The Comparison of Anthropometry and Quality of Life Before and During Ramadan Fasting Among Middle-Aged Population in Kuala Nerus, Terengganu

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Abstract
Ramadan fasting refers to 29 or 30 days of mandatory fasting practice among Muslims. Muslims abstain from various activities, including eating, drinking, sexual activity, smoking, and taking medication from sunrise to dusk. Growing evidences showed the potential effect of Ramadhan fasting as one of strategies to reduce weight. However, limited studies investigated its effects on variables such as anthropometry and quality of life among middle-aged population. The aim of this study is to compare the anthropometry and quality of life before and during Ramadan among community-dwelling middle-aged population in the age range of 35 to 65 years old in Kuala Nerus, Terengganu. This prospective observational study was carried out from March to April 2023 involving 110 participants in Kuala Nerus, Terengganu, Malaysia. Anthropometry parameters such as weight (kg), height (cm), body mass index (kg/m²), waist circumference (cm), body fat percentage (%), total muscle mass (kg), and total body water (%) were measured using a weighing scale, stadiometer, bioelectrical impedance analysis (BIA) and measuring tape respectively. Short Form 36 questionnaire (SF-36) was used to measure the level of quality of life among the participants. Findings showed the significant reductions in weight (kg) (67.1±13.0 vs 69.8±13.3, p<0.001), body mass index (kg/m²) (26.1±4.4 vs 27.6±4.5, p<0.001), waist circumference (cm) (91.2±15.1 vs 94.9±15.3, p<0.001), body fat percentage (%) (28.2±8.9 vs 30.1±8.7, p<0.001), and muscle mass (kg) (45.3±9.1 vs 45.9±9.4, p=0.016) during Ramadhan as compared to before Ramadhan. There were also significant improvements in various aspects of quality of life among the participants. Findings showed the significant reductions in weight (kg) (67.1±13.0 vs 69.8±13.3, p<0.001), body mass index (kg/m²) (26.1±4.4 vs 27.6±4.5, p<0.001), waist circumference (cm) (91.2±15.1 vs 94.9±15.3, p<0.001), body fat percentage (%) (28.2±8.9 vs 30.1±8.7, p<0.001), and muscle mass (kg) (45.3±9.1 vs 45.9±9.4, p=0.016) during Ramadhan as compared to before Ramadhan. There were also significant improvements in various aspects of quality of life observed during Ramadan compared to before, including physical functioning (86.1±12.3 vs 79.1±15.1, p<0.001), physical health (80.8±20.9 vs 66.6±34.1, p<0.001), emotional problems (89.0±17.3 vs 75.4±31.7, p<0.001), social functioning (84.5±13.9 vs 73.9±15.5, p<0.001), pain (83.2±14.8 vs 70.2±18.7, p<0.001), general health (84.3±13.0 vs 70.4±17.8, p<0.001) and emotional or wellbeing (79.7±8.4 vs 76.4±10.9, p=0.044). Correlational analysis found that higher total body water during Ramadan fasting was positively correlated with higher energy levels (p=0.015). This study’s limitation is that these findings confine to local population. Future studies should involve a wider population to provide better understanding on the health benefits of Ramadan fasting. In conclusion, the current study showed the significant potential of Ramadhan fasting in improving anthropometry outcomes and quality of life among middle-aged adults.

Keywords
Anthropometry, middle-aged adult, ramadhan fasting, quality of life

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Introduction

In many religions and cultures around the world, fasting has been practiced for centuries. In Islam, fasting during Ramadhan is one of the five pillars in Islam. The length of Ramadhan fasting depends on the time of year and change according to sunrise and sunset time. Fasting during Ramadhan is defined as refraining from eating, drinking, sexual activity, smoking, taking medication, and a variety of other activities from sunrise to dusk, which is often followed by a feast. Muslims are only allowed to eat once before sunrise (known as suhoor) or once after sunset (iftar). However, they are free to consume foods and drinks in between iftar and suhoor. This changing routines during Ramadhan has dramatically changed their eating behaviour, food consumption, frequency, nighttime sleep length, and other activities.

Mounting evidence reveal the benefit of Ramadhan fasting on several health outcomes. Few studies observed that body composition was significantly impacted by fasting. Anthropometry parameters such as body weight and body mass index (BMI) was reduced during Ramadhan, however, waist-hip ratio (WHR) and body fat percentage slightly rose. In another study, a significant reduction in body composition (body weight, body mass index, skeletal muscle mass, and fat-free mass of their respondent was observed when compared to 1 week before Ramadhan (T1) and the last day of Ramadhan (T3). Several studies have shown that fasting during Ramadhan causes weight loss which has been associated with a decrease in food frequency.

Previous evidence also showed the potential positive effect of Ramadhan fasting on quality of life. A study investigates the effects of Ramadhan on fatigue, mood, sleepiness and health related quality of life among healthy men in Germany revealed the positive effects as early as week 1 following discontinuation of Ramadhan. This study also suggests that Ramadhan does not have a significant impact on quality of life for individual individuals, but it is beneficial in terms of these measurements to those who fast. However, few studies found that during the month of Ramadhan, the worse score for bodily pain scale, physical role, vitality, and mental health were observed compared with non-Ramadhan period. Considering these inconsistencies, this study aimed to investigate the comparison of anthropometry and quality of life among the middle-aged population before and during Ramadhan fasting. Hence, this study is important to address conflicting findings on the effects of Ramadan fasting, particularly in regions with a high Muslim population like Kuala Nerus in Terengganu. This study aims to shed light on how fasting during Ramadhan impacts middle-aged individuals, filling a knowledge gap in this age group's health and well-being and examines important aspects such as anthropometry and quality of life to provide a comprehensive understanding of fasting’s effects on health and life of an individual.

Materials and Methods

Study design

This study was conducted using a prospective observational study design and held in Kuala Nerus, Terengganu. The data were collected from March to April 2023.

Sampling method

This study was conducted using a convenience sampling.

Ethical statement

Ethical approval was obtained from the University of Sultan Zainal Abidin Human Research and Ethics Committee (UHREC) [UniSZA.800-1/1/2 Jld.2 (34)]. All participants gave consent for their participation and a study information sheet was provided prior to the study recruitment.
Study population
Kuala Nerus is a district of Terengganu, one of the states in Malaysia. The study population includes the population of the community-dwelling that lives in the district area. The study participants included middle-aged adults ranging from the age of 40 to 65 years old with no physical and mental disabilities.

Variable and measurement
Sociodemographic data such as age, gender, occupation, and education level were collected with this study outcomes of anthropometry and quality of life. The anthropometry measurements include body weight, height, Body Mass Index (BMI), waist circumference, body fat percentage, muscle mass, and total body water. Meanwhile, the quality-of-life was assessed using the SF-36 questionnaire.

Data collection
The data were collected twice, Before Ramadhan and During Ramadhan. The first data collection was conducted at least two weeks prior to Ramadan month of 2023 while the latter data collection was conducted during the second to fourth week of Ramadan. Participants were assessed for their sociodemographic data, anthropometry measurements, and quality of life assessments.

Anthropometry measurement
Participants were assessed for their body weight (kg), BMI (kg/m2), body fat percentage (%), muscle mass (kg), and total body water (%) using bioelectrical impedance analysis (BIA). Stadiometer was used to measure their height (m) while measuring tape was used to measure their waist circumference (cm).

Quality of life assessment
Participants were required to answer a short form 36 questionnaire, which focused on 8 domains of physical and mental functioning, the role of limitation in terms of physical health due to emotional problems, energy or fatigue, emotion wellbeing, social functioning, pain, and general health. The item score was recorded by using an available algorithm provided by researchers at SF-36, consolidated and converted to a scale from 0 worst to 100 best for each dimension of quality of life examined. The Malay version of SF-36 questionnaire has been translated and well validated with the Cronbach’s alpha value ranged from 0.67 to 0.76 which considered as acceptable and indicative of good reliability for the overall assessment.

Results
A total of 124 Malay participants were recruited in the study during the first data collection (before Ramadhan) however only 73 participants were completed for both study outcomes of anthropometry and quality of life assessment for both sessions. The dropout rate in this study was accounted for 59%.

Sociodemographic data
The mean age for this study participants was 59 years old. Majority of participants were men (64.8%), married (88.7%), obtained secondary school education (64.8%) and low socioeconomic status (62.0%). Table 1 summarized the sociodemographic characteristics of participants.

Anthropometry data before and during Ramadhan fasting
Table 2 showed the comparison of anthropometry values observed among participants during Ramadhan as compared to before Ramadhan. During Ramadhan, participant’s weight decreased by 2.7 kg (M=67.1, SD=13.0) as compared to before Ramadhan (M= 69.8, SD= 13.3) which was statistically significant, (t (96) = -2.70, p< 0.001). Similar finding was observed on body mass index (BMI) during Ramadhan which decreased by -1.4 kg/m2 (M= 26.1, SD= 4.4) compared to before Ramadhan (M=27.6, SD= 4.5) which was statistically significant, (t (96) = -1.42, p<0.001). The body fat percentage of participants also signified a
significant reduction of -1.9 % (t (96) = -1.85, p<0.001) during Ramadhan (M=28.2, SD=8.9), as compared to before Ramadhan (M=30.1, SD=8.8). The muscle mass also reduced significantly, (t (96) = -0.57, p<0.05) during Ramadhan by -0.57, (M= 45.3, SD= 9.1) compared to before Ramadhan (M=45.9, SD= 9.4).

Level of quality of life before and during Ramadhan fasting
Table 3 shows the value for each SF-36 domain before Ramadhan (BR) and during Ramadhan (DR). Except for energy/fatigue, significant changes were observed in the domains of physical functioning, role limitations due to physical health, emotional well-being, social functioning, pain, and general health (p<0.05). Physical functioning during Ramadhan (M=86.09, SD=12.3) was significantly improved (t (73) = 7.02, p< 0.001) by 7.02 score as compared to before Ramadhan (M=79.07, SD=15.1). Limitations due to physical health was significantly improved (t (73) = 14.21, p<0.001) by 14.2 score during Ramadhan (M=80.81, SD=20.85) as compared to before Ramadhan (M=66.60, SD=34.08). The domain of general health also improved by 13.9 (t (73) = 13.88, p<0.001). The role of limitation due to emotional problem has an increment of 13.63 score during Ramadhan (M= 89.00, SD=17.28), compared to before Ramadhan (M=75.37, SD= 31.73) and statistically significant (t (73) = 13.63, p< 0.001). Emotional well-being score during Ramadhan (M=79.66, SD=8.35) is higher compare to before Ramadhan (M=76.44, SD=10.98) with (t (73) = 3.22, p< 0.001) while the domain of pain during Ramadhan (M=83.28,SD=14.83) is improved by 13.07, compare to before Ramadhan (M=70.21, SD=18.66), which was statistically significant (t (73) = 13.07, p< 0.001).

The correlation between the changes in anthropometry and quality of life
The correlational analysis was conducted between the changes of all anthropometry parameters and quality of life. Of these, the only significant correlation was observed between Δ weight and Δ emotional well-being (r= 0.243, p= 0.039) and Δ muscle mass and Δ energy fatigue (r=0.258, p=0.028). Table 4 summarized the significant correlation observed within this study. This suggested that the greater differences of weight, the better emotional well-being was reported among participants. For the muscle mass, the greater difference in muscle mass, the better feeling of full pep and energy was observed.

Table 1: Sociodemographic characteristics of participants (n=124)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency / Mean±SD</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>59.3 ±8.2</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>46</td>
<td>64.8</td>
</tr>
<tr>
<td>Female</td>
<td>25</td>
<td>35.2</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>124</td>
<td>100.0</td>
</tr>
<tr>
<td>Chinese</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Indian</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>63</td>
<td>88.7</td>
</tr>
<tr>
<td>Widow</td>
<td>2</td>
<td>2.8</td>
</tr>
<tr>
<td>Widower</td>
<td>6</td>
<td>8.5</td>
</tr>
<tr>
<td>Educational Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>3</td>
<td>4.2</td>
</tr>
<tr>
<td>Secondary</td>
<td>46</td>
<td>64.8</td>
</tr>
<tr>
<td>Tertiary</td>
<td>22</td>
<td>31.0</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has income</td>
<td>27</td>
<td>38.0</td>
</tr>
<tr>
<td>No income</td>
<td>44</td>
<td>62.0</td>
</tr>
</tbody>
</table>

Data were analyzed using descriptive statistics.
Table 2: The comparison of anthropometry measurements before and during Ramadhan (n=96)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean±SD</th>
<th>Mean diff</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>69.76±13.34</td>
<td>67.06±13.00</td>
<td>-2.70</td>
</tr>
<tr>
<td>Body Mass Index, BMI (kg/m²)</td>
<td>27.55±4.48</td>
<td>26.12±4.37</td>
<td>-1.42</td>
</tr>
<tr>
<td>Waist Circumference (cm)</td>
<td>94.87±15.32</td>
<td>91.24±15.13</td>
<td>-3.64</td>
</tr>
<tr>
<td>Body Fat Percentage (%)</td>
<td>30.05±8.78</td>
<td>28.20±8.85</td>
<td>-1.85</td>
</tr>
<tr>
<td>Muscle Mass (kg)</td>
<td>45.90±9.38</td>
<td>45.33±9.12</td>
<td>-0.57</td>
</tr>
<tr>
<td>Total Body Water (%)</td>
<td>52.17±7.04</td>
<td>52.76±7.40</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Paired-samples T-test, the significant value was p<0.05.

Table 3: The comparison of quality of life before and during Ramadhan (n=76)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean±SD</th>
<th>Mean diff</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical functioning(PF)</td>
<td>79.07±15.12</td>
<td>86.09±12.27</td>
<td>7.02</td>
</tr>
<tr>
<td>Role limitation due to physical health (PH)</td>
<td>66.60±34.08</td>
<td>80.81±20.85</td>
<td>14.21</td>
</tr>
<tr>
<td>**Role of Limitation due to emotional problem (EP)</td>
<td>75.37±31.73</td>
<td>89.00±17.28</td>
<td>13.63</td>
</tr>
<tr>
<td>**Energy/ fatigue(EF)</td>
<td>71.21±11.83</td>
<td>72.77±11.81</td>
<td>1.57</td>
</tr>
<tr>
<td>Emotional or wellbeing(EWB)</td>
<td>76.44±10.98</td>
<td>79.66±8.35</td>
<td>3.22</td>
</tr>
<tr>
<td>**Social Functioning(SF)</td>
<td>73.85±15.47</td>
<td>84.47±13.92</td>
<td>10.62</td>
</tr>
<tr>
<td>Pain(PN)</td>
<td>70.21±18.66</td>
<td>83.28±14.83</td>
<td>13.07</td>
</tr>
<tr>
<td>General Health(GH)</td>
<td>70.38±17.82</td>
<td>84.26±13.00</td>
<td>13.88</td>
</tr>
</tbody>
</table>

Paired-samples T-test, the significant value was p<0.05.

**Used Wilcoxon Signed Ranks Test

Table 4: The correlation of changes in anthropometry and quality of life before and during Ramadhan (n=76)

<table>
<thead>
<tr>
<th>Anthropometry Parameters</th>
<th>Quality of Life Domains</th>
<th>Correlation coefficient, r</th>
<th>p-value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆ weight (kg)</td>
<td>∆ emotional well-being</td>
<td>0.243</td>
<td>0.039</td>
<td>Poor positive correlation</td>
</tr>
<tr>
<td>∆ muscle mass (kg)</td>
<td>∆energy/fatigue</td>
<td>0.258</td>
<td>0.028</td>
<td>Fair negative correlation</td>
</tr>
</tbody>
</table>

Spearman’s rho correlation, significant value was p<0.05

∆: changes in quality of variables

Discussion

The study found the significant reduction of weight, BMI, waist circumference, body fat percentage and muscle mass among participant during Ramadhan. Our findings consistent to previous studies which found body weight, and body mass index (BMI) decreased significantly among their study participants.6,7,11,12 Another study on Type 2 Diabetes Mellitus patient also observed the slight reduction of body weight by 0.71 kg among the participants and decrease in waist circumference.13 The greater amount of weight loss found during Ramadhan could be due to the decrease frequency of mealtime which limit the time window of eating thus creating a calorie deficit that can contribute to weight loss. The prolonged fasting could also lead the changes in human gut microbiota, increased production of short-chain fatty acids, and improvements in glucose regulation, inflammation, and stress resistance.14 These changes in metabolic

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activity could potentially affect anthropometry measurements by altering body composition, such as changes in fat mass and muscle mass. Previous study also observed the significant decreased dietary intake proteins, total fats, saturated fats, and trans-fatty acids decreases during fasting periods, while carbohydrates and fibers appear to increase. In line with the previous study, the decreased intake of protein, age, genetics and physical inactivity could potentially be the reason of the muscle mass loss observed in this study. Thus, maintaining a balance meal consists of adequate protein, carbohydrate, and fibre during sohoor and breaking fast while being physically active during Ramadhan are important to minimize muscle mass loss. Some studies also have shown that individuals with greater protein intake have less low muscle mass loss. Symons reported that a moderate 113g serving of an intact protein (that is, lean beef) contains sufficient amino acids (30g total; ~12g essential amino acids) to increase mixed muscle protein synthesis by 50% in both young and elderly men and women. Additionally, prolonged intermittent fasting may alter hormone levels, such as increased levels of growth hormone and decreased levels of insulin, which could also affect body composition and metabolic activity. Body also uses ketones and fatty acids for energy during fasting thus the body metabolism becomes more efficient and hence lead to better body anthropometry measurement. The combination of calorie restriction, changes in dietary patterns, and potential weight loss during fasting may hence contribute to reductions in waist circumference. Contrast to our findings, a study on Muslim community in Miyazaki, Japan showed no changes or improvement in anthropometric parameters were observed among their participants. In fact, one study found the increased of body fat percentages was observed during Ramadhan.

Likewise, majority of the domains in quality of life were observed to be better During Ramadhan include the physical functioning, restriction due to health problems, emotional wellbeing, social functioning, and pain in general health. Ramadhan fasting entails a major shift from normal eating patterns to exclusive nocturnal eating. During this bless month, all Muslims especially the elderly population were strongly involved in religious activities, such as performing midnight prayers, recite Quran, and doing other spiritual practices. From this present study, Ramadhan fasting was found to be effective in improving several domains of quality of life such as physical functioning, role of limitation due to physical health, role of limitation due to emotional problem, emotional/well-being, social functioning, pain and general health among the participants. This finding is consistent with another study which observed a significant increase in mental health composite (MHC). Another study in healthy Malaysian adults also found a significant improvement in score of role limitation due to emotional problem. Focusing on self-reflection and self-discipline could contribute to a positive impact on overall well-being and quality of life. It is also worth noting that the effects of Ramadhan on physical performance can be affected in different ways by various factors, such as age, sex, time of abstention, culture influences, climatic conditions and activity levels. Ramadhan fasting may have different effects on the physiological functions of a person according to his/her particular situation. From sunrise until sunset, the practice of abstaining from food during Ramadhan may have an impact on the level of energy, hydration, and dietary intake which can impact an individual physical functioning in fasting days.

Ramadhan fasting entails a major shift from normal eating patterns to exclusive nocturnal eating contributes to restoring homeostasis which refers to the process of returning the body to a state of balance or equilibrium. The cells are responding to intermittent fasting by acting upon a synchronized adjusted stress response that leads to an increase in the expression of oxidative defense, DNA repair, protein quality control, mitochondrial biogenesis and autophagy as well as suppression of inflammation. Reducing inflammatory activations in the immune system and recomposing them to a more reasonable state of equilibrium would be essential to restore homeostasis. Hence, restoring homeostasis, or balance, to the immune system can help reduce inflammation and improve treatment efficacy for depression and fatigue and lead to better emotional well-being and shows that no problems associated with work or other daily

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activities as a result of emotional problems throughout the month of Ramadhan as compared to before Ramadhan.

A study showed that intermittent fasting is associated with improved biochemical parameters and reduced risk of many metabolic conditions, such as obesity, metabolic syndromes, hypertension, hypercholesterolemia, cardiovascular disease, type 2 diabetes and chronic kidney disease. It is also consistent with another study which found significant improvements in total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and blood glucose levels after Ramadhan compared to before Ramadhan among their participant which were athletes. The improvement in body composition hence lead to a better physical health and able and individual to do their work without limitation as stated in a study, in the case of people with good physical health, their bodies’ functions and processes are probably at peak levels. However, contradictaly, in another study, there is no impact of Ramadhan fasting is observed among the participants. A study found that fasting during Ramadhan did not have a significant impact on the quality-of-life scores of adult patients with epilepsy. The primary outcome measures of the study were seizure control and quality of life score using the Arabic version of the Ferrans and Powers Quality of Life Index (QLI). Quality of life was scored at the end of each month of the study period, and the results showed that the quality-of-life scores were not affected by fasting.

Changes in the emotional wellbeing are strongly associated with weight. The possible explanation on this correlation including an increase in vitality. A review of the literature of weight change, psychological well-being, and vitality in adults participating in a cognitive-behavioral weight loss program found that patients in behaviorally or medically-oriented weight loss treatments reported improvements in mood. It is also consistent with the finding from another study which stated that excess weight has been associated with numerous psychological problems, including depression and anxiety. These psychosocial problems can eventually develop into depressive or other psychological disorders that are associated with poor self-care behavior, poor metabolic outcomes, increased mortality, functional limitations, increased health-care cost, loss of productivity, and reduced QoL. Stress and depression mainly come from anxiety, stigma, and rejection. Hence, individual which having excessive weight, they may get anxiety and rejection from the people around them and will affect their mental well-being.

During the month of Ramadhan, after Iftar (breaking of fast) the blood glucose level continues to rise from the food ingested. The blood glucose and insulin levels are at the lowest they've been before Iftar meals. Blood glucose levels start to rise about an hour after the Iftar meal and also plasma insulin, before livers and muscles are able to take up circulating glucose. Taraweh prayers which practised after breaking fast, will help in circulating glucose by metabolised it to carbon dioxide and water during the Taraweh prayer. Hence, taraweh prayers are helping to increase energy expenditure and improve flexibility, coordination, reduction of stress connected autonomic depression responses in healthy subjects as well as anxiety relief.

There was also a statistically significant negative correlation between Δmuscle mass and Δenergy/fatigue observed among the participants during Ramadhan. During Ramadan fasting, there is a risk of muscle mass loss due to protein breakdown. The lack of amino acids from the gastrointestinal tract leads to a decrease in protein regeneration. When 80% of stored fat is consumed, an intensive breakdown of protein begins, which enters the metabolic pathway. The reduction in serum creatinine values could be due to the loss of muscle mass during the fasting period. However, the extent of muscle mass loss during Ramadan fasting may depend on several factors such as age, sex, physical activity, and dietary intake. In line with another study which explains that during Ramadan fasting, weight loss occurs due to a reduction in basal metabolism and an increase in catabolic hormones, which can lead to loss of both fat and muscle mass. As protein loss, along with weight loss, hence can lead to fatigue and weakness. This arise as the loss of muscle

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mass due to protein loss can lead to a reduction in the body’s ability to generate force and perform physical tasks, as well as a disruption of the body’s protein balance, which can hence contribute to feelings of fatigue and weakness.\textsuperscript{39,40} Additionally, muscle tissue is also a major source of amino acids, which are the building blocks of proteins.\textsuperscript{41} When muscle mass is lost, the body may not have enough amino acids to synthesize new proteins, which can lead to a further breakdown of muscle tissue.\textsuperscript{42} This can create a negative feedback loop, where muscle loss leads to further protein loss, which in turn leads to more muscle loss and fatigue.

Conclusion

This study found that Ramadan fasting can benefit both, the anthropometry measurement and quality of life among middle age population. This study also signified the correlation between the changes in weight and emotional well-being, as well as muscle mass changes and energy fatigue among the participants. Regardless of the restricted of meal times and the mounting religious and spiritual practices done especially at nighttime, the state of quality of life among participant were even better during Ramadhan. This study has several strengths. It used a convenient face-to-face questionnaire-based method for data collection, making it easy for middle-aged participants to receive help while answering questions. Since there are few studies on the impact of Ramadan fasting on middle-aged Muslims in Malaysia, this research provides valuable information for healthcare professionals, policymakers, and individuals in this age group. It helps them understand how fasting can affect their health and could be used for healthcare interventions. Additionally, the study provides participants with knowledge about how their diet and physical activity influence their body composition, like muscle mass and fat percentage. However, several limitations occurred in this study such as the SF-36 questionnaire used in the study had a high number of questions, particularly. This could be burdensome and time-consuming for respondents, potentially leading to dropouts during data collection. The required sample size also was not obtained due to withdrawal from participants. Considering there was no dietary data included, weight loss should be cautiously interpreted.

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Conflict of Interest Disclosure

None to declare.

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