THE ROLE OF GINGER ON BODY WEIGHT AND MORPHOLOGICAL CHANGES IN SMALL INTESTINE OF WISTAR ALBINO RATS.

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Abstract

Introduction: Obesity is one of the big health issues globally[1]. Millions of individuals suffered from obesity and having the risk of developing Hypertension, cardiovascular dysfunction, Diabetes mellitus, and metabolic disorders. **Objectives:** To determine and compared the role of ginger on body weight and morphological changes in small intestine of normal and obese Wistar albino rats.

Methodology: This animal study was conducted at the Department of Anatomy PUMHS with the collaboration of AHVS-SAU Tando Jam, for 6 months from January 2018 to June 2018. Sixty (60) healthy male adult Wistar Albino rats (WARs) with body weight (BW) of 180.0 – 220.0 gm were selected. Rats were taken from the Animal Resource Center of SAU Tando Jam. The WARs were divided into 3-groups with 20 rats in each group. Control group WARs were fed a normal diet, Group B HF-diet provoked group and Group C Ginger treated group of rich fatty diet After when, the experimental study was about to end, the animals were sacrificed and pieces of the small intestine were fixed in 10.0% formalin for 24 hours, and embedded in paraffin. Findings of all group animals were recorded. A pre-designed proforma was used for the collection and documentation of data during research. SPSS 22.0 was used to analyze data. **Results:** In this study, no significant difference was found in initial BW among all groups ($p<0.163$) was quite insignificant. Final BW was significantly raised in group B of a fatty diet, and in ginger used group it was reduced almost equal to controls ($p<0.05$). The mean value of intestinal weight and intestinal diameter was significantly greater only in fatty diet group B as compared to normal diet group whereas intestinal diameter among groups was insignificant with ($p<0.058$). **Conclusion:** The present study concluded that ginger consumption had a significant impact on the reduction of body weight in obese WARs as compare to normal healthy WARs.

Keywords: Rich fatty diet, Obesity, Small intestine, Ginger, Morphological changes.

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INTRODUCTION

Obesity is one of the big health issues globally[1]. Millions of individuals suffered from obesity and having the risk of developing Hypertension, cardiovascular dysfunction, Diabetes mellitus, and metabolic disorders.[2,3] *Zingiberofficinale* (Ginger) is a shrubby plant, which has commonly been used for traditional medicine and additive to cooking.[4] Ginger is an antioxidant and used for illnesses including vomiting, indigestion, cold, muscular and joint pain.[5] Besides, its numerous pharmacological activities ginger is used as anti-obesity, anticancer, and anti-inflammatory agent.[6,7]Ginger is the most regularly utilized flavors worldwide, particularly in the South-east Asian nations. It has historically been utilized traditionally as a curative medicine for certain disorders together with the inflammatory disorder and has been exhibited to have several pharmacological functions, for example, anti-inflammatory, lipid, and glucose-lowering, antiulcer, antiemetic and anticancer activities.[8]Obesity results due to accumulation of fat in the body and increased the body weight.[9] The current health challenges have stimulated researchers regarding weight loss, by utilizing organic compounds, which have less side effects.Current therapeutic methods are generally determined on stimulating or blocking various enzymes and biomolecules that boost the fat metabolism.[10] Ginger and its components have been utilized for their appetizing and expectorant characteristics moreover they are recounted to have cholesterol- lessening and gastro-defensive characteristics.[11]Several active constituents exist in ginger together with oleoresins and terpene which are termed as

ginger-oil.[12]The major recognized constituents from terpenes are $C_{15}H_{24}$ & phenolic compounds that are gingerol and shogaol.Gingerol is a substance that is powerfully anti-inflammatory and antioxidant characteristics. The antioxidants can restore and maintain normal gut and use as fat cutter.[13]
The present study intends to explore the impact of ginger on weight reduction and morphological changes of small intestine by its consumption.

Objectives: To identify and compared the body weight and morphological effects of ginger on the small intestinal by induce high fatty diet provoked obese Wistar Albino Rats.

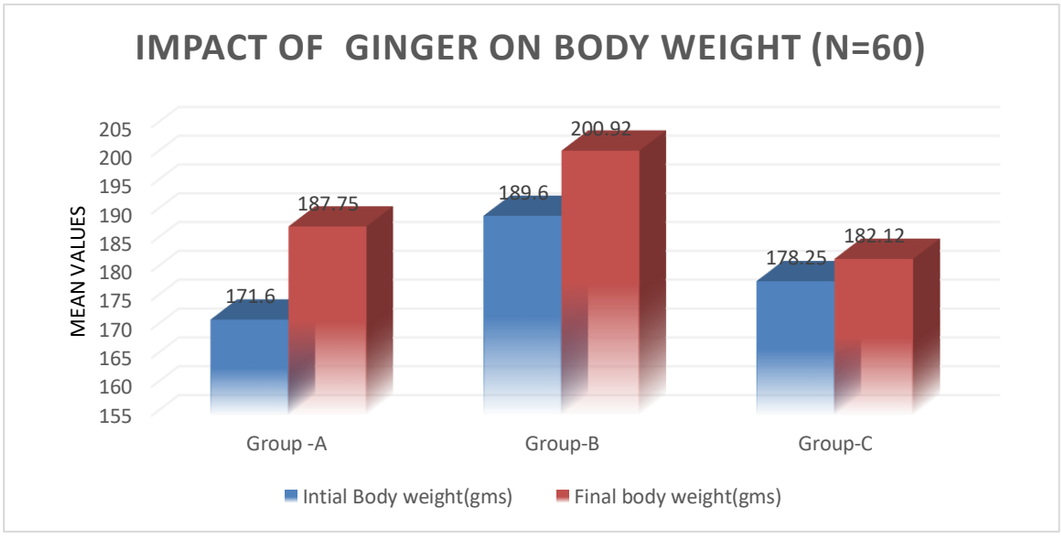
Materials and Methods:

A experimental study was conducted at the Department of Animal Husbandry and Veterinary Sciences Sindh Agriculture University Tando Jam and the Anatomy department of Peoples University of Medical and Health Sciences for Women Nawabshah (SBA). The duration of study was six (6) months from January 2018 to June 2018. The 60 Male Wistar Albino rats with body weight (BW) of 170-220 gms were selected, whereas females Wistar Albino rats and BW <180 gm or >220gm were excluded from the study. Present study was performed after approval by the ethical Committee, PUMHSW, SBA. Rats were acquired from the Animal Resource Center of SAU Tando jam. Following official approval, experiments were carried out on adult male WARs. Animals were monitored for 1 week for adaptation to the environment, appraisal of their diet intake, and health status before the commencement of the study. Animals were housed around 6 per cage in a temperature-controlled room (22± 2°C) and humidity (55%±5%), and a 12-hours circadian rhythm. The animals were allowed to have food & water ad libitum. The selected animals for present study were divided into three groups as:Group A (n=20): served as a Control group and all animals of this group were fed a normal diet.Group B (n=20): HF-diet provoked group; a rich fatty diet was served to this group of animals. Group C (n=20): Ginger treated group; animals were on a rich fatty diet with ginger. Findings of all group animals were recorded. A pre-designed proforma was used for the collection and documentation of data during research. SPSS 22.0 was used to analyze data. ANOVA tukey test was applied and results were shown as mean and standard deviation.

Composition of Balanced Diet and High Fat Diet Balanced diet: The feeding ofnormal controlrats: 10% protein, 10% fat, 74.4 % carbohydrates, 3.5% mineral mixture, 1 % vitamin mixture, 0.1% methionine and 1 % fiber. Whereas High fat diet (HFD) for induction of obesity: 10 % protein, 30% fat, 54.4 % carbohydrates, 3.5 % mineral mixture, 1 % vitamin mixture, 0.1% methionine and 1 % fiber.
Results: Ginger contains gingerols and shogaols compounds which help to stimulate several biological activities in the body. Total sixty (60) animals were used in the present study. The initial body weight among groups showed ($p<0.163$) with an insignificant difference. The mean body weight of animals of group A was 171.75±6.04 grams, group B 189.6±10.75 grams, and 178.25±29.38 grams of group C. The mean final body weight, was significantly raised in group B (fatty diet group) 200.92±9.28 gms as compared to control group187.75±6.21gms whereas group C was also reduced to 178.12±27.42g ($P<0.05$). It was observed that bodyweight significantly associated with the consumption of fatty diet, and ginger uses can be reduced its effects, as shown in Table-1 and represented in Graph-1.
The mean of intestinal length was significantly higher in HFD- group (49.62±2.77) cm as compared to control group whereas experimental group showed (45.75±4.46 cm). It observed that ginger produced its antioxidant effects which help in a reduction in length of the intestine by enhancing its metabolic activity. whereas the highly significant difference ($p<0.05$). The mean of intestinal weight was significantly HFD-group (8.55±1.34) gms as compared to control group (7.42±0.84)gms but ginger consumption group (group-C) it observed that intestinal weight was reduced was statistical significant difference of($P<0.05$). There was no significant difference in the intestinal diameter among all study groups, p-values were quite insignificant. The intestinal diameter of group A was 2.87±.64 mm, of B was 2.75±0.46 mm and group C was 2.87±0.35 mm as shown in Table-1 and represented in Graph-1.

Table-1: Comparison of Initial and Final Body Weight (gms) Among Study Groups(n=60)

Variables	Group-A (n=20) Control	Group-B (n=20) HF-Diet	Group-C (n=20) Ginger treated group with HF-diet	p- value
Initial Body weight (gms)	171.6±6.04	189.6±10.75	178.25±29.38	<0.163
Final body weight (gms)	187.75±6.21	200.92±9.28	182.12±27.42	<0.05

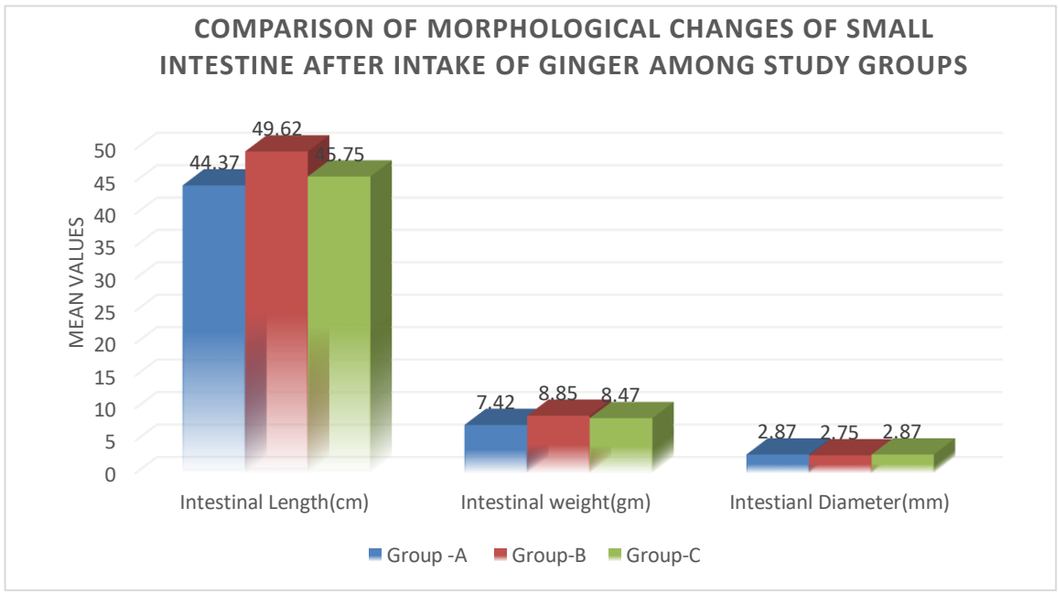


Graph-1: Comparison of Initial and Final Body Weight (gms) among Study Groups(n=60)

Table-2: Comparison of Morphological Changes of Small Intestine After Intake of HFD Among Study Groups(N=60)

Variables	Group-A (n=20) Control	Group-B (n=20) HF-Diet	Group-C (n=20) Ginger treated group with HF-diet	p- value
Intestinal Length (cm)	44.37±4.13	49.62±2.77	45.75±4.46	<0.05
Intestinal weight (gm)	7.42±0.84	8.85±1.34	8.47±1.23	<0.05
Intestinal Diameter (mm)	2.87±0.64	2.75±0.46	2.87±0.35	<0.058

Graph-2 Comparison of Morphological Changes of Small Intestine After Intake of Ginger



among Study Groups(n=60)

DISCUSSION

Rich fatty diets was observed as likely to lead to the raised body weight. In this study after experiment body weight was significantly raised in fatty consumption groups in contrast to controls, and significantly declined after consumption of ginger. Other studies Suk S*et al*.,[14] and Mansour *et al*., [15] also observed that the bodyweight linked to fat because the rats which were fed with hyperlipidemic diets showed more weight. In their study body weight was decreased in the ginger and fatty consumed group as compared to only a high-fat diet group. Present study results were consistent with these studies. Ebrahimzadeh A V *et al.*,[16, 17]revealedin his experimental and human studies thathigh ginger group had less body weight in contrast to high-fat group. Similar results have been shown in present study. Thomson M et al.,[18]observed low cholesterol and anti-diabetic effects, but our study results were confined on body weight and small intestinal weight and size so, present study shown significant results of ginger consumption on small intestine and body weight. On the other hand, Dalby MJ *et al.*,[19] reported that tissue weight and length of the small intestine were higher in the cow diet group as compare to other study groups.Khalifeh MS *et al.*,[20]revealed that ginger subside the inflammation of mucosa of small intestine, we found almost similar findings on small intestine after intake of ginger.

Conclusion: The present study concluded that ginger consumption had a significant impact on the reduction of body weight in obese WARs as compare to normal healthy WARs.

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