Ketogenic Diet: Is it a doorway to physical and mental health?

by

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Abstract

The prevalence and rise in the reported number of irreversible chronic physical and mental illnesses, and the consequent deterioration in the quality of life of the afflicted compounded by monetary burden associated with pharmacological treatment, has caused a dire need for alternative strategies to promote better health. Recent studies in the last couple of decades have identified the therapeutic potential of low-carbohydrate diets like the Ketogenic diet in treating various chronic conditions. The possibility that healthy diet can induce healing effects to not only prevent and reverse chronic illnesses but also cure an already advanced condition, and the right food intake can be a potential replacement to pharmaceutical methods of treatment which are often needed for life and cause significant side effects, requires serious investigation.

This study aims to uncover, if Ketogenic diet can be used alleviate or cure chronic physical and mental conditions, and eliminate the need for medication to maintain health, from the layman perspective of a ketogenic dieter. The data was collected from 132 respondents who participated in a voluntary questionnaire about the impact Ketogenic diet has had on their health. The potential respondents were identified from Ketogenic diet related Facebook forums and the survey measured their perceived improvement in health and resulting reduction in medication on a linear scale and other factors like Energy, Mood, Cognitive Function, etc. as indicators of improved health. The data was used to perform quantitative descriptive analytics to depict the summary of information gathered from the questionnaire. The results reveal that there is strong evidence that participants of this study saw a remarkable improvement in their health, and that Ketogenic diet can potentially alleviate and cure chronic physical and mental conditions, and reduce or eliminate the need for pharmacological treatment to manage it.

Keywords: Ketogenic diet, chronic illness, mental health, medication

1.0 Introduction

The Ketogenic diet has gained traction in the recent years, as a healthy diet and lifestyle choice after increasing number of evidence has come to light in the form of personal anecdotes of success stories of people who have adopted the ketogenic diet and restored their health. Although the popularity of ketogenic diet has increased only in the recent past, as much as two decades, their therapeutic abilities have been known as early as 1920 after a clinical trial aimed at treatment of epilepsy was successful (Kessler, Neal, Camfield, & Kossoff, 2011). In the recent past, therapeutic use of ketogenic diets in treating chronic illnesses and diseases has been studied with positive results. Consequently, it warrants the question, if the chronic conditions that are widely believed to be incurable but only manageable with medication, can in fact be cured. According to National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) as seen on their website on 8th February 2019, 90% of the nation's $3.3 trillion in annual health care expenditures are allotted to treatment of chronic and mental health conditions ("Health and Economic Costs of Chronic Disease | CDC," n.d.). If practicing low-carb diets like ketogenic diet can lead to reduction in dependence on pharmaceutical medication and make way for a healthier life, it could have a significant beneficial economic impact and also lead to a healthier lifestyle. Hence, it is worth exploring the idea of using diet as medicine to prevent, manage and even cure chronic conditions.

This paper will explore the effects of ketogenic on mood, energy levels, improvement in chronic conditions including mental health, and consequent reduced need for medication to manage it.

2.0 Literature Review:

Ketogenic diet has gained popularity due to patients taking it up to lose weight. So, to begin with, there have been numerous studies proving the long term effects of ketogenic diet in treating obesity patients

overcome their weight issues and get to their ideal weight. According to the study from 2004 (Dashti et al., 2004) ketogenic diet significantly reduces body weight and body mass index of the patients. It also helped reduce the level of triglycerides and blood glucose levels, without any significant long term side effects. On major advantage of sustaining the weight loss compared to the traditional high-carb low-fat diets it allows the calories to be cut down dramatically due to the reported lack of hunger. It has proven to be a more effective treatment than low-fat diet regime due to the ability to stick to the diet due to reduction in craving and hunger (Yancy, Olsen, Guyton, Bakst, & Westman, 2004) . The lack of hunger contributes to the depletion of liver's glycogen stores contributing to the sustenance of the ketosis state.

Insulin resistance refers to the condition of the body cells' inability to absorb circulating glucose in the blood stream, due to which higher levels of insulin is produced by the pancreas with no success in producing the desired effect of enabling the cells to absorb the glucose in the blood stream causing the blood-sugar levels to go high. The condition of insulin resistance leads to pre-diabetic state and finally diabetes. The insulin resistance which manifests as carbohydrate intolerance contributes to converting carbohydrates to fat causing obesity and increasing the risk for diabetes and cardiovascular diseases. The reduced blood glucose levels due to ketogenic diets thus improved blood glycemic control and reduced HbA1c levels (Nielsen & Joensson, 2008). A low-carb ketogenic diet improved glycemic control in patients with type-2 diabetes due to being effective in reducing insulin resistance and reduced blood glucose levels to an extent that medications were reduced or even discontinued in most participants in a study done with 28 participants, despite the small sample size and short duration follow up (Yancy et al., 2004). Another study conducted amongst obese diabetic patients deemed it safe to use for a longer period of time amongst obese diabetic subjects (Dashti et al., 2007).

Carbohydrate restriction and nutritional ketosis improved most biomarkers in cardiovascular diseases, led to decrease in blood pressure and inflammation (Bhanpuri et al., 2018). There is evidence of

ketogenic diet proving to be an effective treatment in preventing and treating increasingly prevalent neurodegenerative diseases like Alzheimer's (Broom, Shaw, & Rucklidge, 2019) and epilepsy, because the ketone bodies produced as a result of the diet act as a neuroprotective agents (Bough & Rho, 2007).

There is emerging evidence of effectiveness of ketogenic diets in treating conditions like cancer, polycystic ovary syndrome, etc. A pilot study performed with 16 patients with advanced cancer concluded that the ketogenic diet does not have any adverse side effects and improved quality of life and some blood parameters with advanced metastatic tumors (Schmidt, Pfetzer, Schwab, Strauss, & Kämmerer, 2011). A pilot study conducted to reveal the effects of ketogenic diet on women with polycystic ovary syndrome on elven women revealed improvement in weight, free testosterone Luteinizing hormone/Follicle stimulating hormone and fasting insulin in women with obesity over 24-week period. Two women in this study became pregnant despite the fertility problems.

The therapeutic effects of the diet is not limited to chronic physical conditions, but the benefits may extend to mental health as well. This an area where evidence is still emerging. A study conducted by (Murphy, Likhodii, Nylen, & Burnham, 2004) using animal model of depression, the Porsolt test, to determine whether ketogenic diet has antidepressant properties and observed that rats on ketogenic diet are less likely to exhibit behavioral despair and hence concluding that ketogenic diet may have antidepressant properties. Two separate studies conducted by (El-Mallakh & Paskitti, 2001) and (Phelps, Siemers, & El-Mallakh, 2013) have suggested that ketogenic diet may have mood stabilizing effect in subjects with Type II Bipolar Disorder, warranting further research on the area.

The purpose of this study is to further explore the areas of emerging evidence of ketogenic diet benefits with respect to its ability to mitigate or cure chronic conditions – both physical and mental – and reduced need for medication. The research paper, by the end of the study aims to answer the following questions:

Q1: Can Ketogenic diet can improve or cure chronic health conditions (both physical and mental health conditions)

Q2: Is there a reduced or no need for medication to manage chronic health conditions (both physical and mental health conditions)

3.0 Methods

This study follows the framework utilized by a previous study titled "Low carbohydrate diets in family practice: what can we learn from an internet-based support group" (Feinman, Vernon, & Westman, 2006), where authors have studied the effects of a low-carbohydrate diet through an online survey. Similarly, this study is based on data collected through a survey conducted on amongst low-carb-high-fat ketogenic dieters. The survey examines general dieting habits and meal plans of the ketogenic dieters, the duration for which they have been practicing it, the impact it has had on alleviating their chronic physical ailments, mental health and also its impact on their quality of life by improving overall health, their attitude and perception about the sustainability of the diet and inclination to adopt the diet as a part of their lifestyle indefinitely. The study incorporates quantitative analytical methods applied on the survey data to quantify the impact of the diet on various chronic conditions as perceived by the respondents. It also attempts to find association between dieting patterns and habits that contribute to most beneficial effects.

3.1 Participants

The traditional ketogenic diet is one in which 90% of calories come from fat, 6% from protein, and 4% from carbs, is the one which was used in treating epilepsy. But the modified ketogenic diet recommended by pioneers like Dr. Eric Berg for the participants studied in this paper is 75% fat, 20%

protein and 5% carbohydrates ("Lose weight fast with weight loss expert Dr. Berg," n.d.), with 7-10 cups of vegetables (not counting the vegetable carbohydrates) coupled with intermittent fasting, was considered for this study.

Participants were a convenience sample of 132 people who had been practicing the ketogenic diet. The demographic information of the participant group can be seen below.

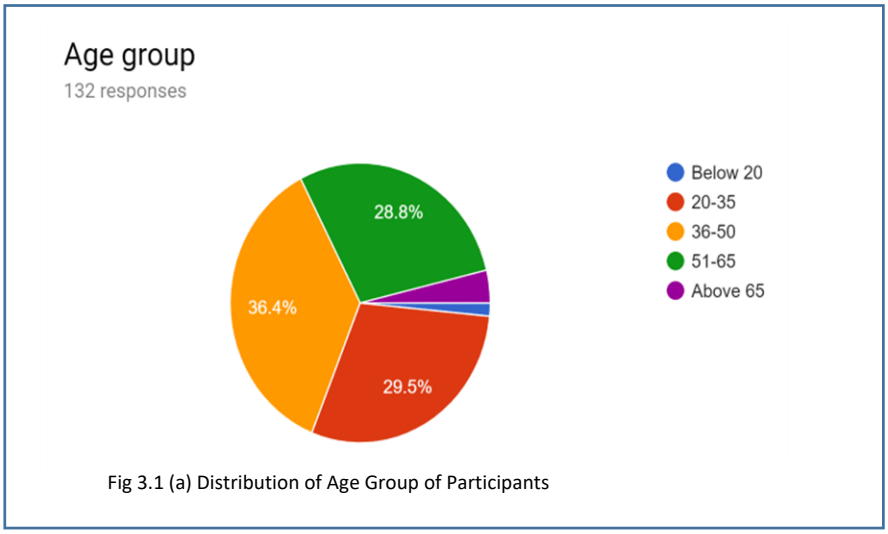


Fig 3.1 (a) Distribution of Age Group of Participants

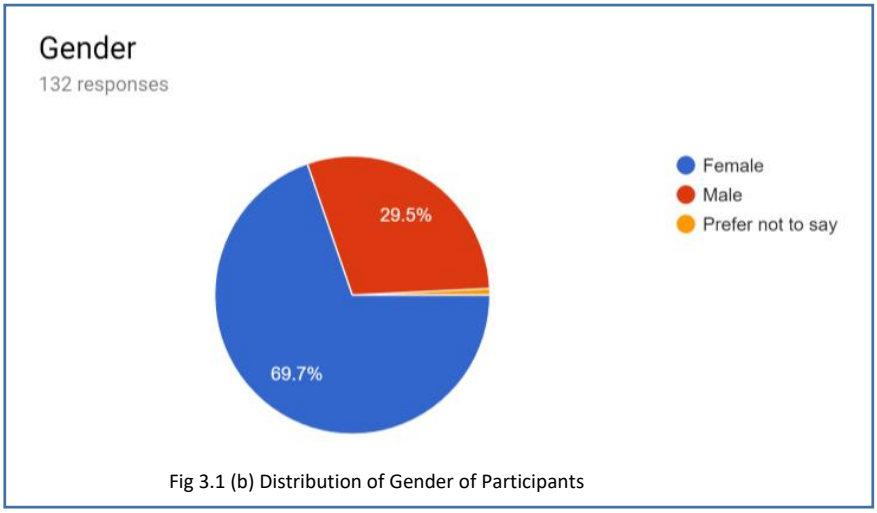


Fig 3.1 (b) Distribution of Gender of Participants

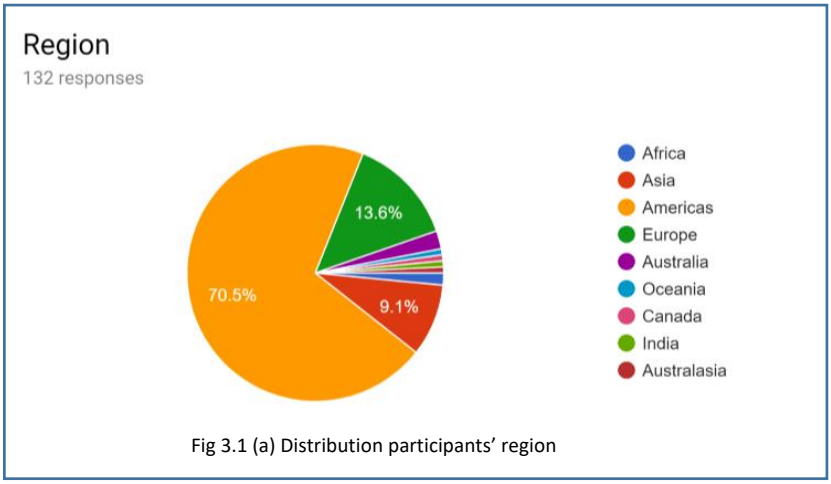


Fig 3.1 (a) Distribution participants' region

It is important to note that 83.6% of the participants also followed some pattern of intermittent fasting in conjunction with the diet. The survey included a question "Do you follow a low-carb diet?". If the answer was "No" to this question, then such participants were excluded from the study. 5 out of 132 participants had been following the ketogenic diet for less than 2 weeks at the time that they responded to the survey. They too have been excluded from the study, since it was not sufficient enough time to evaluate the effects of the diet. There were no other exclusion criteria.

3.2 Procedures

The survey was made available to the potential participants on 2nd February, 2019 through the following Facebook groups after obtaining permission from the administrators -

1. Dr Berg Keto and IF lab ("Dr Berg's Keto and IF Lab," n.d.)
2. Keto Connection ("Keto Connection," n.d.)

The survey was shared as a post on these Facebook groups. Each of the above group has over 200,000 members. These members were invited to take the survey on a voluntary basis and were not individually identified. The survey has 30 questions, takes 3.5 minutes to complete on an average. All information collected from the respondents are strictly confidential and anonymous and are only represented as

group data. The survey still continues to accept responses, but there hasn't been significant change in the number of respondents who have volunteered to complete the survey.

3.3 Measures

The survey created and distributed using the tool Google Forms, which is a survey administration tool included in the Google Drive suite ("Create a survey using Google Forms," n.d.) available freely for personal use along with google account. All the data used for the analysis in the study is obtained through the responses of the respondents of the survey. The constructs of the measures in the survey can be broadly categorized into areas pertaining to but not limited to weight loss, dieting habits, diet sustainability, impact on physical health, and impact on mental health.

The research question is primarily concerned with the impact on physical and mental health. Within these constructs the study aims to measure the following:

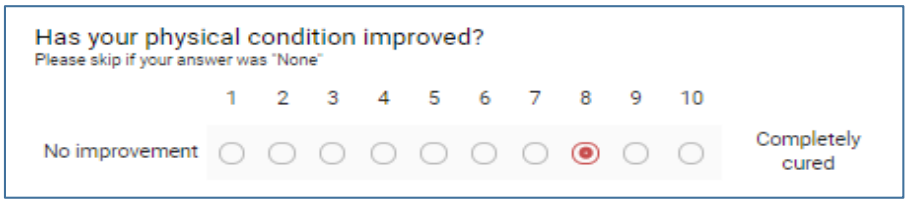
- Improvement in the respondent's physical condition
- Any reduced need for medication for the physical condition
- Improvement in the respondent's mental condition
- Any reduced need for medication for the mental condition

The items in the survey that answers the measures enumerated above, are the four questions given below. All of the questions are scored on a linear scale of 1 to 10. The corresponding meaning of the scoring is provided in under each item.

1. Has your physical condition improved?

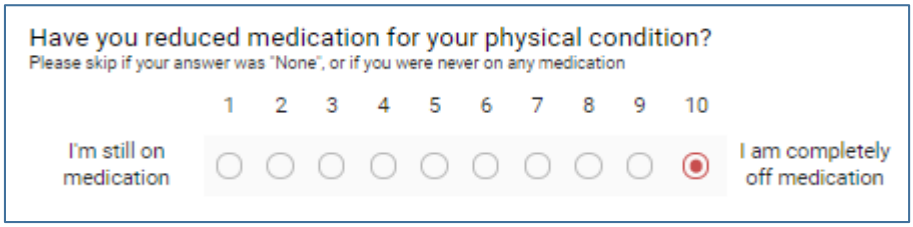
   1 = No improvement
   10 = Completely cured

Sample response:



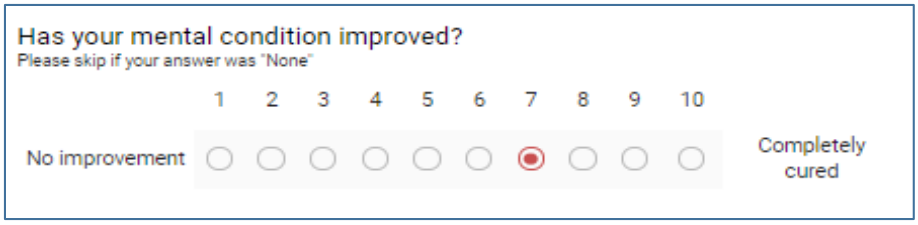
2. Have you reduced medication for your physical condition?
   1 = Still on medication
   10 = Completely off medication

   Sample response:



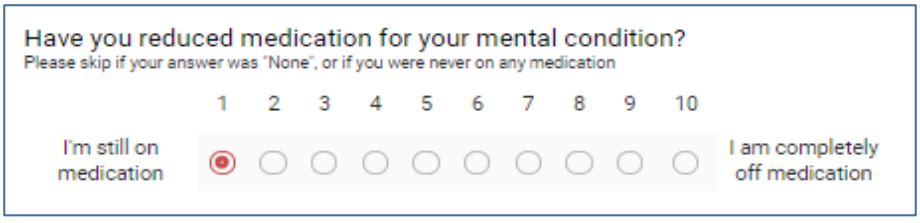
3. Has your mental condition improved?
   1 = No improvement
   10 = Completely cured

   Sample response:



4. Have you reduced medication for your mental condition?
   1 = Still on medication
   10 = Completely off medication

   Sample response:



These items are optional responses, and the respondents are allowed to skip these questions if they did not have an existing condition prior to the commencement of the diet or even if they did, were not on medication.

3.4 Analysis

The data set considered only the respondents who followed the ketogenic diet and excluded from the analysis, responses of participants who did not follow the ketogenic diet. The data was then cleaned and normalized, and analyzed. The core approach for analysis is using the **Descriptive Statistics** techniques. The observations obtained from the responses of the survey will be summarized using descriptive analytical techniques.

As a part of the preliminary analysis, the overall health improvement is observed through pie chart. The changes in mood, energy, mental clarity, cognitive function, sleep quality, lack of hunger, lack of cravings were observed through grouped bar charts.

The central analysis of the study surrounds the constructs enumerated in the measures section. These items correspond to the “Health Benefits” section of the survey. The data collected for the items mentioned in the measures section, {‘Has your physical condition improved’, ‘Have you reduced medication for your physical condition’, ‘Has your mental condition improved’, ‘Have you reduced medication for your mental condition’}, the impact on physical and mental chronic illness and the corresponding reduction in medication were observed through histograms, to determine whether the results are in favor of improvement or not.

4.0 Results

Reiterating the research question, the study aims to find out if ketogenic diet can have a significant impact on improving/curing a chronic physical/mental condition, and thereby result in reduced/no need for medication to manage it. The results were obtained by performing descriptive analytics to summarize the results obtained.

The overall health impact as perceived by the respondents is shown in the pie chart in Fig 4.1.

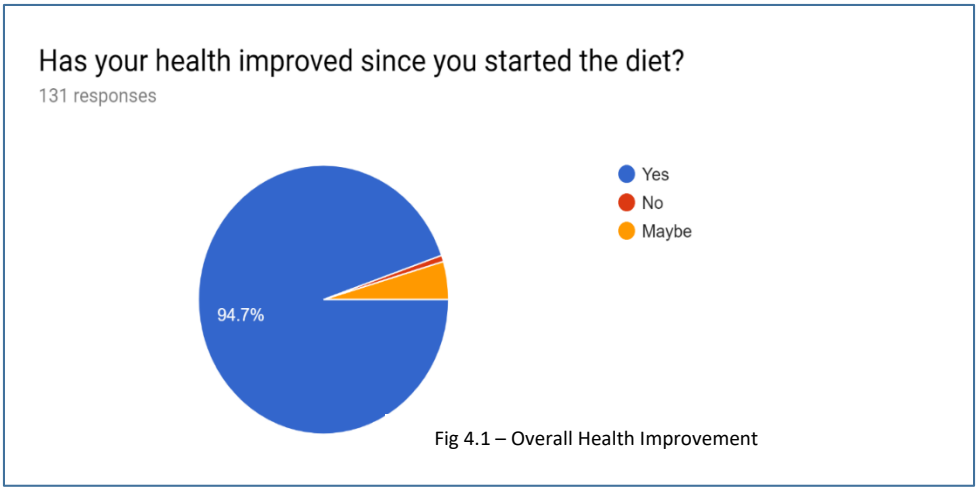


Fig 4.1 – Overall Health Improvement

The respondents were also asked about their perceived improvement in Mood, Energy, Mental Clarity, Cognitive Function, Sleep Quality, Lack of Hunger and Lack of Craving. Fig 4.2 depicts how each of these

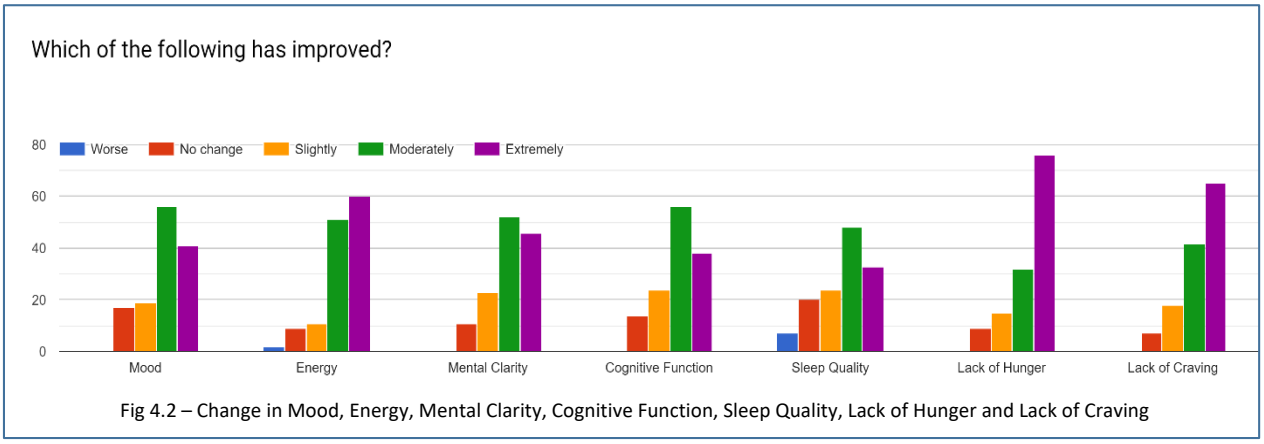


Fig 4.2 – Change in Mood, Energy, Mental Clarity, Cognitive Function, Sleep Quality, Lack of Hunger and Lack of Craving

aspects were impacted after the respondents started the Ketogenic lifestyle. Their responses were scored on this scale – {Worse, No Change, Slightly, Moderately, Extremely}. The overall percentage of different levels of responses aggregated over all the measures can be seen in table included in Fig 4.3

	id	Worse	No change	Slightly	Moderately	Extremely
0	Marginal_Proportion_Percentage	0.865801	9.632035	14.393939	36.255411	38.852814

Fig 4.3 – Marginal proportions of responses overall

The respondents were asked if they had any chronic physical/mental condition prior to the commencement of the diet. And the responses can be seen in the following horizontal bar charts in Fig 4.4 for physical conditions and Fig 4.5 for mental conditions

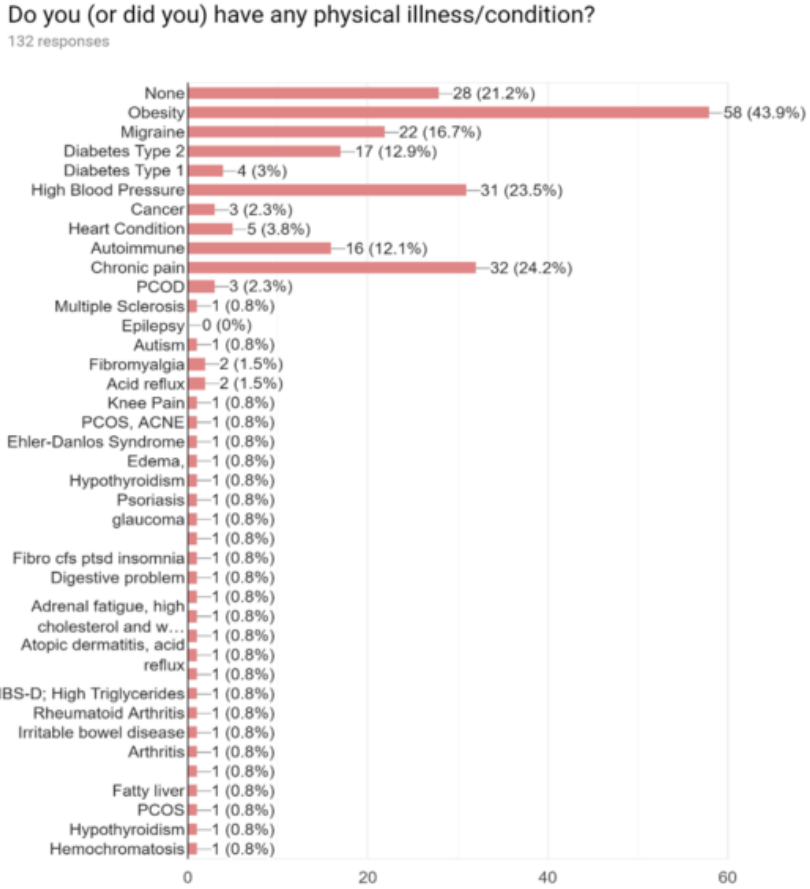


Fig 4.4 – Physical chronic conditions respondents reported having

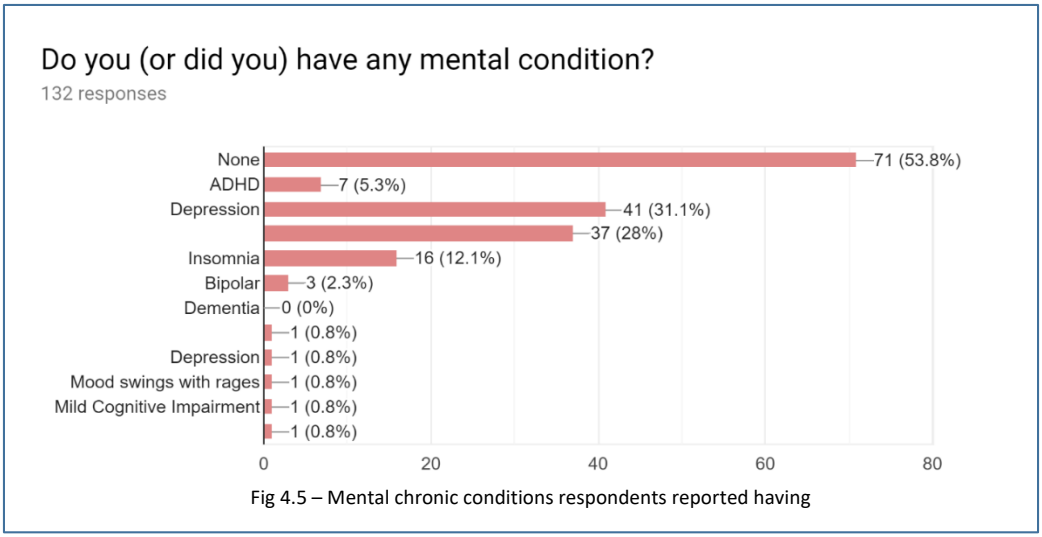


Fig 4.5 – Mental chronic conditions respondents reported having

The most frequently seen physical chronic condition was Obesity. It is followed by chronic pain, High Blood Pressure, Migraine, Diabetes Type 2 and Auto Immune disease. The most frequently seen mental condition was Depression, followed by Anxiety/Panic Disorder and insomnia.

The respondents were asked if they observed any improvement in their physical/mental condition. Reiterating the scoring system, the responses are on a linear scale of 1 to 10 (1 – no improvement and 10 – completely cured). The histogram depicting the count for each of the scores can be seen in Fig 4.6 for physical condition and Fig 4.7 for mental condition.

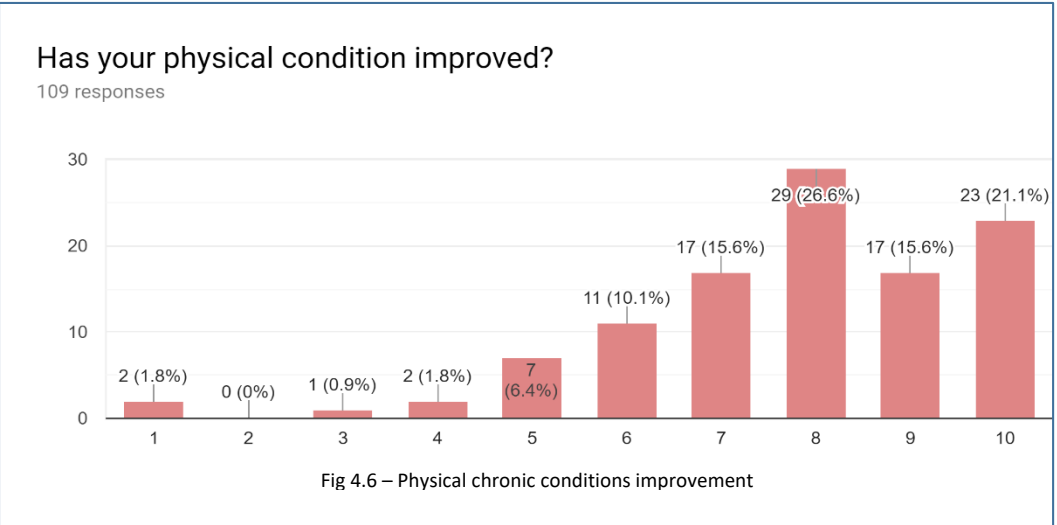


Fig 4.6 – Physical chronic conditions improvement

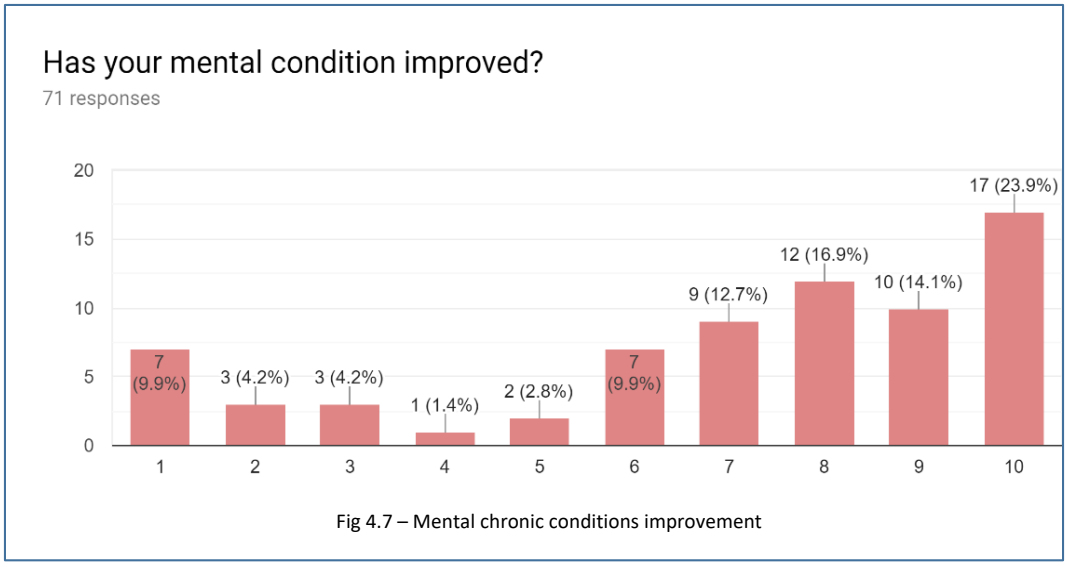


Fig 4.7 – Mental chronic conditions improvement

The respondents were then asked to report any reduction in medication that they were using to manage their health conditions – both physical and mental. Reiterating the scoring of these measures, the responses were measured on a linear scale of 1 to 10 (1 – still on medication, 10 – completely off medication). The response histograms can be seen in Fig 4.8 for reduction in medication for physical condition and Fig 4.9 for mental condition.

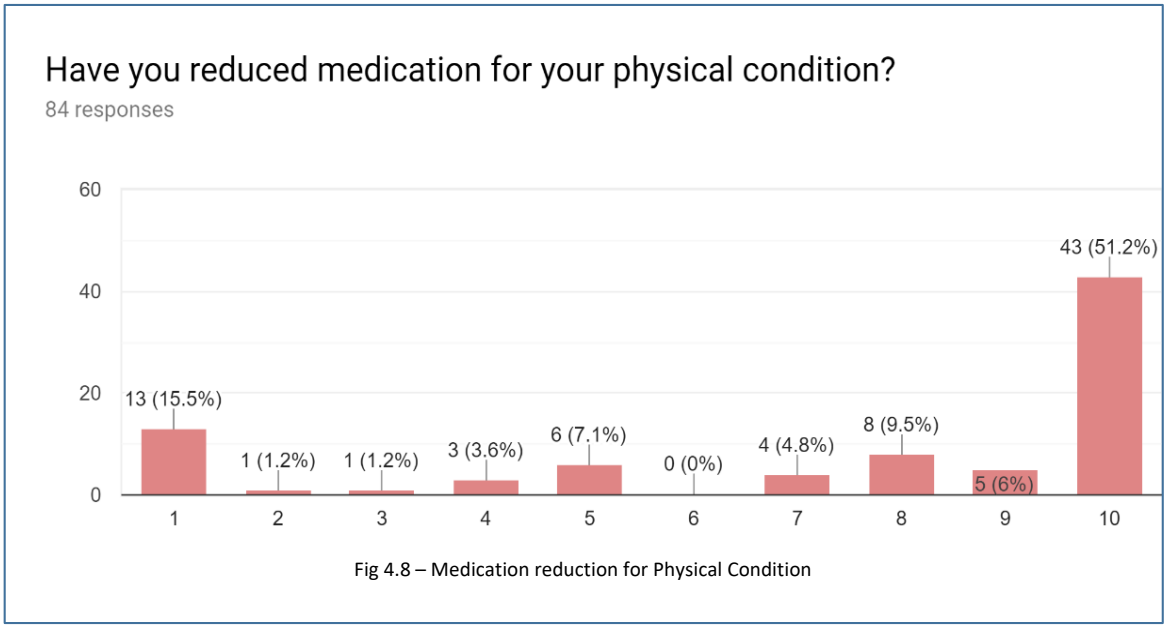


Fig 4.8 – Medication reduction for Physical Condition

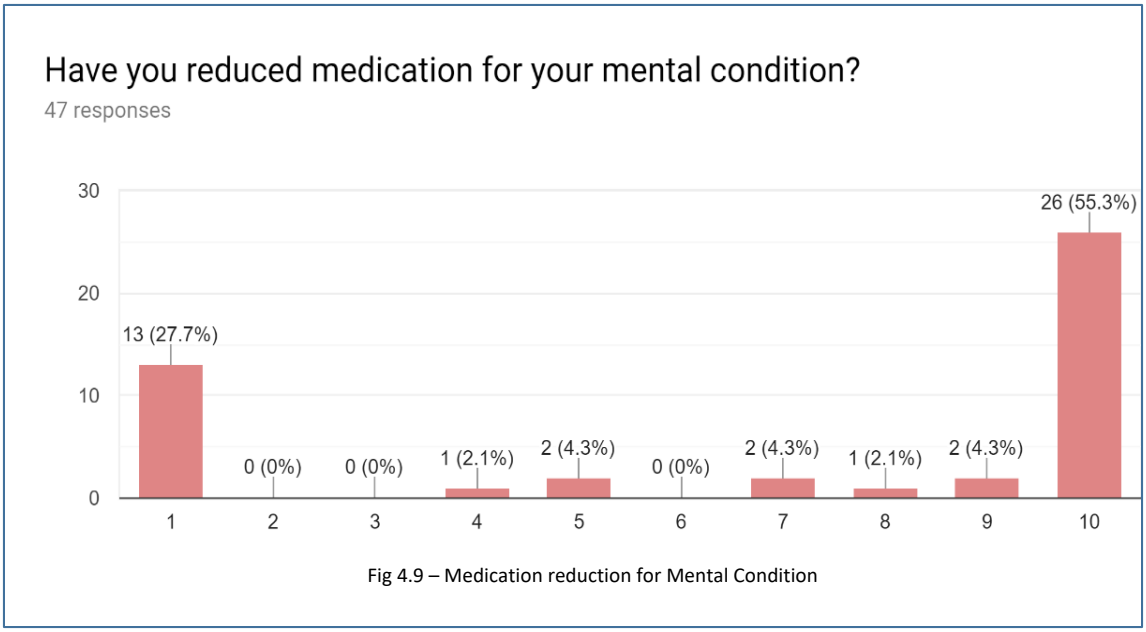


Fig 4.9 – Medication reduction for Mental Condition

5.0 Discussion

5.1 Interpretation of Results

The first research question the study aimed to answer was -can Ketogenic diet can improve or cure chronic health conditions (both physical and mental health conditions). The results show, for the both physical and mental conditions, the responses are overwhelmingly in favor of remarked improvement in the respondents' ailment. From Fig 4.6 and Fig 4.7 we can see that, the histograms are skewed to the right (the improved side). For the physical condition, 2.7% of responses showed insignificant improvement (scores 1 – 3), 18.3% of the responses showed moderate improvement (scores 4 – 6), 57.8% of the responses showed remarkable improvement (scores 7 – 9) and 21.2% of the respondents have reported that their ailment has been completely cured. Similarly, for mental condition 18.3% of responses showed insignificant improvement (scores 1 – 3), 14.1% of the responses showed moderate

improvement (scores 4 – 6), 43.7% of the responses showed remarkable improvement (scores 7 – 9) and 23.9% of the respondents have reported that their mental condition has been completely cured. This shows that Ketogenic diet has a significant impact in not only improving, but in many cases also curing the physical/mental chronic condition.

The second research question was - is there a reduced or no need for medication to manage chronic health conditions (both physical and mental health conditions). From Fig 4.8 and Fig 4.9 we see that 17.9% and 27.7% of the respondents are still on medication for physical and mental conditions respectively. 10.7% and 6.4% of the respondents have moderately reduced medication for physical and mental conditions respectively, 20.3% and 10.7% of the respondents have seen a remarked reduction in medication for physical and mental conditions respectively. 51.2% of the respondents have completely gone off medication for the physical condition, and 55.3% of the respondents have gone off medication for the mental condition. More than half the participants that have responded to these questions have successfully improved their condition well enough to not need any medication to manage their illness anymore. This effectively answers the second research question that, Ketogenic dieters have a significantly reduced need for medication to manage their chronic illnesses, and in many case have managed to completely go off their medication.

In addition to the primary research question, a noteworthy inference is the overall improvement in health, perceived by respondents in addition to improvement in their chronic ailment. From Fig 4.1, we see that 94.7% of the respondents responded that they have seen an improvement in their overall health. From Fig 4.2, for factors like Mood, Energy, Mental Clarity, Cognitive Function, Sleep Quality, Lack of Hunger and Lack of Craving, the majority of responses for improvement is either moderate of extreme with respect to all of the factors enumerated. The most significant improvements observed are with respect to Lack of hunger and Lack of cravings– which in turn contributes to the sustainability of the diet. The next best improvement observed is with respect to Energy. 2 respondents have reported

that their energy level is worse, and 7 respondents have reported that their sleep is worse. But, as observed from Fig 4.3, the percentage of respondents who have reported that one of these factors are worse, or no change, is significantly lesser (10.4%), where as 36.2% of the responses are moderate improvement and 38.8% of the responses correspond to extreme improvement. This denotes a significant overall improvement with respect all the aspects.

These results are consistent with studies mentioned in the literature review section, where several studies have explored individual chronic illness and concluded that Ketogenic diet has been effective in improving patients' conditions. It is also consistent with the findings of the study on "Low carbohydrate diets in family practice" (Feinman et al., 2006), where the conclusion drawn from participants' responses indicated that low-carbohydrate diet practitioners saw a significant improvement in their health conditions.

5.2 Study Limitations

The results however should be viewed from the lens of a limited perspective, due to the limitations of the study. The scope of the research is minimized since the study is being completed within a limited time frame and data resources. The study is primarily based upon a small (132 responses) set of data obtained through convenience sampling. Also, the response rate of the potential participants was low, since there were no resources available to provide additional incentive for the participants to want to take the survey and the time window available to collect data was small. Such a sample is far less reliable that data with a relatively large size, obtained through more rigorous and sophisticated sampling methods. Another important limitation of this study is the lack of a control group. All the participants in this study were identified from a low-carbohydrate ketogenic dieters' forums. Hence the results cannot be measured relative to people who did not practice the ketogenic diet.

5.3 Recommendations for Future Work

Despite the limitations of the study, this can be a pilot example of measuring the impact of low-carbohydrate diet on individual health. The results from this study may evoke curiosity in the healthcare community to conduct more formal clinical trials in a controlled environment. These trials may overcome the limitations of the study by including a higher sample size of more diverse participant groups, to specifically evaluate the effects of various factors like exercise, macronutrient breakdown, meal plans, plant-based diets versus animal-based diet, and intermittent fasting patterns. This will clarify, if and to what degree these factors play a role health improvement.

The most important sub-group to be included is a control group of participants who do not practice the ketogenic diet. Additionally, the supplementary factors mentioned (exercise, macronutrient breakdown, meal plans, plant-based diets versus animal-based diet, and intermittent fasting patterns) can be included as a practice amongst the control group participants to see if any of these can attribute to health improvement without needing to practice the ketogenic diet.

The future clinical trials may take advantage of using specific health markers (such as blood sugar levels, lipid profiles, cholesterol levels, triglycerides, blood profile tests, etc.) as a more valid measure of improvement in physical health. This is a more accurate way of measuring health than the one used in this study, where improvement is based solely on the participants' perception of improvement.

5.4 Conclusion

This study offers preliminary evidence of the efficacy of low-carbohydrate Ketogenic diet in creating general health improvement, reversing and curing chronic physical and mental health conditions that are currently considered irreversible. The study also confirms over 50% the participants that suffered from chronic physical or mental illness required lesser or even no medication to maintain optimal

health. Further research is warranted to investigate the validity of the results through controlled clinical trials. Following future research, the mainstream healthcare associations can integrate the learnings into their diet recommendations to improve the health and quality of life of all individuals of human race and consequently create a massive positive socio-economic impact.

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