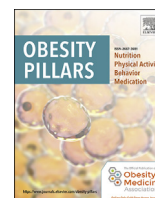




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Impact of COVID 19 pandemic lockdown on weight of patients in outpatient setting



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ABSTRACT

Background: Maintaining body weight is a delicate balance achieved by proper nutrition, optimal sleep, stress management and adequate exercise. The COVID-19 pandemic and the subsequent lockdown presented unique challenges including access to a proper diet and/or right physical activity and change in stress levels as well as changes in sleep duration and pattern.

Methods: Patients in an outpatient practice were handed the survey questionnaire which they patients completed and handed back at check out. This was a one-time survey. Questions included information about weight before and after lockdown/stay at home order, food intake, physical activity, sleep and stress levels. Using IBM SPSS Statistics Software analysis of variance was calculated for each group with a determined alpha value of 0.05. This was used to determine statistical significance in weight change between the groups.

Results: A significant difference in weight change based on patients' self-report of change in stress levels was found with $p = 0.04$. Of individuals who reported a decrease in stress had a mean weight loss of 3.58lbs, while individuals who reported an increase in stress reported a weight gain of 2.39lbs.

Conclusion: In our study, we did find that the COVID restrictions have impacted all the above-mentioned lifestyle contributors, but we could only derive significant association between decreased stress and weight loss. Although we did see weight changes with change in all the above variables, it was not statistically significant.

1. Introduction

Maintaining body weight is a delicate balance achieved by proper nutrition, optimal sleep, stress management and adequate exercise [1–5]. The COVID-19 pandemic and the subsequent lockdown/stay-at-home order presented unique challenges to individuals and families for which we as a society were unprepared for. This includes access to a proper diet and/or right physical activity and change in stress levels as well as changes in sleep duration and pattern. There has been an increase in physical inactivity and sedentary lifestyle because of COVID restrictions to prevent the spread of the virus, time spent outdoors decreased and screen time increased [6]. Because of school closures, many adults had to stay home with their young children and were caring for them while working at the same time, this caused an increase in stress levels and decrease in sleep for some individuals [7]. Whereas, others saved time required for driving to work and thus experienced improved stress levels and sleep duration [8].

Obesity is a well-known risk factor for severe COVID symptoms and other respiratory infections [9]. Obesity is associated with increased morbidity and mortality [10]. In addition, it is a tremendous economic burden to the health system because of being a risk factor for many other diseases including but not limited to hypertension, hyperlipidemia, cardiovascular disease, osteoarthritis, obstructive sleep apnea, depression, and certain types of cancer [11–13]. It is also an established fact that healthful lifestyle and behaviors can boost the immune system thereby increasing our capacity to combat various infections [14]. Because of this, it is imperative that we continue to study the various factors that affect weight and attempt to form strategies to prevent weight gain.

This study investigated if the patients in an outpatient setting had a change in weight and explored the reasons for this change. This study will help us identify if an individual's weight change occurred during the pandemic and what factors influenced this change. This can further help our understanding of these situations and come up with better plans to combat the problem in the future should the need arise.

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2. Methods

The hypothesis that reduced physical activity with or without increased food intake along with altered sleep and stress levels during the lockdown/stay at home order would have caused weight gain in the participants. The results were correlated to the demographics (age, sex and race) that were collected.

Patients coming to the office for well visits or sick calls were approached and asked if they were willing to participate in the study. If the patients agreed, the medical assistant rooming the patient handed them the survey and patients were directed to the Principal Investigator (PI) to ask questions if any. The PI answered any questions and patients completed the survey and handed it back at check out. This was a one-time survey. Any participant, both males and females, over the age of 18 years were included in the study. Any non-English speaking patients were excluded from the study. No names or other identifiers were collected and hence there is minimal risk of loss of confidentiality. Participants were informed that participation is voluntary and their decision to not participate in the study will not affect their relationship with the office or Physician. The survey took approximately 5 min to complete. Participants were not offered any kind of compensation. 492 patients completed the survey. Questions included information about weight before and after lockdown/stay at home order, food intake, physical activity, sleep and stress levels. Confidentiality was maintained by handing the survey and answering questions in a private room.

Using IBM SPSS Statistics Software (18.0.1.1) analysis of variance was calculated for each group with a determined alpha value of 0.05. This was used to determine statistical significance in weight change between the groups.

3. Results

3.1 Demographics: 61.4% of the participants are females. The age range was 18–92 years old and the average age of participants in the sample is 60 years old. Of the 442 participants, who reported their race/ethnicity, 365 reported to be White, 46 African American, 18 Hispanic, 8 Asian, and 5 reported “Other”. Regarding age, the sample had an average age of 60 years old with 25% of the sample being under the age of 35 and over half of the sample being above the age of 50. Most individuals in this study are of older age and since the study is investigating the impact of various behaviors on weight gain or loss during COVID lockdown procedures, the potential cofounder age was not considered.

3.1. Stress levels

A significant difference in weight change based on patients’ self-report of change in stress levels was found with $p = 0.04$ (Table 1). Of individuals who reported a decrease in stress had a mean weight loss of 3.58 lbs., while individuals who reported an increase in stress reported a weight gain of 2.39 lbs. Additionally, patients who reported no change in stress levels had a mean weight gain of 3.89 lbs.

3.2. Sleep duration

No significant difference ($p = 0.371$) in weight change between groups that reported sleeping more versus groups that slept less was

Table 1

Figures the average change of weight in patients who reported increased, decreased, or no change in stress levels. Negative average represents average weight loss, while positive average signifies weight gain. P-value is from calculation of between groups analysis of variance.

Stress Level	Mean Weight Change	Sample Size	p -value
Increased	2.39 lbs	220	0.04
Decreased	-3.58 lbs	38	
No Change	3.89 lbs	161	

found using ANOVA analysis (Table 2). The patients who reported sleeping more gained an average of 0.78 lbs., while patients who slept less or spent the same amount of time sleeping had an average weight gain of 1.44 lbs. and 3.35 lbs. respectively.

3.3. Physical activity

No significant difference ($p = 0.812$) in average weight change between groups that reported increased physical activity and those that did not (Table 3). Patients who reported an increase in physical activity had a mean weight gain of 1.08 lbs., while patients who had a decreased or no change in physical activity had an average weight gain of 2.51 lbs. and 2.74 lbs. respectively.

3.4. Home cooking

ANOVA analysis found no significant difference ($p = 0.683$) in average weight change between groups that increased home cooking and those that did not (Table 4). Patients who reported an increase in home cooking had a mean weight gain of 1.73 lbs., patients who had decreased frequency of home cooking had an average weight gain of 3.96 lbs., and patients who reported no change had an average weight gain of 2.88 lbs.

3.5. Food intake

No significant difference ($p = 0.103$) in average weight change between groups that increased, decreased, or had no change in food intake was found using ANOVA analysis (Table 5). With this being said, the group that reported a decrease in food intake had an average weight loss of 1.95 lbs., while the groups that reported increase or no change had an average weight gain of 2.41 lbs. and 3.44 lbs. respectively. While no significance was found statistically, the group that reported lower food intake had an average weight loss while other groups had weight gain.

3.6. Remote work

No significant difference ($p = 0.214$) in average weight change

Table 2

Figures the average change of weight in patients who self-reported increased, decreased, or no change in sleep duration. P-value is from calculation of between groups analysis of variance.

Sleep Duration Change	Mean Weight Change	Sample Size	p-value
Increase	0.78 lbs	90	0.371
Decrease	1.44 lbs	85	
No Change	3.35 lbs	245	

Table 3

Figures the average change in weight of patients who reported to have increased, decreased, or have not changed their amount of physical activity. P-value was calculated by between groups analysis of variance test.

Change in Physical Activity	Mean Weight Change	Sample Size	p-value
Increase	1.08 lbs	53	0.812
Decrease	2.51 lbs	215	
No Change	2.74 lbs	153	

Table 4

Depicts mean change of weight in patients who increased, decreased, or did not change the amount of meals per week they cooked at home. P-value is derived from a test of between groups analysis of variance.

Change in Home Cooking	Mean Weight Change	Sample Size	p-value
Increase	1.73 lbs	199	0.683
Decrease	3.96 lbs	30	
No Change	2.88 lbs	191	

Table 5

Compares the average change in weight of patients who reported to have increased intake of food with those who reported decreased intake of food. Negative average represents average weight loss, while a positive average signifies weight gain. P-value was calculated by between groups analysis of variance test.

Change in Food Intake	Mean Weight Change	Sample Size	p-value
Increase	2.41 lbs	146	0.103
Decrease	-1.95 lbs	52	
No Change	3.44 lbs	222	

Table 6

Depicts the average change in weight of patients depending on settings of work: remote, in-person, hybrid, or not applicable. P-value is derived from a test of between groups analysis of variance.

Work	Mean Weight Change	Sample Size	p-value
Remote	5.84 lbs	88	0.214
In-Person	1.90 lbs	256	
Hybrid	3.02 lbs	55	
Not Applicable	-0.31 lbs	51	

between groups that had remote work and those that had in-person work, or hybrid (Table 6) was found. The average weight gain of individuals who worked remotely was 5.48 lbs., and those who worked in-person and hybrid had an average weight gain of 1.9 lbs. and 3.02 lbs.

3.7. Weight loss intervention

No significant difference in weight change ($p = 0.768$) was found between patients that reported undergoing an intervention for weight loss versus those who did not using ANOVA analysis. The group reporting taking an intervention had an average gain of 1.72 lbs., while the group that did not report a weight loss intervention had a mean gain of 2.43 lbs.

3.8. Hospitalization

Using ANOVA analysis, no significant difference in weight change was observed ($p = 0.784$) between patients who were hospitalized and those who were not. Patients who were hospitalized had a mean gain of weight of 1.86 lbs. and patients who were not hospitalized had an average gain of 2.50 lbs.

4. Discussion

The effect of lifestyle contributors on weight gain has been studied extensively and is found to be monumental. Through our study, we attempted to find the effect of the COVID lockdown on these contributors.

The relationship between stress and obesity has been studied previously and strong association between increased stress and weight gain is documented. This has been thought to occur because of stress related increased stimulation of the hypothalamic-pituitary-adrenal axis and the resultant glucocorticoid excess [15]. The finding that decreased stress is directly related to weight loss could be explained by this. Most participants (52.5%) in our study reported increased stress and had a mean weight gain of 2.39 lbs. The number of individuals who reported decreased stress was relatively low at 9.1% but was associated with significant mean weight loss of 3.56 lbs. The participants who did not report change in stress levels (38.4%) also had a mean weight gain of 3.8 lbs. although the number is fairly small, and significance could not be established.

Most study participants did not believe that their sleep duration had

changed but the mean weight gain in this group was about 3.4 lbs. which was still not significant. There was an increase in weight in all groups, but the least weight gain was in the group that reported an increase in sleep duration. Association between decreased sleep, late bedtime, night shift work and obesity has been consistently identified by epidemiological studies [16]. This is speculated to be happening secondary to reduced energy expenditure, increased food intake, decreased satiety hormones and increased ghrelin levels [17].

Regarding physical activity, the majority of study participants reported decreased physical activity while some stated it was unchanged and only few were able to increase their physical activity. Although not significant, the group with decreased and unchanged physical activity reported more weight gain. Also, participants working remotely or in a hybrid setup gained more weight than individuals who worked in person. This is in accordance with the previous data that supports strong correlation between physical activity and maintenance of weight loss [18].

The changing food contexture worldwide over the years is one of the major causes of increased incidence of obesity in adults and children. Access is increased to convenient, energy dense foods with increased palatability. Multiple studies have also demonstrated an association between ultra-processed foods and obesity [19]. Restrictions during the pandemic have altered the amount of food intake as well as the type of foods consumed [20]. According to our survey, 34.7% of the study participants had reported increased food intake with mean weight gain of 2.41 lbs. whereas only 12.3% reported decreased food intake and had a mean weight loss of 1.95 lbs. The group that stated no change in the food intake consisted of the remaining 52.8% and had a mean weight gain of 3.44 lbs. Participants who admitted having increased their home cooking had mean weight gain of 1.7 lbs. as compared to the group that did not notice any change in their home cooking who had a mean weight gain of 2.88 lbs. The group that had decreased home cooking had a mean weight gain of 3.96 lbs. Even though the results were not significant, this does demonstrate the impact of the pandemic on obesity via increase in the overall calorie intake.

Also, we observed that participants who underwent some form of weight loss intervention, mainly self-directed lifestyle modifications had overall less weight gain. As well as patients who were hospitalized for multiple illnesses including COVID have had less weight gain as compared to the other group. The reason for both of these observations is self-explanatory. We would typically expect weight loss in both of the above situations but most likely because of the COVID restrictions and the above-mentioned changes, it did not occur.

5. Study limitations

Our study did have a few limitations. To start with, all studies that employ survey questionnaires are susceptible to recall bias. The information gained is largely subjective and based on individual perception. Memory does play a key role in this.

Secondly, it has been shown in the previous studies that dietary intake can be misreported [21]. Along with this, there is data suggesting that physical activity can be overestimated [22]. This decreases the accuracy of information collected via the survey questionnaire. This can partly explain the above finding that most study participants did not report changes in their food intake, physical activity, sleep or stress level but still the mean weight changes occurred.

Regarding selection bias, we do not have the information available to discern the differences in the patients who completed the survey versus who declined but it is a possibility that patients perceived change in their weight may have affected their decision to complete or decline the survey. The outpatient practice where the study was conducted has very low percentage of non-English-speaking population. We do not believe this would significantly impact the generalizability of this study.

The reason for a smaller sample is that while designing the study, the focus was on patients at an outpatient practice with the sample size being dependent on the number of patients who voluntarily agreed to be a part of the study around the time of COVID lockdown. Therefore, the sample size could not be increased as the patients who volunteered during that period is what is available for analysis.

Finally, in an attempt to keep the survey questionnaire at a reasonable length we did not include questions regarding other factors that influence change in weight such as alterations in medication regimen, smoking status [23] etc.

6. Conclusions

Obesity is a chronic medical condition that has significant health as well as economic impact. Weight change is influenced by multiple lifestyle factors such as food intake, physical activity, sleep and stress. The COVID 19 lockdown restrictions has affected all of these. In our study, we did find that the restrictions imposed by COVID 19 lockdown have impacted all of the above-mentioned factors, but we could only derive significant association between decreased stress and weight loss. Although we did see weight changes with change in all the above variables, it was not statistically significant. Further studies to keep exploring the influence of various factors on obesity are needed so that we can continue to strengthen our knowledge and build strategies for obesity prevention and treatment especially during unusual circumstances such as a pandemic.

Authorship contributions

Kanchan Pillai (KP) and Mahesh Pillai (MP) have contributed equally and are both first authors on this study. Conceptualization and protocol writing: MP and KP. Data collection: KP. Statistical Analysis: Sishir Doddi (SD). Manuscript writing: KP, MP, SD. All contributors reviewed, edited, and approved the final submission and publication.

Ethical review

This study was approved by the Institutional Review Board. The participants were handed the survey in a private room. No identifiers are collected in the survey. This minimizes the risk of loss of confidentiality.

Source of funding

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Supplement

Survey Questionnaire.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.obpill.2022.100028>.

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