

The Effect of Intermittent Fasting on Chemotherapy and Quality of Life in Cancer Patients

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ABSTRACT

The effects of intermittent fasting (IF) and chemotherapy were analyzed in comparison to patient quality of life (QOL) to determine which time length is the most feasible and beneficial fasting period for patients to complete, and if there is a correlation between glucose levels in the body and the decrease of chemotherapy related symptoms. The Common Terminology Criteria for Adverse Events (CTCAE) of the National Cancer Institute (NCI) grade scale of 0-4 was used to determine the quality of life patients would experience while practicing IF versus Ad Lib. Results found that the 48 hour time period was the most effective in reducing chemotherapy patient symptoms, as well as being the most feasible time period to ask patients to fast for, when compared to 24h and 72h periods.

RESEARCH QUESTION

What is the optimum period of intermittent fasting for chemotherapy in order to improve the quality of life in cancer patients?

HYPOTHESIS

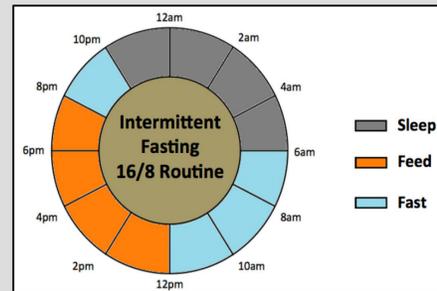
Null Hypothesis: There is no indication that intermittent fasting is beneficial to chemotherapy patients in regards to both their quality of life and effectiveness.

Alternative Hypothesis: Glucose alters the effectiveness of chemotherapy, therefore a fasting period would be sufficient to lower glucose levels and improve patient quality of life.

INTRODUCTION

Intermittent fasting is an eating pattern that has a series of eating and fasting periods throughout the week. IF can be performed in one of two ways: by not eating 1-3 days out of the week, or not eating for a certain period of time each day, such as fasting for the first 16 hours of the day, then intaking food for the last 8 hours of the day.

Figure 1: 16/8 Intermittent fasting schedule; Fasting is observed between the hours of 8pm - 12pm (16 hours)



While patients undergo chemotherapy treatments, they are subject to developing many symptoms, such as alopecia, fatigue, nausea, etc. Through IF, glucose levels in the body can be naturally lowered, and overall decrease patient symptoms and improve patient QOL in a phenomenon called differential cell resistance. During IF, the body becomes starved, and in this process the organisms will use their energy for cell maintenance, and decreases the amount of energy available for growth and reproduction (Naveed et al., 2014).

Differential Stress Resistance:



Metastasis can only occur in cancer cells through growth and reproduction, so during starvation, since the body reduces the amount of energy the cells are allocated for growth, they die quickly.

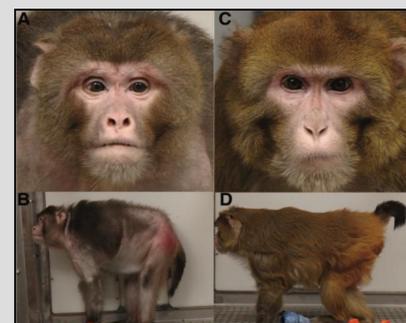


Figure 2: Colman, R., 2009 A/B Rhesus Monkey (27.6 yrs) fed Ad Libitum, C/D monkey (27.6 yrs) fed 10% restricted diet

RESULTS

Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
No symptoms	Asymptomatic, mild symptoms	Moderate symptoms, does not completely affect daily routine	Severe symptoms, associated with pain, affects daily routine	Extreme symptoms, intervention necessary

Figure 3. Common Terminology Criteria for Adverse Events (CTCAE)

Chemotherapy Symptom	Ad Lib (CTC Grade)	STF (CTC Grade)
Fatigue		3
Weakness	2.9	1.5
Alopecia (Hair Loss)	2.5	1.85
Headaches	1	0.85
Nausea	1.6	0.55
Vomiting	1.2	0.15
Diarrhea	0.5	0.25
Abdominal Cramps	1	0.55
Mouth Sores	1.3	0.55
Dry Mouth	1.7	0.75
Short-Term Memory Impairment		
Numbness	1.3	0.95
Tingling	1.6	1.35
Neuropathy-motor	1	1
Mean	1.585714286	0.939285714
Standard Deviation	0.738873511	0.511099332
Variance	0.545934066	0.261222527
n	14	14
t-test		0.012252

Table 1. Average of chemotherapy symptoms experienced according to CTCAE

DISCUSSION

In figure four, a correlation with an r-squared value of 0.9481 was found between the rates of obesity and body mass index and liver and intrahepatic bile duct cancer through the years of 1976-2010. Obesity is caused by more caloric intake compared to energy expenditure, which can cause extra glucose to remain in the body; as the daily caloric intake of people increase, cancer rates increase as well, showing a correlation between glucose levels and cancer rates. Table one is an average of all the patient cases that were collected for each symptom. During chemotherapy with Ad Lib eating, patients had an overall average CTC value of 1.5857, while during intermittent fasting time periods, they had an overall decreased average CTC value of 0.9392. Using a t-test, it was found that the p-value of the intermittent fasting and Ad Lib eating was 0.012252; when compared to a p-value of 0.05, the alternative hypothesis must be accepted and the null hypothesis is rejected. This means that intermittent fasting is a feasible way of lowering the body's glucose levels and overall improves patient quality of life through lowering the grade of chemotherapy symptoms experienced. In figure five, there was a decrease in almost all patient symptoms from the 24 h to the 48 h fasting period, but from the 48 h to the 72 h fasting period results varied. From this, it was concluded that a 48 h fasting period would be the most beneficial IF length for patients to complete because it is the most efficient time period for lowering chemotherapy symptoms, so it would overall be increasing the quality of life for patients.

METHODS

Systematic Literature Review
- Sources: Ebscohost, PubMed- NCBI, PLOS, Google Scholar, NIH and BMC Cancer and Medicine
- Data analysis: r-squared values were found to find correlations, T-tests were used to calculate P-values to find statistical significance

CONCLUSIONS

The 48 hour fasting period is overall the most favorable time period for cancer patients to fast for because it decreases the most chemotherapy symptoms experienced by patients when compared to a 24 hour or 72 hour time period; it is also the most feasible time period to ask patients to fast for.

FURTHER WORK

The number of papers and patients that were available to this study was limited due to minimal research on this fairly new topic in the scientific field; intermittent fasting during chemotherapy has only been analyzed in humans within the last ten years. For future research on this subject, larger data sets would be necessary.

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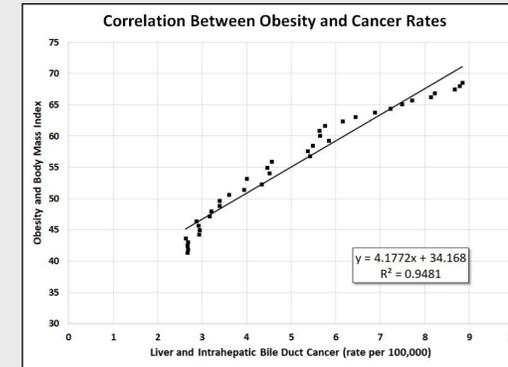


Figure 4. Liver and Intrahepatic Bile Duct Cancer (rate per 100,000) and obesity comparison

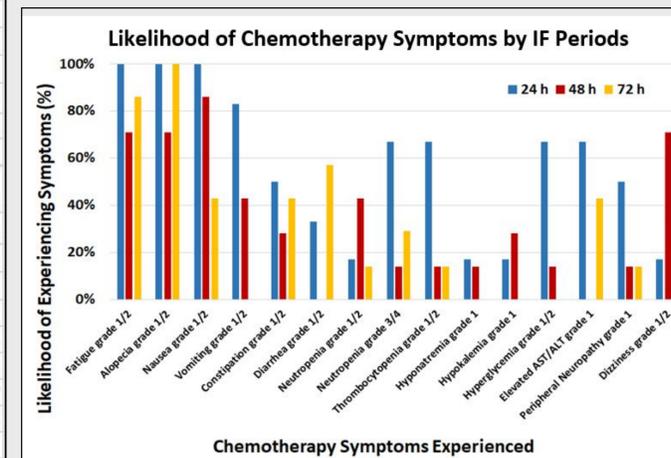


Figure 5. Chemotherapy toxicity patient symptom occurrence shown at 24 hours, 48 hours, and 72 hours.