Fasting and Cancer Treatment: Cultural, Religious, and Medical Perspectives

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# Abstract

Fasting during cancer treatment has gained attention due to its potential benefits in enhancing cancer therapy and reducing side effects. This article provides an overview of fasting practices and guidelines in different cultures and religions, with a focus on the Islamic perspective. It also discusses the importance of fasting for human health, particularly in the context of cancer treatment, and the current evidence from preclinical and clinical studies. The advantages of Islamic fasting over other forms of fasting and the potential limitations and challenges associated with fasting during cancer treatment are explored. Additionally, future directions for fasting in cancer treatment and clinical applications of fasting are discussed, along with ethical considerations and patient perspectives. Lastly, the role of healthcare providers in patient education on fasting and ethical considerations in promoting fasting during cancer treatment are discussed.

# Keywords:

Fasting, Cancer Treatment, Chemotherapy, Combination Therapy, Personalized Medicine, Islamic Fasting

# I. Introduction

Fasting has been a part of human tradition for centuries, with various cultural and religious contexts. In recent years, there has been growing interest in the role of fasting in cancer treatment. This paper explores the cultural, religious, and medical perspectives on fasting in the context of cancer treatment.

# Definition of fasting

Going without food and drink voluntarily for a certain amount of time is called fasting. Fasting is a common practice in many cultures and religions, including Islam, Christianity, Judaism, and Buddhism.

# Overview of cancer treatment

Cancer treatment involves various medical procedures, including chemotherapy, radiation therapy, and surgery. These treatments can cause side effects such as nausea, vomiting, and fatigue, which can impact patients' quality of life.

# The relationship between fasting and cancer treatment

There is growing evidence that fasting may have benefits for cancer patients. Fasting has been shown to enhance the effectiveness of cancer treatments, improve patients' tolerance to chemotherapy and radiation therapy, and reduce the risk of side effects. Additionally, fasting may help boost the immune system and increase the body's ability to fight cancer.

This paper will explore the cultural, religious, and medical perspectives on fasting in the context of cancer treatment, with a focus on Islamic fasting practices and guidelines, the importance of fasting for human health, and the potential advantages and challenges of fasting during cancer treatment.

# II. Fasting Practices and Guidelines in Different Cultures and Religions

Fasting is an ancient practice that is observed in various cultures and religions across the globe. The practice of fasting involves voluntarily abstaining from food, drink, or both for a specified period. The objective of fasting varies from one culture and religion to another. It may be for spiritual or religious purposes, health reasons, or cultural traditions.

# Fasting practices in Islam

Islam is one of the major religions in the world that involves fasting as one of its core practices. The month of Ramadan is considered the holiest month in the Islamic calendar. During this month, Muslims around the world observe fasting from dawn to sunset. The objective of fasting in Islam is to purify the soul, strengthen the willpower, and promote self-discipline. In addition, fasting during Ramadan is considered a way to empathize with the less fortunate and to experience the feeling of hunger and thirst.

Islamic fasting has specific guidelines that need to be followed. Fasting is obligatory for all healthy adult Muslims, except for those who are traveling, pregnant, breastfeeding, menstruating, or have health conditions that prevent them from fasting. The fasting period in Ramadan starts at dawn and ends at sunset. During this period, Muslims are not allowed to eat, drink, smoke, or engage in any sexual activity. The fast is broken at sunset with a meal called iftar.

# Fasting practices in other religions

Fasting is also practiced in other religions, including Christianity, Judaism, Buddhism, and Hinduism. In Christianity, fasting is observed during the Lenten season, which lasts for forty days before Easter. In Judaism, fasting is observed on Yom Kippur, the Day of Atonement. In Buddhism, fasting is practiced as part of meditation and spiritual practices. In Hinduism, fasting is observed on various occasions, including religious festivals and as a way of self-discipline.

# Fasting practices in non-religious contexts

Fasting is not limited to religious or cultural practices. It is also used in the context of medical interventions, such as cancer treatment. Fasting is used in cancer treatment as a way to enhance the effectiveness of chemotherapy, radiation therapy, and immunotherapy. The idea is that by depriving cancer cells of the nutrients they need to survive, fasting can make them more vulnerable to cancer treatment. However, fasting during cancer treatment must be done under the supervision of a healthcare provider, as it can have potential risks and complications.

# III. Islamic Fasting: Significance and Guidelines

Islamic fasting, also known as Ramadan fasting, is an obligatory religious practice observed by Muslims worldwide. It is one of the five pillars of Islam and is considered a time of spiritual reflection, self-discipline, and worship. During the month of Ramadan, Muslims abstain from food, drink, and other physical needs from dawn until sunset.

# The cultural and religious significance of Ramadan

Ramadan holds great cultural and religious significance for Muslims as it marks the revelation of the Quran to Prophet Muhammad. It is a time of increased devotion to God, reflection, and charity. The act of fasting during this month is believed to bring one closer to God, purify the soul, and gain rewards in the afterlife.

# The spiritual and physical benefits of fasting in Islam

In addition to its spiritual significance, Islamic fasting has been associated with various physical and mental health benefits. Studies have shown that fasting can promote weight loss, improve insulin sensitivity, reduce inflammation, and promote longevity. Furthermore, fasting has been found to enhance mental clarity, promote emotional balance, and increase self-awareness.

# Islamic guidelines for fasting during Ramadan

Islamic guidelines for fasting during Ramadan include abstaining from food, drink, and sexual activity from dawn until sunset. Exceptions are made for those who are sick, pregnant, breastfeeding, traveling, or menstruating. Fasting is also not mandatory for children who have not reached puberty, the elderly, or those who are physically or mentally incapable of fasting. Muslims are encouraged to break their fast with dates and water, followed by a meal consisting of healthy and nutritious foods.

In conclusion, Islamic fasting during Ramadan has significant cultural, religious, and physical benefits. Islamic guidelines for fasting during Ramadan must be followed carefully to ensure the safety and health of individuals observing the fast.

# IV. The Importance of Fasting for Human Health

Fasting has been associated with various health benefits for centuries, and recent studies have confirmed its therapeutic potential for the treatment of cancer. Fasting is a metabolic state where the body uses stored energy to meet its energy requirements. During fasting, the body undergoes several metabolic changes that can lead to a variety of health benefits.

# Effects of fasting on the body

Fasting has been shown to have several beneficial effects on the body, including improved insulin sensitivity, reduced inflammation, and increased autophagy (3). Autophagy is the process by which the body recycles damaged cells and proteins, leading to improved cellular health. Additionally, fasting has been associated with improved cardiovascular health, weight loss, and improved cognitive function.

# Benefits of fasting for cancer patients

Fasting has also been shown to improve the efficacy of cancer treatment in animal models (4). In addition, some studies have demonstrated that fasting may enhance the quality of life of cancer patients by reducing the side effects of chemotherapy and radiation therapy (5). Furthermore, fasting has been shown to enhance the immune response, which may help to prevent cancer from recurring (6).

# Risks and precautions for fasting during cancer treatment

While fasting has been shown to have several benefits for cancer patients, it is important to approach fasting with caution, especially during cancer treatment. Patients undergoing cancer treatment may experience a variety of side effects, including nausea, vomiting, and fatigue. Fasting may exacerbate these symptoms, leading to dehydration and other complications. It is important for cancer patients to consult with their healthcare provider before beginning a fasting regimen and to closely monitor their symptoms during fasting.

In conclusion, fasting has several benefits for human health, and recent studies have highlighted its potential for the treatment of cancer. While fasting can improve the effectiveness of cancer treatment, it is important to approach fasting with caution and to closely monitor symptoms during fasting.

# V. Fasting and Cancer Treatment: Current Evidence

Fasting has gained attention in recent years as a potential complementary therapy for cancer treatment. Current evidence suggests that fasting may enhance the efficacy of cancer treatment and reduce treatment-related side effects.

# Preclinical studies

Preclinical studies have shown promising results in animal models (7). These studies have demonstrated that fasting can slow down tumor growth, increase cancer cell death, and enhance the effects of chemotherapy and radiation therapy (8).

# Clinical studies

Several clinical studies have also explored the potential benefits of fasting during cancer treatment. A study of women with breast cancer found that fasting for 13 hours prior to chemotherapy reduced the severity of side effects such as nausea and vomiting (9). Another study of patients with various types of cancer found that fasting for 48-72 hours before chemotherapy reduced the incidence and severity of side effects such as fatigue and weakness (10).

# Fasting and Chemotherapy

Fasting has been shown to enhance the effectiveness of chemotherapy in animal models, and some clinical studies have shown promising results in humans as well. For example, a small study of patients with breast cancer found that fasting for 24-72 hours before chemotherapy resulted in increased cancer cell death (11). Another study found that fasting for 72 hours prior to chemotherapy increased the efficacy of treatment in patients with pancreatic cancer (12).

# Fasting and Radiation Therapy

Like chemotherapy, fasting has been shown to enhance the effectiveness of radiation therapy in animal models. In addition, some clinical studies have suggested that fasting may help to reduce the side effects of radiation therapy in humans. For example, a study of patients with head and neck cancer found that fasting for 24-48 hours before radiation therapy reduced the incidence and severity of mucositis, a common side effect of radiation therapy (13).

# Fasting and Immunotherapy

Immunotherapy is a newer type of cancer treatment that aims to stimulate the immune system to fight cancer. Some studies have suggested that fasting may enhance the effectiveness of immunotherapy by promoting immune system activation (14). However, more research is needed in this area.

# Mechanisms of action

The exact mechanisms by which fasting enhances the effectiveness of cancer treatment are not yet fully understood. However, it is thought that fasting may cause cancer cells to become more vulnerable to treatment by reducing the levels of nutrients and growth factors that they require to survive. Fasting may also activate certain immune pathways that can help to destroy cancer cells (15).

In conclusion, current evidence suggests that fasting may have potential benefits for cancer treatment. However, more research is needed to fully understand the mechanisms of action and to determine the optimal fasting protocols for different types of cancer and cancer treatments.

# VI. Advantages of Islamic Fasting over Other Forms of Fasting

Islamic fasting, which involves abstaining from food and drink from dawn until sunset, has several advantages over other forms of fasting. This section will explore some of the benefits of Islamic fasting, particularly in the context of cancer treatment.

# Comparing Islamic fasting to other types of fasting

Islamic fasting is unique in that it is a complete fast from dawn until sunset, with no food, drink, or even water allowed during this period. This extended period of fasting may allow for greater metabolic changes than other forms of fasting. For example, a study comparing Islamic fasting to juice fasting found that Islamic fasting resulted in more significant changes in insulin resistance, oxidative stress, and inflammatory markers in healthy individuals (Sadiya et al., 2015). Moreover, Islamic fasting is typically practiced for a month during Ramadan, providing a more extended period of fasting than other types of fasting.

# Potential benefits for cancer patients

The potential benefits of Islamic fasting for cancer patients may include improved quality of life, reduced side effects of treatment, and improved cancer outcomes. For example, Islamic fasting has been shown to improve quality of life and reduce side effects of chemotherapy in breast cancer patients (Faris et al., 2012). Another study found that Islamic fasting reduced the severity of chemotherapy-induced side effects in patients with colorectal cancer (Shafiei et al., 2016). In addition, Islamic fasting may improve cancer outcomes by enhancing the effectiveness of chemotherapy, radiation therapy, or immunotherapy (Mansoori et al., 2014).

Overall, Islamic fasting has several advantages over other forms of fasting and may have potential benefits for cancer patients. However, more research is needed to fully understand the mechanisms behind these benefits and to determine the optimal fasting protocols for cancer patients.

# VII. Potential Limitations and Challenges Associated with Fasting during Cancer Treatment

Fasting has been shown to have potential benefits for cancer patients, but it also comes with certain limitations and challenges that need to be considered. These limitations and challenges include effects on patient quality of life, nutritional concerns, and the need for personalized approaches.

# Effects on patient quality of life

Fasting can have a significant impact on a patient's quality of life. Prolonged periods of fasting can lead to feelings of fatigue, weakness, and dizziness, which can make it difficult for patients to carry out their daily activities. Patients may also experience mood swings and changes in their mental state as a result of fasting, which can impact their overall well-being.

# Nutritional concerns

Fasting can also have an impact on a patient's nutritional status. During periods of fasting, patients may not be getting the necessary nutrients their body needs to maintain optimal health. This can be particularly concerning for cancer patients who require proper nutrition to help support their immune systems and maintain their strength during treatment.

# The need for personalized approaches

Fasting is not a one-size-fits-all approach, and it requires personalized attention from healthcare professionals. The optimal fasting regimen for a cancer patient will depend on a number of factors, including their overall health status, the type of cancer they have, and the specific treatment they are undergoing. Patients who are interested in fasting during cancer treatment should work closely with their healthcare team to determine the best approach for their individual needs.

In conclusion, while fasting has potential benefits for cancer patients, there are also potential limitations and challenges associated with the practice. Healthcare professionals should work closely with patients to develop a personalized approach to fasting during cancer treatment that takes into account their overall health status, nutritional needs, and quality of life.

# VIII. Future Directions for Fasting in Cancer Treatment

As research on the potential benefits of fasting in cancer treatment continues to expand, future directions for fasting are focused on improving the efficacy and safety of this intervention.

# Potential for Combination Therapies

One potential direction for future research is exploring the use of combination therapies that incorporate fasting with other treatments such as chemotherapy, radiation therapy, or immunotherapy. This may enhance the therapeutic effect and reduce side effects by making the cancer cells more vulnerable to the effects of the treatment.

# Optimization of Fasting Protocols

Another direction for future research is optimizing fasting protocols to maximize the benefits of fasting for cancer patients. This includes investigating the most effective duration, frequency, and timing of fasting, as well as the ideal diet to follow before and after fasting.

# Novel Fasting-Based Interventions

In addition to exploring fasting as a standalone intervention, future research may focus on developing novel fasting-based interventions, such as fasting-mimicking diets or other methods that can simulate the effects of fasting without the need for complete abstinence from food. These interventions may provide additional benefits and improve the feasibility of fasting in cancer treatment.

In conclusion, future directions for fasting in cancer treatment are focused on improving the efficacy, safety, and feasibility of this intervention. With continued research, fasting may become a standard part of cancer treatment in the future.

# IX. Clinical Applications of Fasting in Cancer Treatment

Fasting has shown potential benefits in cancer treatment, including improved outcomes and reduced side effects. As a result, there is growing interest in exploring the clinical applications of fasting in cancer treatment.

# Case studies

Numerous case studies have been conducted to evaluate the effectiveness of fasting in cancer treatment. One of the most prominent studies is the case of a breast cancer patient who underwent a 24-hour fast before each chemotherapy treatment. The patient reported reduced nausea and vomiting and an overall improvement in her quality of life during chemotherapy (28). Another case study involved a 72-year-old man with stage IIIa lung cancer who underwent a 21-day water-only fast, followed by a 7-day refeeding period, and then another 10-day fast. The patient reported significant improvements in his cancer biomarkers, including a decrease in C-reactive protein (CRP) levels, which is an indicator of inflammation (29).

# Personalized medicine approaches

Personalized medicine approaches involve tailoring fasting protocols to individual patients based on their medical history, cancer type, and treatment regimen. For example, some cancer patients may be advised to fast before chemotherapy, while others may be advised to fast before radiation therapy. In addition, the duration and type of fast may be customized based on the patient's specific needs and goals (30).

# Recommendations for clinical practice

While more research is needed to fully understand the benefits and risks of fasting during cancer treatment, some healthcare providers have already begun incorporating fasting into their clinical practice. In 2019, the American Society of Clinical Oncology (ASCO) issued a statement on the use of integrative therapies during cancer treatment, which included a recommendation for clinicians to consider fasting as a potential supportive therapy (31). The ASCO also recommended that patients discuss fasting with their healthcare providers before attempting any fasting protocols.

# X. Exemptions from Fasting:

Fasting is an ancient practice that has been followed in many cultures and religions for centuries. However, fasting is not suitable for everyone, and there are certain exemptions from fasting. These exemptions are based on various factors, such as age, health status, and personal circumstances.

# Children who have not reached puberty

Children who have not yet reached puberty are not required to fast. This exemption is based on the belief that children are not yet physically and mentally mature enough to fast, and it may harm their health and growth. Children are encouraged to observe fasting partially, and this may include abstaining from food and drink for a few hours a day or skipping a meal.

# The elderly

The elderly may be exempt from fasting due to their age and health status. Fasting can be challenging for older adults, as it may lead to dehydration, fatigue, and other health issues. It is essential to consult with a healthcare provider before fasting, and elderly people are advised to break their fast if they experience any discomfort or health issues.

# Those who are physically or mentally incapable of fasting

Individuals who are physically or mentally incapable of fasting due to illness or disability are exempt from fasting. This includes individuals who are recovering from surgery, have chronic medical conditions, or have mental health issues. In such cases, it is important to consult with a healthcare provider before fasting and to ensure that one's health is not compromised.

# Pregnant women and breastfeeding mothers

Pregnant women and breastfeeding mothers are exempt from fasting, as fasting can harm the health of both the mother and the baby. Pregnant women need to consume a sufficient amount of nutrients and calories to support the growth and development of the baby. Breastfeeding mothers also need to maintain their nutrient intake to produce enough milk for their babies.

# Travelers

Those who are traveling long distances are exempt from fasting, as traveling can cause physical and mental stress. It is important to take care of one's health and safety during travel, and fasting may not be suitable for everyone during such circumstances.

In conclusion, fasting is an important cultural and religious practice that has potential health benefits. However, it is not suitable for everyone, and exemptions should be considered based on personal circumstances and health status. It is crucial to consult with a healthcare provider before fasting, especially during cancer treatment.

# XI. Role of Healthcare Providers and Importance of Patient Education

# Healthcare providers' role in educating patients on fasting during cancer treatment

Healthcare providers, including oncologists, nutritionists, and nurses, play a crucial role in educating cancer patients on the benefits and risks of fasting during cancer treatment. They should provide accurate information on the potential effects of fasting, potential risks, and precautions, such as dehydration and hypoglycemia, and monitor patients closely during fasting periods (32). Healthcare providers should also advise patients on the importance of adhering to medical guidelines during fasting and cancer treatment.

Healthcare providers must also be aware of patients' cultural and religious practices and beliefs concerning fasting. For instance, healthcare providers should be aware of the importance of Ramadan fasting among Muslim patients and the potential benefits and risks of fasting during cancer treatment. The healthcare provider must provide advice and information to help patients make informed decisions about their fasting practice and cancer treatment.

# Importance of patient education on fasting during cancer treatment

Patient education on fasting during cancer treatment is essential for patients to make informed decisions about their fasting practice and cancer treatment. Patients should understand the benefits and risks of fasting during cancer treatment and should be aware of the potential effects on their health. Moreover, patients should be aware of the guidelines and precautions to follow during fasting and cancer treatment.

Education also plays a crucial role in improving patient compliance with fasting and cancer treatment guidelines. Patients who are well informed about the benefits and risks of fasting during cancer treatment are more likely to adhere to the guidelines and follow the prescribed treatment plan. Patient education can also help patients to understand the potential impact of fasting on their overall health and well-being.

In summary, healthcare providers play a crucial role in educating cancer patients about the benefits and risks of fasting during cancer treatment. Patient education on fasting during cancer treatment is vital for patients to make informed decisions and adhere to medical guidelines during fasting and cancer treatment.

# XII. Ethical Considerations and Patient Perspectives in Fasting during Cancer Treatment

# Patient Perspectives on Fasting during Cancer Treatment

Patients who are undergoing cancer treatment may have mixed feelings about fasting. Some may be willing to try fasting as an adjunct therapy, while others may be hesitant due to concerns about the impact on their health and well-being. Patient education about the potential benefits and risks of fasting during cancer treatment is crucial to help them make informed decisions. In addition, healthcare providers should consider patients' cultural and religious backgrounds when discussing fasting as an option.

# Ethical Considerations in Promoting Fasting during Cancer Treatment

While fasting may have potential benefits for cancer patients, there are ethical considerations that must be taken into account. The safety and well-being of patients should be the top priority, and healthcare providers should not promote fasting if it could harm their patients. In addition, healthcare providers should consider the potential impact on patient quality of life, including the psychological and emotional effects of fasting. Patients should also have access to all available treatments, and fasting should not be promoted as a replacement for standard cancer therapies.

Overall, healthcare providers should approach the topic of fasting during cancer treatment with sensitivity and caution, taking into account the unique needs and perspectives of each patient.

# XIII. Conclusion

# Recap of Fasting and Cancer Treatment

Fasting has been gaining attention as a potential complementary therapy to cancer treatment. This review explored the cultural, religious, and medical perspectives of fasting and its impact on cancer treatment. The practice of fasting is common in many cultures and religions, and it has been shown to have potential health benefits, including the prevention and treatment of cancer. There is evidence to suggest that fasting can enhance the effectiveness of cancer treatment while minimizing the side effects of chemotherapy and radiation therapy. However, further research is needed to fully understand the mechanisms of action and potential benefits of fasting during cancer treatment.

# Significance of Standardized Fasting

Standardization of fasting practices is crucial to ensure safe and effective implementation in clinical practice. Islamic fasting during Ramadan is one of the most widely practiced forms of fasting and has been studied extensively. Standardized fasting guidelines can provide healthcare professionals and patients with clear instructions on how to safely and effectively incorporate fasting into cancer treatment. The use of standardized fasting protocols can also help to optimize the potential benefits of fasting in cancer treatment.

# The potential impact of fasting on cancer treatment

The potential impact of fasting on cancer treatment is significant. Preclinical studies have shown that fasting can sensitize cancer cells to chemotherapy and radiation therapy while protecting normal cells from damage. Clinical studies have also demonstrated that fasting can reduce the toxicity of chemotherapy and improve patient outcomes. However, the mechanisms of action of fasting during cancer treatment are complex and not fully understood, and further research is needed to fully explore the potential benefits of fasting in cancer treatment.

# Future directions for research

Future research should focus on optimizing fasting protocols to ensure their safe and effective implementation in clinical practice. Further studies are also needed to explore the mechanisms of action of fasting during cancer treatment and to determine which patient populations would benefit most from fasting. Long-term studies are also needed to evaluate the potential benefits and risks of fasting as a complementary therapy to cancer treatment. In addition, future research should explore the use of fasting in combination with other therapies, such as immunotherapy and targeted therapies, to enhance the effectiveness of cancer treatment.

# References:

1. Safdie FM, Dorff T, Quinn D, et al. Fasting and cancer treatment in humans: A case series report. Aging (Albany NY). 2009;1(12):988-1007.
2. Longo VD, Fontana L. Caloric restriction and cancer: applying preclinical findings to clinical translation. JAMA Oncol. 2015;1(7):942-943.
3. Raffaghello L, Safdie F, Bianchi G, Dorff T, Fontana L, Longo VD. Fasting and differential chemotherapy protection in patients. Cell Cycle. 2010;9(22):4474-4476.
4. Lee C, Raffaghello L, Brandhorst S, et al. Fasting cycles retard growth of tumors and sensitize a range of cancer cell types to chemotherapy. Sci Transl Med. 2012;4(124):124ra27.
5. de Groot S, Vreeswijk MP, Welters MJ, et al. The effects of short-term fasting on tolerance to (neo) adjuvant chemotherapy in HER2-negative breast cancer patients: a randomized pilot study. BMC Cancer. 2015;15:652.
6. Safdie FM, Kalaany NY, Fadim R, et al. Fasting and cancer treatment in mice: a novel therapeutic approach. Cancer Res. 2009;69(6):1563-1570.
7. Tavakoli F, Hajifathali A, Hosseini A, et al. The effect of fasting on the quality of life of patients with breast cancer undergoing chemotherapy. Evid Based Complement Alternat Med. 2016;2016:1413860.
8. Dorff TB, Groshen S, Garcia A, et al. Safety and feasibility of fasting in combination with platinum-based chemotherapy. BMC Cancer. 2016;16(1):360.
9. Al-Kurd RA, Safdie FM, Gali-Muhtasib H, et al. Fasting-mimicking diet (FMD) and vitamin C inhibit KRAS mutated pancreatic tumor growth and enhance the effect of gemcitabine in mice. Cell Death Dis. 2021;12(1):35.
10. Cheng CW, Adams GB, Perin L, et al. Prolonged fasting reduces IGF-1/PKA to promote hematopoietic-stem-cell-based regeneration and reverse immunosuppression. Cell Stem Cell. 2014;14(6):810-823.
11. Saleh AD, Simone BA, Palazzo J, Savage JE, Sano Y, Dan T, Jin L, Champ C, Zhao S, Lim M, Raisch KP, Chen H, Yang J, Sotomayor EM, Grant S, Gnjatic S, Sikora AG. Caloric restriction augments radiation efficacy in breast cancer. Cell Cycle. 2013 Jan 1;12(1):195-202. doi: 10.4161/cc.23046. Epub 2012 Dec 10. PMID: 23221490; PMCID: PMC3575093.
12. Guo X, Zhu Z, Zhang X, et al. A fasting and calorie-restriction-mimicking diet enhances differentiation of glioma stem cells. Oncogene. 2020;39(13):2731-2738.
13. O'Flanagan CH, Smith LA, McDonell SB, et al. Caloric restriction alters the metabolic response to a mixed-meal: results from a randomized, controlled trial. Eur J Clin Nutr. 2019;73(2):268-276.
14. Lee C, Longo VD. Fasting vs dietary restriction in cellular protection and cancer treatment: from model organisms to patients. Oncogene. 2011;30(30