Original research article

Impact of 5:2 Intermittent Fasting and Physical Activity on Liver Enzymes in Overweight and Obese Individuals

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ABSTRACT

Background: Overweight and obesity are linked to liver disease and dysfunction, as obesity can adversely affect liver function through various mechanisms. The study aims to determine the effect of intermittent fasting type 5:2 and physical activity on SGOT, SGPT, body weight, and BMI levels. **Methods:** The research design used a pre-post-test group research design. The subjects of the study were overweight and obese individuals at the Faculty of Medicine and Health Sciences, University of Jambi. **Results:** The study concluded that intermittent fasting and physical activity did not significantly affect SGOT and SGPT levels, with minimal changes (SGOT: 29.40 to 27.85, p=0.699; SGPT: 30.85 to 29.35, p=0.735). However, there were significant reductions in body weight (from 80.02 kg to 77.35 kg, p<0.001) and Body Mass Index (BMI) (from 29.69 to 28.68, p<0.001). **Conclusion:** Intermittent fasting and physical activity impacted body weight and BMI but did not affect SGOT and SGPT levels.

Keyword: Intermittent fasting; Physical activity; SGOT; SGPT; Body weight; BMI

INTRODUCTION

Overweight and obesity are challenges and threats to world Public Health today; if not handled, it will become a serious problem both now and in the future. In general, Overweight is a condition when excess body weight can be caused by the accumulation of body fat, excess muscle, bone, or fluid retention; likewise, obesity is also a condition where there is excessive fat accumulation in the body that comes from calories consumed that exceed the number of calories used.[1] The body needs calories for endurance and work, but energy intake and expenditure must be balanced to maintain body weight. The following energy imbalances can lead to Obesity and Overweight.[2] Many factors cause overweight and obesity. Psychological factors, genetics, lifestyle,

and drugs can cause obesity. The increasing use of drugs can cause weight gain.[3] This is worrying because obesity is often associated with an increase in premature death and an increase in the incidence of degenerative diseases, including Type II Diabetes, cardiovascular disease, hypertension, hyperlipidemia, and several types of cancer.[4]

Obesity and Overweight have become problems in various countries in the world with a rapidly increasing prevalence.[1] Based on the 2018 Basic Health Research (Riskesdas) results, 21.8% of adults over 18 in Indonesia are obese. The prevalence of Overweight and Obesity has increased by 14.8% over 5 years, where the prevalence of obesity in 2013 was 15.4%. The increase in Overweight and Obesity worldwide, especially in Indonesia, clearly harms health and quality of life. Overweight or obesity status is generally determined through anthropometric examination. This process involves measuring height and weight, which are then calculated using a formula to obtain the body mass index (BMI). In addition, measuring waist circumference or the ratio of waist and hip circumference (waist-hip ratio) is also used as an indicator.[5]

The negative impact of obesity is not only related to overall body weight but also to the distribution of stored fat. Central or visceral obesity, where fat accumulates in the abdomen and abdominal cavity, carries a much higher risk for various diseases than fat accumulation in the subcutaneous tissue. Other studies have shown increased liver enzymes in obese individuals. Similar findings were also found by Pondaag et al., who reported increased serum glutamic oxaloacetic transaminase (SGOT) or aspartate aminotransferase (AST) and SGPT levels in men with central obesity. Damage to the liver, heart muscle, brain, kidneys, and skeletal muscle can be detected by measuring SGOT levels, while serum glutamic pyruvic transaminase (SGPT) or alanine aminotransferase (ALT) are often used to assess hepatocellular damage.

Physical activity is significant to burn calories in the body to overcome the imbalance between calories consumed and calories used. Hepatitis is also caused by unhealthy lifestyles, such as heavy activity without being balanced with sufficient rest and excessive exercise.[6] Thus, we can prevent overweight and obesity. Physical activity is a body movement produced by skeletal muscles and requires energy, including activities carried out while working, playing, doing housework, traveling, and recreational activities (WHO, 2017). Any activity that keeps moving can increase stamina and burn calories. The Healthy Living Community Movement (GERMAS) states that everyone should exercise 30 minutes daily, but many people cannot do it for some reason. Unbalanced exercise causes obesity with an increased risk of non-

communicable diseases (PTM) and death.[7] One activity that can be done is walking.

Walking has five main advantages, called 5M. First, this sport is easy for all groups to do. Second, it is cheap because it does not require special equipment or the help of a trainer. Third, it is lively because it can be done in a relaxed and cheerful way. Fourth, it is mass because it can be done in groups or with family. Fifth, it provides excellent health and fitness benefits if done regularly. Walking and exercise can help people lose weight.[8] Although it has a low intensity if done for a long duration and routinely, this sport effectively burns body fat. Walking can also burn calories in significant amounts. For example, walking 2 miles per hour for 30 minutes can burn about 64.9 kcal. If the speed is increased to 4 miles per hour for the same duration, the calories burned can reach 186.7 kcal.[8]

In addition, one approach that has been widely used for the past 10-20 years as an effort to lose weight is intermittent fasting (IF).[9] Intermittent fasting is a period of not eating and drinking or one of the two, the rules of which vary, depending on the fasting method.9 Intermittent fasting has many methods in its implementation, one of which is the application of intermittent fasting type 5:2.[10] Intermittent fasting method type 5:2, namely, During the fasting period, the perpetrators are only allowed to consume 20-25% of their total energy needs. During the five days of not fasting, they can eat anything.[11] This fasting method has anti-inflammatory effects, increases insulin sensitivity, and prevents cardiovascular disease.[12]

Previous studies have examined the effects of Intermittent Fasting (IF) and physical activity on various health parameters. Studies examining the combined effects of both on liver function in overweight and obese individuals are limited. Previous studies have found that IF can reduce body weight but does not cause a decrease in blood glucose or increase Serum Glutamic Oxaloacetic Transaminase and Serum Glutamic Pyruvic Transaminase.[13] This study explores the effect of the IF 5:2 method and physical activity on SGOT and SGPT levels in overweight and obese individuals. By addressing these shortcomings, the findings of this study can provide evidence-based recommendations for practical and effective strategies in combating obesity and its associated complications.

METHODS

This study used a pre-experimental design with pre-posttest groups to examine the effects of the 5:2 IF method and physical activity on liver enzyme levels (SGOT and SGPT) in overweight and obese individuals.[14] The intervention involved a fasting program conducted on Mondays and Thursdays, where participants consumed food with a total intake of 500–600 kcal/day. In addition, participants did physical activity by walking for at least 30 minutes in one week on non-

fasting days every week. The study was conducted from August to September 2024 at the Faculty of Medicine and Health Sciences, University of Jambi, involving 20 students who had a body mass index (BMI) classified as overweight (23–24.9), Obesity I (25–29.9), or Obesity II (≥30). Which is expressed as the ratio of body weight (in kilograms) divided by the square of height (in meters) (kg/m2).[15] Participants were excluded from the study if they could not complete it, were taking certain medications, were on a different diet, or withdrew midway through the study. Weight, height, SGOT, and SGPT measurements were taken before and after the intervention. Participants received a detailed explanation of the 5:2 IF method and the physical activity components, including potential benefits and possible side effects. Written informed consent was obtained before the intervention. Data were analyzed by comparing health indicators before and after the intervention using a paired t-test to evaluate the effectiveness of the intervention and using a Pearson test to see if there was a relationship between physical activity and the levels tested.[16] Therefore, a normality test was carried out using the Sapiro Wilk test.[17] to determine whether it was normally distributed.

RESULTS

Table 1 presents the prevalence of obesity based on sex characteristics. Female participants had a higher proportion in the Overweight (10%) and Obesity II (25%) categories compared to male participants (20%). Conversely, male participants had a higher proportion in the Obesity I (30%) category than female participants (10%).

Table 1. Sex Characteristics of Research Subjects

Sex Characteristics	Overweight		Obesity I		Obesity II	
	n	%	n	%	n	%
Male	1	5	6	30	4	20
Female	2	10	2	10	5	25

Based on the frequency distribution table of physical activity duration for 6 weeks, most participants did physical activity in the range of 200-299 minutes per week, with a total of 9 participants (45%). This shows that almost half of the sample has a relatively high level of physical activity.

Table 2. Frequency Distribution of Participants' Physical Activity Duration During 6 Weeks

Duration (minutes/week)	Frequency (n)	Percentage (%)
<100	0	0
100-199	5	25
200-299	9	45
300-399	4	20
>400	2	10

A total of 5 participants (25%) were recorded as doing physical activity in the range of 100-199 minutes per week, which is classified as moderate physical activity. In addition, 4 participants (20%) did physical activity for 300-399 minutes per week, reflecting a higher level of commitment to the sport being done.

In contrast, only 2 participants (10%) recorded more than 400 minutes of physical activity per week, indicating that only a few participants engaged in high-intensity physical activity. No participants engaged in less than 100 minutes of physical activity per week (0%), indicating that all participants met the minimum recommended physical activity standards during the study period.

Table 3. Paired T-Test Results of SGOT and SGPT

Variable		Mean	Standard Deviation	Min – Max	Sig. (2-tailed)
SGOT (U/L)	Pre	29.40	12.72	11 – 62	0.699
	Post	27.85	12.70	7 – 59	
SGPT (U/L)	Pre	30.85	20.72	7 – 80	0.735
	Post	29.35	15.92	10 – 64	

Table 3 shows the SGOT levels before and after implementing intermittent fasting type 5: 2 and physical activity involving 20 selected research subjects. In the data, there was a decrease in SGOT and SGPT levels by 1.5%. The intervention did not produce statistically significant changes in all parameters measured. SGOT levels decreased slightly from 29.40 ± 12.72 U/L to 27.85 ± 12.70 U/L (p = 0.699), and SGPT levels also decreased slightly from 30.85 ± 20.72 U/L to 29.35 ± 15.92 U/L (p = 0.735). These results indicate that the intervention did not significantly increase SGOT and SGPT levels.

SGOT and SGPT levels in this study decreased slightly but did not reach statistical significance (SGOT p = 0.699, SGPT p = 0.735). This result follows research by Hirsh et al. (2019); fasting monitoring was carried out for 52 days,

which found a slight increase, and the changes were not statistically significant.[7] The results of this study contradict the research conducted by Kord Varkaneh, Hamed et al. (2022). Data from this study showed that the average SGOT and SGPT had statistical significance, indicating a real impact on liver function.[17]

Table 4. Results of Paired T-Test of Body Weight and Body Mass Index (BMI)

Variable		Mean	Standard Deviation	Min – Max	Sig. (2-tailed)
Body Weight (kg)	Pre	80.02	13.14	54 – 99	< 0.001
	Post	77.33	13.09	51 – 96.5	
BMI (kg/m^2)	Pre	29.698	4.39	23.37 – 37.32	< 0.001
	Post	28.688	4.33	22.07 – 35.88	

Based on Table 4, the results obtained after the implementation of intermittent fasting type 5:2 and physical activity after 6 weeks, where there was a percentage of weight loss of 2.96% for body weight and a decrease in BMI percentage of 1.01%. This decrease significantly affected the change; statistical results showed significant changes in body weight and Body Mass Index (BMI) among participants before and after the intervention. The average body weight decreased from 80.02 ± 13.14 kg (ranging from 54 to 99 kg) to 77.33 ± 13.09 kg (ranging from 51 to 96.5 kg), with a statistically significant p value of <0.001, indicating that the intervention effectively reduced body weight. Similarly, the mean BMI decreased from 29.698 ± 4.39 kg/m² (ranging from 23.37 to 37.32 kg/m²) to 28.688 ± 4.33 kg/m² (ranging from 22.07 to 35.88 kg/m²), with a p-value < 0.001, further supporting the effectiveness of the intervention in reducing BMI. These findings confirm the positive impact of the intervention on body weight and BMI.

Several studies consistently show significant body weight and BMI reductions after the IF 5:2 intervention. This result is consistent with research conducted by Harahap et al. (2023); with a 4-week fasting treatment, significant weight loss results were found.[18] Other studies also show significant results in weight loss and BMI conducted by Witjaksono F et al. (2022) had statistically significant results.[19] Hasil ini memperkuat efektivitas metode IF 5:2 dalam mencapai penurunan berat badan dan perbaikan BMI, konsisten dengan hasil penelitian ini. This result also aligns with Kang J et al. (2022) research, in which monitoring was carried out for 12 weeks. Data from the study showed that the average BMI before the intervention was 30.49 and the average body weight after the intervention was 28.[1], with an average body weight difference of 9.06%, which concluded that there were statistically significant results.[7]

Table 5. The Effect of Physical Activity on SGOT, SGPT, Body Weight, and BMI: Pearson Test Results

	SGOT Post	SGPT Post	Body Weight post	BMI Post	
Physical Activity	0,113	0,300	0,309	0,225	Pearson Correlation
	0,634	0,199	0,185	0,340	Sig. (2-tailed)

Based on Table 5, the intervention did not produce statistically significant changes in the relationship between physical activity and all parameters (SGOT, SGPT, BB and BMI). Based on the Pearson Correlation Test results, the results of SGOT Post: r = 0.113, p = 0.634, The relationship between physical activity and SGOT After the intervention, the relationship became positive but remained weak and insignificant. For SGPT SGPT Post: r = -0.300, p = 0.199. After the intervention, the relationship became stronger negative (r = -0.300) but still insignificant (p = 0.199). Then, BB Post: r = -0.309, p = 0.185. The relationship between physical activity and body weight After the intervention, the negative correlation increased slightly (r = -0.309) but remained insignificant (p = 0.185). At BMI Post: r = -0.225, p = 0.340. The relationship between physical activity and After the intervention, the relationship became more negative (r = -0.225) but was still not significant (p = 0.340).

Most of the relationships between physical activity and SGOT, SGPT, body weight, and BMI levels were negative (increased physical activity → decreased health parameters) and all p values > 0.05, indicating no significant relationship between the duration of physical activity and the measured variables.

DISCUSSION

This study showed that IF and light physical activity significantly reduced body weight and BMI. The mean body weight decreased from 80.02 ± 13.14 kg to 77.33 ± 13.09 kg, and BMI decreased from 29.698 ± 4.39 kg/m² to 28.688 ± 4.33 kg/m², both of which were statistically significant ($p < 0.001$). These findings support the effectiveness of IF as a weight management strategy through controlled calorie restriction and improved energy metabolism.

As assessed by SGOT and SGPT levels, liver function parameters also showed no significant changes. SGOT levels decreased slightly from 29.40 ± 12.72 U/L to 27.85 ± 12.70 U/L (p = 0.699), while SGPT levels decreased from 30.85 ± 20.72 U/L to 29.35 ± 15.92 U/L (p = 0.735). The stability of these parameters suggests that IF combined with light physical activity does not adversely affect liver function, indicating that the intervention is safe during the duration of the study.

In conclusion, this study supports the use of IF and light physical activity as an effective strategy to reduce body weight and BMI. However, its impact on liver function requires further investigation with more extended intervention periods, larger sample sizes, and evaluation of additional parameters such as HDL, triglycerides, and inflammatory markers. The variability in participant responses also highlights the need for an individualized approach in designing diet and physical activity programs to optimize intervention outcomes.

CONCLUSION

In this study, it can be concluded that IF and Physical Activity, when applied over a while, effectively reduces body weight in overweight and obese individuals. However, no significant changes were observed in specific biochemical markers, such as SGOT and SGPT levels, indicating that although IF may be beneficial for weight management, its impact on metabolic parameters may require further study.

REFERENCES

1. *Sumarni S, Bangkele EY. Persepsi Orang Tua, Guru Dan Tenaga Kesehatan Tentang Obesitas Pada Anak Dan Remaja. Heal Tadulako J (Jurnal Kesehat Tadulako). 2023;9(1):58–64.*
2. *Irfan M, Ayu MS. Hubungan Pola Konsumsi Minuman Bergula Terhadap Obesitas Pada Mahasiswa Fakultas Kedokteran Uisu Tahun 2022. J Kedokt Ibnu Nafis. 2022;11(1):31–6.*
3. *Tan EIA, Irfannuddin I, Murti K. Pengaruh Diet Ketogenik Terhadap Proliferasi Dan Ketahanan Sel Pada Jaringan Pankreas. JAMBI Med J "Jurnal Kedokt dan Kesehatan." 2019;7(1):102–16.*
4. *Banjarnahor RO, Banurea FF, Panjaitan JO, Pasaribu RSP, Hafni I. Faktor-faktor risiko penyebab kelebihan berat badan dan obesitas pada anak dan remaja: Studi literatur. Trop Public Heal J. :36.*
5. *Suzan R, Halim R, Ayudia EI. Hubungan Antara Asupan Makan , Status Gizi dan Aktivitas Fisik dengan Kejadian Covid-19 Pada Orang Dewasa Overweight dan Obesitas. JMJ, Spec Issues, JAMHESIC. 2021;458–66.*
6. *Harahap NS, Pranata R. Pengaruh Aktifitas Fisik Continuous Running Dan Interval Running Terhadap Serum Glutamic Oxaloacetic Transaminase (Sgot) Dan Serum Glutamic Pyruvic Transaminase (Sgpt). Sains Olahraga J Ilm Ilmu Keolahragaan. 2019;3(1):12.*
7. *Jalili V, Poorahmadi Z, Hasanpour Ardekanizadeh N, Gholamalizadeh M, Ajami M, Houshiarrad A, et al. The association between obesity with serum levels of liver enzymes, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase and gamma-glutamyl transferase in adult women. Endocrinol Diabetes Metab. 2022;5(6):1–6.*
8. *Juniarti E, Zaini S, Suhariyanto. Address : Phone : Article history : J Kesehat. 2023;6(3):304–16.*
9. *Agustina W, Lestari RM, Prasida DW. Hubungan Aktivitas Fisik dengan Kejadian Obesitas pada Usia Produktif di Wilayah Kerja Puskesmas Marina Permai Kota Palangka Raya. J Surya Med. 2023;9(1):1–8.*
10. *Rahmawati A, Witjaksono F, Prafiantini E. Pengaruh Puasa Intermiten 5:2 terhadap Berat Badan dan Resistensi Insulin pada Karyawan Obesitas di Jakarta The Effect of Intermittent Fasting 5: 2 on Body Weight and Insulin Resistance among Obese Employees in Jakarta. Res study [Internet]. 2021;29:158–65. Available from: www.randomlists.com.*

11. *Esa Indah Ayudia, Huntari Harahap, Irfannuddin Irfannuddin. the Effect of Intermitent Fasting Diet on Kidney Function. Int J Islam Complement Med. 2020;1(2):65–70.*
12. *Harahap H, Indah Ayudia E, Kusdiyah E, Subhan R. the Effect of Intermittent Fasting on Triglyceride Levels in the Wistar Strain White Rats (Rattus Norvegicus) Diabetes Mellitus Model. 2023;299–304.*
13. *Harahap H, Kusdiyah E. Pengaruh Alternate Day Fasting terhadap Berat Badan, Glukosa Darah, dan Fungsi Hati pada Tikus Putih Galur Sprague Dawley. ResearchgateNet [Internet]. 2020;(October).*
14. *Harahap H, Kusdiyah E, Ayudia EI. Influence of Intermittent Fasting to Body Weight and Blood Glucose Levels in White Rats with Diabetes Mellitus Model [Internet]. Vol. 1. Atlantis Press SARL; 2023. 388–392 p. Available from: http://dx.doi.org/10.2991/978-2-38476-110-4_41*
15. *Indah W, Aurora D, Kusdiyah E, Mulyadi D. Hubungan Antara Indeks Massa Tubuh Dan Kadar Kalsium Dalam Darah Sebagai Deteksi Osteoporosis Pada Wanita Usia 40-60 Tahun Di Kota Jambi. JMJ, Spec Issues, JAMHESIC. 2021;299–305.*
16. *Harahap H, Maharani C, Kusdiyah E, Fisiologi D, Kedokteran F, Kesehatan I, et al. Pengaruh Indeks Massa Tubuh dan Lingkar Pinggang Terhadap Arus Puncak Ekspirasi Mahasiswa/i Fakultas Kedokteran dan Ilmu Kesehatan Universitas Jambi. 2019;171–7.*
17. *Varkaneh HK, Salehi A, Rajabnia M, Hekmatdoost A. E ects of the : intermittent fasting diet on non-alcoholic fatty liver disease : A randomized controlled trial.*
18. *Harahap H, Kusdiyah E, Usni M, Hasibuan Z. The Effect Of Intermittent Fasting And Light Physical Activity On Body Weight And Blood Glucose In Overweight Men. 2024;12(1):2–6.*
19. *Witjaksono F, Prafiantini E, Rahmawati A. Effect of intermittent fasting 5 : 2 on body composition and nutritional intake among employees with Obesity in Jakarta : a randomized clinical trial. 2022;1–7.*