where participation rate might be highest)²² to administer the survey, and tracking and linking their survey responses over multiple timepoints prior to their graduation.

CONCLUSION

Our study compared the self-reported mental health and lifestyle behaviors of chiropractic students early and late in their DCP. Overall, our students reported health-promoting lifestyle behaviors throughout the DCP. We observed some changes in lifestyle behaviors that could either promote or detract from health over the course of the DCP as well as a high prevalence of alcohol use, although this was poorly defined in our available records. These findings highlight the need to follow this exploratory, retrospective study using student health records with a prospective design with prevalidated questions.

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