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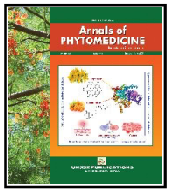

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Effects of *Triticum aestivum* L. supplementation on lipid profiles and oxidative stress markers in overweight and obese individuals

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Abstract

Obesity and overweight are caused by an excessive amount of fat in the body, which leads to many diseases, such as diabetes mellitus, heart disease, hypertension, and certain cancers. Wheatgrass is a nutrient-dense natural product. Since, it is a nutrient booster, the present study was planned to observe the impact of wheatgrass supplements. This cross-sectional study included individuals who were either overweight or obese. Fifty subjects were equally divided into two groups. Group A (control group) and Group B (Intervention group), consisting of individuals with a BMI greater than 25 kg/m^2 in each group. Weight, body mass index (BMI), haemoglobin, uric acid, alanine transaminase (ALT), aspartate transaminase (AST), total cholesterol, triglycerides, high-density lipoprotein (HDL), very low-density lipoprotein (VLDL), and catalase were analysed. In the intervention group, each individual took 3 g of wheatgrass powder per day with lukewarm water for 30 days. We assessed the parameters as mentioned above, post-intervention. Supplementation with wheatgrass in the present study increased catalase and haemoglobin levels, whereas a reduction in uric acid and lipid profiles was also observed. No changes in the ALT and AST were observed in the treatment group. Wheatgrass powder at a dosage of 3 g per day for 1 Month appears to have a positive effect on lipid profile, haemoglobin, uric acid, catalase. These results showed the potential effect of wheatgrass in overweight patients, which can help protect them from the serious consequences.

1. Introduction

Overweight and obesity are considered to be abnormal or excessive body fat that has the potential to influence an individual's health(World Health Organisation, 2000). It is one of the largest public health concerns, with numerous severe diseases, including diabetes, hypertension, cardiovascular disease (Centers for Disease Control, 2003). Obesity impacts not only the physical appearance of an individual but also disease processes. The World Health Organisation (WHO) and the National Institutes of Health (NIH) have established overweight as between 25.0 kg/m^2 and 29.9 kg/m^2 and obesity as more than 30.0 kg/m^2 (Kumanyika *et al*., 2008). The number of obese patients has been rising across the world in the past two decades (Arroyo-Johnson and Mincey, 2016; Liu *et al.,* 2017). As per the National Family Health Survey 4 (NFHS-4,2015-16), the prevalence of BMI greater than 25 kg/m^2 among India, among the females and males are 20.6% and 18.9% respectively, and considering the prevalence of BMI over 25 kg/m^2 in Delhi, among females and males are 33.5% and 24.6%, respectively. Obesity is one of the most important health issues, which is linked with a higher risk of insulin resistance, type 2 diabetes, cardiovascular disease, and cancer (Raina, 2011). Most of the time, excess energy intake from diets that are often nutritionally deficient causes a positive energy balance that leads to overweight or obesity (Ernst *et al.,* 2009). Dietary lipids represent a significant source of unwanted calories; reducing these fats is an interesting way to reduce fat absorption (Bray *et al.,* 2007; González-Castejón*et al.,* 2011). When exercising or pregnant, many people tend to overeat, and they are unable to resume their prior eating patterns. Consumption of foods high in fat and sugar is frequently associated with an increase in obesity (George *et al.,* 2011). Sedentary lifestyles also contribute significantly to the rise in obesity (Strychar, 2006). Certain mental and physical ailments, as well as many hereditary disorders that also cause or contribute to weight gain, are treated with medication. Over the years, a variety of drugs have been tried to treat obesity; however, the majority of these drugs have since been discontinued because of their severe side effects (Kang *et al.,* 2012). Many Asian countries now propose using natural items to manage obesity in an effort to find safer alternatives. Plants have long been used as traditional and natural resources. Scientists are pushing for more product-based therapies to develop safer anti-obesity drugs. Therefore, it is important to evaluate and analyse herbal remedies to prevent overweight or obesity and their side effects.

Wheatgrass is a juvenile plant of the common wheat, *Triticum aestivum* L. *T. aestivum,* commonly called wheatgrass, belongs to the family Gramineae (Chowdhury *et al.,* 2017). *Triticum* can be a genus of annual or biennial grasses. Wheatgrass, a juvenile grass plant, is freshly pressed into juice or dried into powder for animal and human consumption. Wheatgrass is a good source of vitamins and minerals. It has high concentrations of manganese, copper, zinc, phosphorus, magnesium, and iron. The abundance of minerals in natural brown wheat aids in blood pressure regulation, wound healing, and hormonal

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system maintenance. Additionally, wheatgrass provides iron to improve blood quality. Internal water balances are maintained by potassium and phosphorus in addition to other nutrients. Thus, wheatgrass aids in reestablishing internal balance (Adams *et al.,* 2002; Baublis *et al.,* 2000; Alvarez *et al.,* 2000). People who are overweight or obese are more likely than those who are of normal weight to develop metabolic syndrome, which is a condition marked by insulin resistance, high blood pressure, and dyslipidemias (Klop *et al.,* 2013). A direct relation between plasma triglycerides and body weight has been noticed (Helvaci *et al*., 2019), as a high percentage of patients with myocardial infarction exhibited hypertriglyceridaemia (Tenenbaum *et al.,* 2014). As wheatgrass juice contains high levels of the antioxidants chlorophyll, laetrile, and the antioxidant enzyme superoxide dismutase (SOD), which transforms harmful reactive oxygen species (ROS) free radicals into hydrogen peroxides (which contain an additional oxygen molecule that kills cancer cells) and the oxygen molecule, it offers an alternative healing method to cancer therapy (Toor *et al.,* 2020). The atherogenic index of plasma (AIP) is a key marker for cardiovascular risk, often elevated in overweight and obese individuals due to imbalanced lipid profiles and increased metabolic stress.

In a randomised, double-blind, placebo-controlled study, the use of wheatgrass (*T. aestivum*) juice was found to be effective and safe as either a single or adjuvant treatment for active distal ulcerative colitis (UC) (Ben-Arye *et al*., 2002). Wheatgrass juice is also used in the treatment of various skin lesions, burns, and ulcers due to its wound-healing properties, which include stimulating granulation tissue formation and epithelialization (Sareen *et al*., 2014). Additionally, wheatgrass therapy has shown benefits in managing skin conditions and ulcerative wounds by exhibiting antibacterial effects. It has also been reported to be helpful in conditions such as urinary stones, cystitis (inflammation of the urinary bladder), and nephritis (inflammation of the kidneys). Furthermore, water treated with magnets, when used alongside wheatgrass, has been claimed to enhance the therapeutic effects and promote faster recovery, though more scientific validation is needed for this approach (Mujoriya *et al.,* 2011).

Wheatgrass is a nutrient-dense natural product, rich in vitamins (such as A, C, and E), minerals, amino acids, chlorophyll, and antioxidants. It has been associated with several health-promoting properties, including improving haemoglobin levels and reducing cholesterol levels (Bhikaji *et al.,* 2015; Afroz *et al*., 2014). These effects contribute to better cardiovascular health and improved metabolic function, which are often compromised in overweight and obese individuals. Although, limited research has been conducted specifically on the effectiveness of wheatgrass in weight management, its high nutrient content may support weight loss efforts in several ways. Detoxifying properties and antioxidant capacity may also reduce oxidative stress and inflammation, which are frequently elevated in obesity. Therefore, the present study is planned to observe the impact of wheatgrass supplements on anthropometric parameters, metabolic markers, and overall health status in overweight and obese individuals, with the objective of determining its potential role as a natural adjunct in weight management and metabolic health improvement.

2. Materials and Methods

The study was conducted in the Hamdard Institute of Medical Sciences and Research (HIMSR), Jamia Hamdard, New Delhi, in collaboration with the Department of Medicine and the Hakim Abdul Hamid Centenary Hospital (HAHC Hospital), New Delhi, after approval from the Ethical Committee of the Institution. This is a cross-sectional study conducted on 50 subjects (11 males and 39 females), who were overweight and/or obese and were on medication prescribed by the medicine department, HAHC Hospital, New Delhi. The total number of subjects was n=50, which were divided category-wise into the following groups. Group A: (n=25) Control group: individuals with a BMI greater than or equal to 25 kg/m^2 (no intervention in this group). Group B: (n=25) Individuals with BMI greater than or equal to 25 kg/m^2; wheatgrass powder was administered orally, 3 g daily in powder form, for 30 days.

The inclusion criteria of the present study are overweight or obese individuals as per WHO's BMI criteria, aged 18-60 years. The exclusion criteria include individuals with a BMI below 25 kg/m², any chronic disease or illness, tuberculosis, cancer, AIDS, or pregnancy. At pre-intervention, parameters were assessed in both groups: Anthropometry (height, weight, and BMI) and biochemical estimations (haemoglobin, uric acid, AST, ALT, lipid profile-total cholesterol, triglycerides, HDL, VLDL, catalase, and AIP). At intervention, the dosage of wheatgrass powder was 3 g, which was given with lukewarm water to group B for 30 days. Usually, it is taken empty stomach and therefore taken early in the morning. At post-intervention, parameters were again assessed: Anthropometry (height, weight, and BMI), biochemical estimations (haemoglobin, uric acid, AST, ALT, lipid profile total cholesterol, triglycerides, HDL, VLDL, catalase, and AIP). All biochemical tests were done in the hospital. AIP, calculated as the logarithmic ratio of triglycerides to HDL (Niroumand *et al.,* 2015)

2.1 Wheatgrass powder source and its authentication

The wheatgrass powder was purchased from the Universal Biotech, LalKuan, and verified by a botanist at the Department of Botany, Jamia Hamdard, New Delhi, India with a Voucher Specimen Number (BHY/2022/046); the sample is deposited in the Herbarium for the future reference.

2.2 Statistical analysis

Confidence intervals of proportions were calculated using GraphPad Prism version 9. Data were expressed as mean ± Standard Error of the Mean (SEM). Statistical significance was assessed by a paired *t*-test. All tests were two-tailed, confidence intervals were calculated at the 95% level, and a *p*-value of <0.05 was considered significant.

3. Results

The study was conducted on 50 patients (11 males and 39 females) taking treatment in the Medicine Outpatient Department (OPD), HAHC Hospital, New Delhi. These overweight 50 patients were selected based on inclusion and exclusion criteria and had given valid consent in writing. These 50 patients were selected in a manner to segregate them into two groups of 25 each. One group of 25 patients was overweight, and no intervention was done; this group served as the control in this study, whereas the second group of 25 patients was overweight, and wheat grass powder was administered to this group. The average age of the control group was 38.40 ± 2.00, and in the intervention group, it was 36.60 ± 1.89.

The general characteristics, including age, sex, weight, height, and BMI, differed between the control group (Group A) and the intervention group (Group B), as presented in Table 1.

3.1 Effect of wheatgrass on weight

In group B, supplementation with 3 g of wheatgrass, weight at pre-intervention was 71.48 ± 1.92, and at the post-intervention it became 71.04 ± 1.87 kg. The value shows a significant decrease in weight. The *p*-value was 0.0020*. The average weight in the control group (group A) is 71.80 ± 1.36 kg (Table 2).

3.2 Effect of wheatgrass on BMI

BMI in the intervention group (group B), supplementation with wheat grass, does not produce any significant effect. BMI at pre-intervention was 29.16 ± 0.49 kg/m^2 and at post-intervention was 29.13 ± 0.46 kg/m^2. The *p*-value is 0.7455. The mean ± SEM of a control group is 29.15 ± 0.53 kg/m^2 (Table 2).

3.3 Effect of wheatgrass on haemoglobin (Hb)

In group B, that is the intervention group, supplementation with 3 g of wheatgrass produced a significant increase in haemoglobin levels; at pre-intervention, Hb was 11.98 ± 0.24 g/dl, and it became 12.47 ± 0.24 g/dl in the post-intervention. The **p*-value is 0.0019, showing a significant increase in the haemoglobin. The mean ± SEM of the control group was 11.98 ± 0.23 g/dl (Table 2).

3.4 Effect of wheatgrass on uric acid

Changes in the uric acid after the supplementation with wheatgrass in the intervention group (group B) show no significant variation. At pre-intervention, it was 5.41 ± 0.28 mg/dl, and at post-intervention, it was 5.30 ± 0.22 mg/dl. The *p*-value is 0.4329. The mean ± SEM of the control group was 4.33 ± 0.22 mg/dl (Table 2).

3.5 Effect of wheatgrass on AST and ALT

No changes in the AST and ALT levels were seen after the supplementation with wheatgrass. At pre-intervention, AST was 24.27 ± 1.25 U/l, and at post-intervention, it was 24.27 ± 0.86 U/l. The *p*-value is 0.9955.The mean ± SEM of the control group was 37.49 ± 1.63. At pre-intervention, ALT was 30.22 ± 1.77 U/l, and at post-intervention, it became 30.22 ± 1.38. The *p*-value is 0.9956. The mean ± SEM of the control group was 41.54 ± 1.95 U/l. No changes were seen in the AST and ALT after the supplementation (Table 2).

3.6 Effect of wheatgrass on total cholesterol

In the intervention group (group B), supplementation with 3 g of wheatgrass does not produce a significant variation in total cholesterol levels. At pre-intervention, it was 144.97 ± 3.86 mg/dl, and at post-intervention, it was 145.00 ± 3.65 mg/dl. The *p*-value is 0.9807. The mean ± SEM of the control group was 127.00 ± 2.75 mg/dl (Table 2).

3.7 Effect of wheatgrass ontriglycerides

In this research work, there was a significant decrease in the triglyceride levels after the supplementation of wheatgrass for 30 days. At pre-intervention, it was 105.15 ± 12.43 mg/dl, and at post-intervention, 68.69 ± 9.65 mg/dl. The *p*-value is 0.0001*. The mean ± SEM of a control group was 104.00 ± 6.49 mg/dl (Table 2).

3.8 Effect of wheatgrass on HDL

In group B, supplementation with 3 g of wheatgrass, at pre-intervention it was 46.84 ± 0.75 mg/dl, and at the post-intervention it became 45.28 ± 0.70 mg/dl. Post intervention, there was a significant change in HDL levels (Table 2).

3.9 Effect of wheatgrass on VLDL

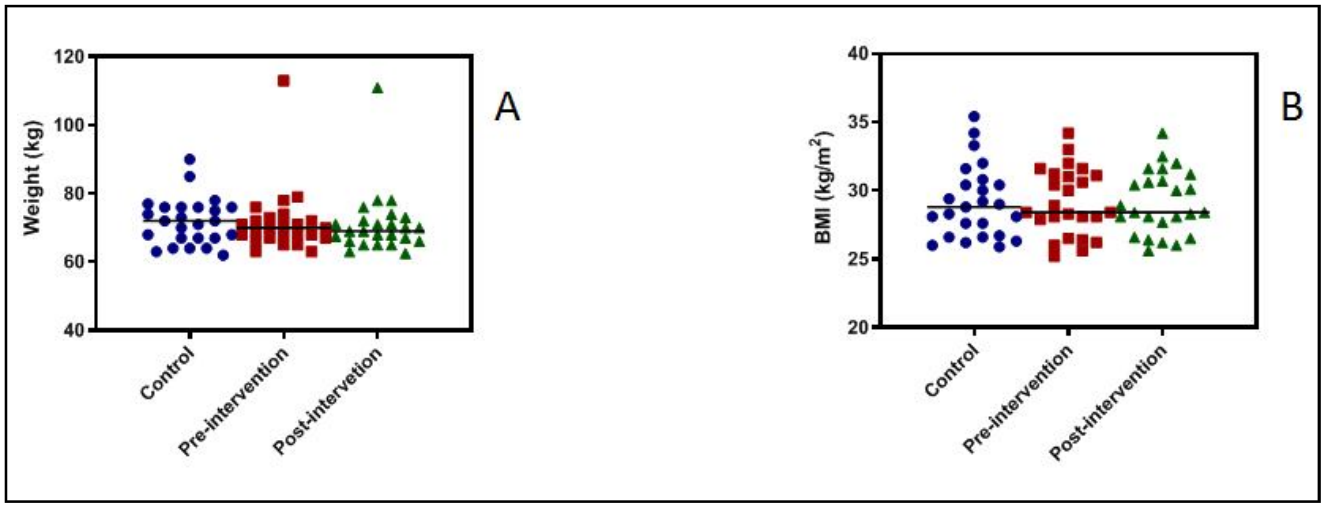
In this study, there was a significant decrease in the VLDL after the supplementation of wheat grass for 30 days. At pre-intervention, it was 22.24 ± 3.27 mg/dl, and at post-intervention, 16.42 ± 3.52 mg/dl. The *p*-value is 0.0001*. This shows a significant change in the VLDL. The mean ± SEM of the control group was 23.02 ± 2.01 mg/dl (Table 2).

3.10 Effect of wheatgrass on catalase

In this study, there was a significant decrease in the catalase after the supplementation of wheatgrass for 30 days. At pre-intervention, it was 74.01 ± 1.54 k U/l, and at post-intervention, 78.99 ± 1.58k U/l. The *p*-value is <0.0001*. This shows a significant change in the catalase. The mean ± SEM of the control group was 75.30 ± 1.64k U/l (Table 2).

3.11 Receiver operating characteristics (ROC) curve

The area under the curve (AUC) of triglyceride is 0.9522 (95.22%), whereas the area under the curve of VLDL is 0.9378 (93.78%). Area under the curve (AUC) is close to 1.0 (100%), and this signifies that the test has almost perfect discrimination (Figure 3).



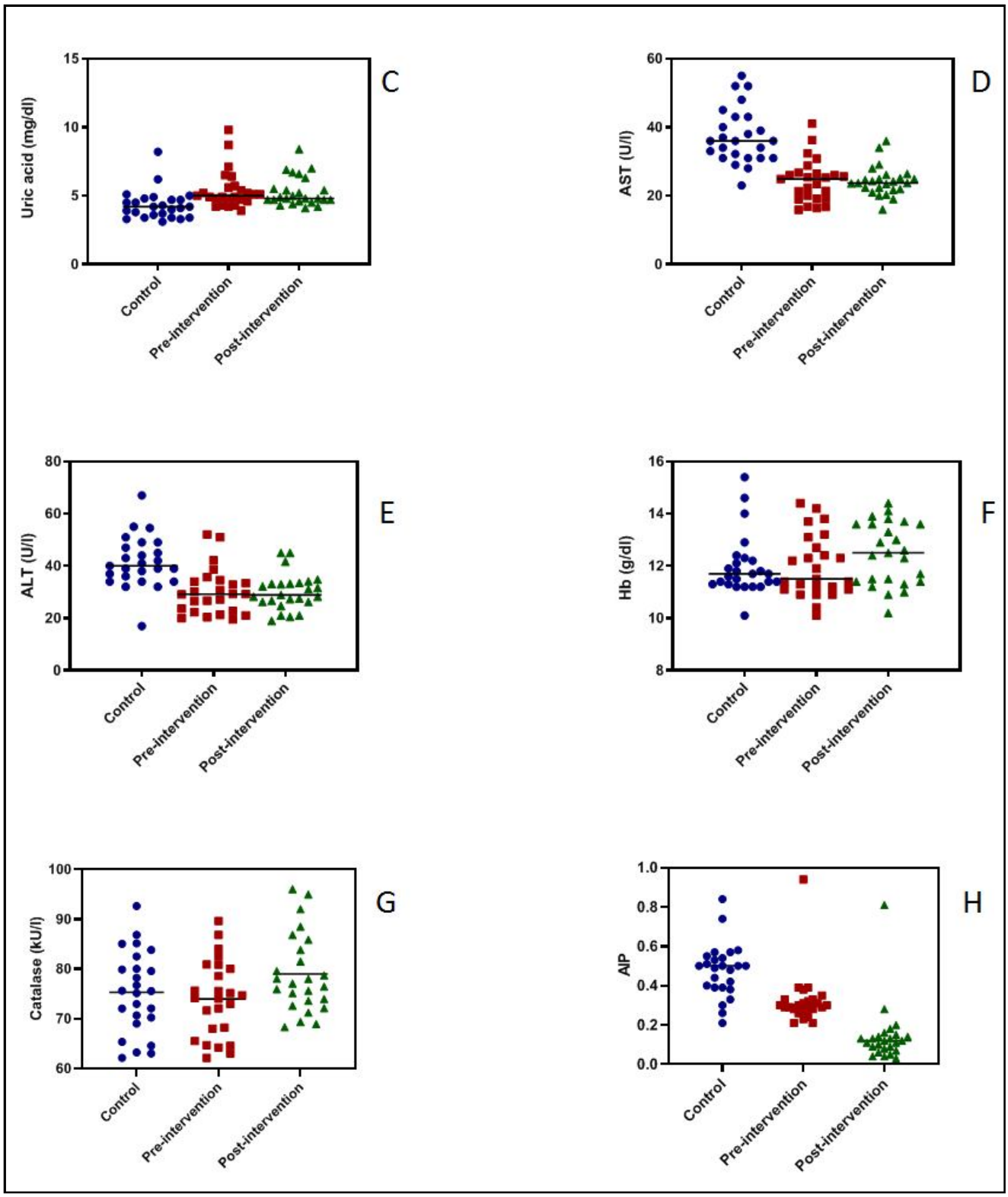


Figure 1: Effects of wheatgrass supplementation in overweight and obese individuals. (A) change in body weight, (B) change in BMI, (C) change in serum uric acid levels, (D) change in AST levels, (E) change in ALT levels (no significant change observed with wheatgrass treatment), (F) change in haemoglobin levels, (G) change in catalase activity, and (H) change in AIP. Data are presented as mean ± SEM (n = 25 per group at each time point). Statistical analysis was performed using paired *t*-tests. **p*<0.05 indicates a statistically significant difference.

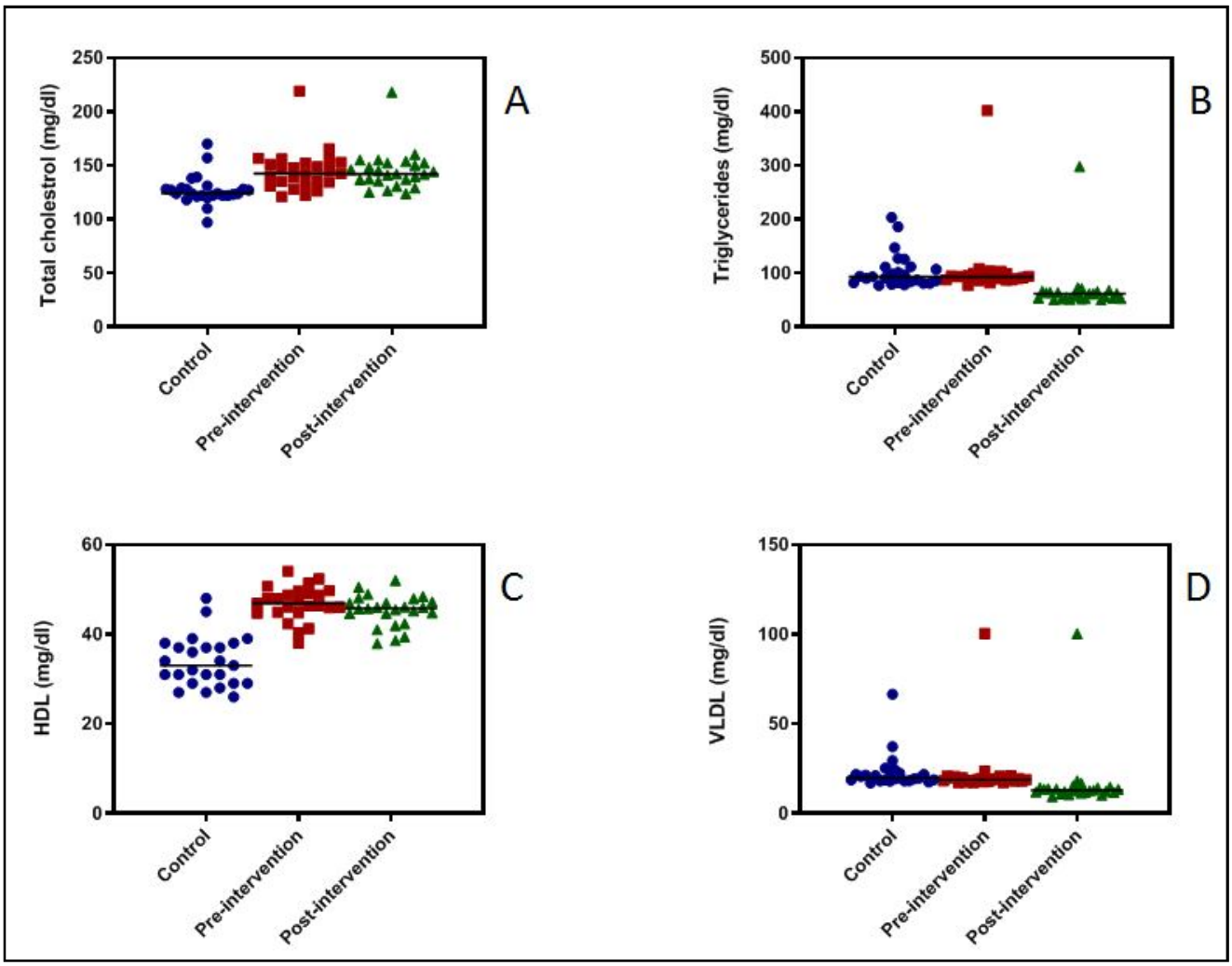


Figure 2: Effect of wheatgrass supplementation on lipid profile parameters in overweight and obese individuals. (A) Total cholesterol, (B) triglycerides, (C) high-density lipoprotein (HDL) cholesterol, and (D) very low-density lipoprotein (VLDL) cholesterol levels in blood. Data are presented as mean ± SEM, with n = 25 participants per group at each time point. Statistical analysis was performed using a paired *t*-test. **p*<0.05 was considered statistically significant.

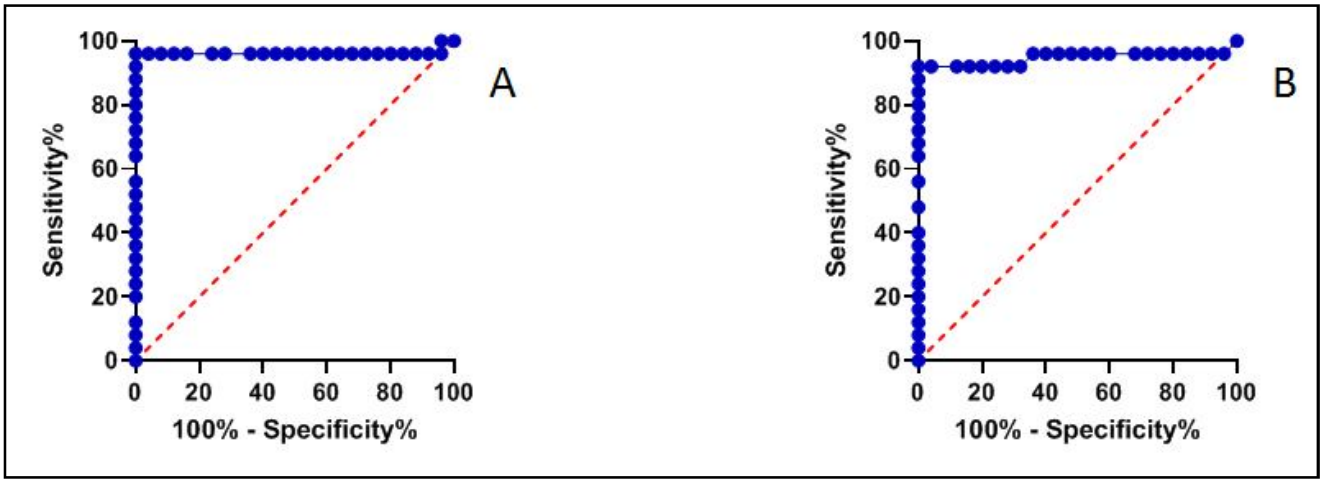


Figure 3: (A) Triglyceride ROC-Curve plotted between the pre-intervention and post-intervention of group B, (B) VLDL ROC-curve plotted between the pre-intervention and post-intervention of group B.

Table 1: Changes in the parameter in the experiment group (Group B) before and after the intervention. The control group (Group A) is not part of the intervention

Characteristics	Control (Mean ± SEM)	Pre intervention (Mean ± SEM)	Post intervention (Mean ± SEM)
Sex (male/female)	5 male/20 female	6 male/19 female	6 male/19 female
Age	38.40 ± 2.00	36.60 ± 1.89	36.60 ± 1.89
Weight (kg)	71.80 ± 1.36	71.48 ± 1.92	71.04 ± 1.87
Height (cm)	157.0 ± 1.25	156.4 ± 1.43	156.4 ± 1.43
BMI (kg/m^2)	29.15 ± 0.53	29.16 ± 0.49	29.13 ± 0.46

Table 2: Change in parameter after the intervention. All data are represented as means ± SEM. Comparisons between the groups using a paired *t*-test. **p*-value<0.05

Parameters	Control (Mean ± SEM)	Pre intervention (Mean ± SEM)	Post intervention (Mean ± SEM)	*p*-value
Weight (kg)	71.80 ± 1.36	71.48 ± 1.92	71.04 ± 1.87	0.0020*
BMI (kg/m^2)	29.15 ± 0.53	29.16 ± 0.49	29.13 ± 0.46	0.7455
Haemoglobin (g/dl)	11.98 ± 0.23	11.98 ± 0.24	12.47 ± 0.24	0.0019*
Uric Acid (mg/dl)	4.33 ± 0.22	5.41 ± 0.28	5.30 ± 0.22	0.4329
Total Cholesterol (mg/dl)	127.0 ± 2.75	144.9 ± 3.86	145.0 ± 3.65	0.9807
Triglyceride (mg/dl)	104.0 ± 6.49	105.1 ± 12.43	68.69 ± 9.65	0.0001*
HDL (mg/dl)	33.84 ± 1.11	46.84 ± 0.75	45.28 ± 0.70	0.0028*
VLDL (mg/dl)	23.02 ± 2.01	22.24 ± 3.27	16.42 ± 3.52	0.0001*
AST (U/l)	37.49 ± 1.63	24.27 ± 1.25	24.27 ± 0.86	0.9955
ALT (U/l)	41.54 ± 1.95	30.22 ± 1.77	30.22 ± 1.38	0.9956
Catalase (kU/l)	75.30 ± 1.64	74.01 ± 1.54	78.99 ± 1.58	<0.0001*
AIP	0.48 ± 0.03	0.32 ± 0.03	0.14 ± 0.03	<0.0001*

4. Discussion

Wheatgrass is a nutrient-dense natural product. Very few studies have been conducted on wheat grass efficiency. Since it is a nutrient booster, it can aid in weight reduction. Therefore, the present study was planned to observe the impact of wheatgrass powder. Supplementation with wheatgrass in the present study had a favorable impact on biochemical parameters, haemoglobin, uric acid, and lipid profiles (triglycerides, total cholesterol, VLDL, HDL). Significant reductions in weight, triglycerides, HDL, VLDL, and catalase (Figures 1A, 2B, 2C, 2D, and 1G) and a non-significant reduction in BMI, uric acid, and total cholesterol (Figures 1B, 1C, and 2A) and a significant increase in haemoglobin (Figure 1F). No changes in the AST and ALT (Figures 1D and 1E) were seen as experimental groups were compared (pre-intervention with post-intervention). The impact of low haemoglobin levels (less than 10 g/dl) on fatigue has been extensively studied in the past (Prochaska *et al.,* 2017). Severe anemia, particularly when haemoglobin levels are less than 8 g/dl, can result in a wide range of symptoms related to fatigue, including headaches, dizziness, pallor, exercise intolerance, tachycardia, palpitations or dyspnea at rest, anorexia, headaches, sleep disturbances, difficulty concentrating, and sensitivity to cold. Haemoglobin levels are typically used to detect mild anaemia, which is defined as 10-12 g/dl in females and 10-14 g/dl in males. It is linked with a few clinical signs (Erslev, 2000). Haemoglobin levels were considerably raised in our study by supplementing with wheat grass, which may lessen the negative effects of low haemoglobin levels.In this study, it was also observed that wheat grass powder decreases the triglycerides and VLDL significantly. Meta-analysis of prospective studies indicates that increased triglyceride levels are a risk factor for cardiovascular disease (Ye *et al.,* 2019). The elevated concentrations of atherogenic triglyceride-rich lipoproteins are mainly responsible for this association (Stalenhoef *et al.,* 2008). However, the evidence for triglycerides being an independent risk factor for coronary heart disease is still debatable because information gathered from large clinical research studies was not always conclusive. Uric acid is the final byproduct of the metabolism of nucleic acids. Elevated blood uric acid levels have long been associated with gout. Gout is a disease that results in red, tender, hot, and swollen joints as a result of recurrent attacks of acute inflammatory arthritis. Pathologically, gout results from elevated blood uric acid levels that lead to uric acid kidney stones and crystal deposits in joints, tendons, and other tissues (Jin *et al.,* 2012). Wheatgrass powder is beneficial in controlling the uric acid levels in the blood of those who are suffering from hyperuricemia. The present study shows that wheat grass powder helps lower the blood uric acid levels. There is a slight decrease in parameter like BMI (Figure 1B). As the duration and sample size were limited, this study needs to be undertaken for a longer period and with a higher sample size in order to get statistically significant results. We have seen appreciable changes in uric acid and total cholesterol. A decrease in the HDL level may be due to the lack of physical activity, medication such as beta-blockers, anabolic steroids,

progestins, and benzodiazepines can also depress HDL. In the present study, the ROC curve for triglycerides and VLDL is significant at a 95 per cent confidence interval.

Obesity is a sign of malnutrition. Obesity worldwide is a public health challenge because of its strong and positive association with important health problems such as type 2 diabetes, cardiovascular disease, stroke, and other cancers, non-communicable diseases. Wheatgrass has been traditionally used for a long time to treat various ailments and disorders. Some studies confirm that obese people are characterised by a lack of micronutrients (Ernst *et al.,* 2009; Kimmons *et al.,* 2006; Kaidar *et al.,* 2008; Madan *et al.,* 2006; Flancbaum *et al.,* 2006; Kaidar-Person *et al.,* 2008). It was observed that many obese people cut down on food and continue eating unhealthy foods, which leads to malnutrition. Wheatgrass is one of the products with many medicinal properties. It is a powerful source of nutrients such as proteins, essential amino acids, vitamins, minerals, chlorophyll, and active enzymes (Ghumman *et al.,* 2017). Several studies document the use of chlorophyll in the treatment of ulcers and resistance to conventional therapies (Lv *et al.,* 2019). Ensuring that you eat the recommended dietary intake of vitamins, minerals, and other nutrients that our bodies need is essential for maintaining a healthy body and mind (Sareen *et al.,* 2014). Proper ROC analysis, however, is only one part of effective and meaningful research. Several other ROC analysis applications, such as sample sizeand meta-analysis, were used in clinical research (O'Malley *et al.,* 2006; Rutter *et al.,* 2001).

Furthermore, this study found that wheatgrass powder has a significant effect on catalase (Figure 1G). Numerous illnesses, such as diabetes, vitiligo, cardiovascular conditions, Wilson's disease, hypertension, anaemia, some dermatological conditions, Alzheimer's disease, bipolar disorder, and schizophrenia, are associated with catalase deficiency or malfunction (Al-Abrash *et al.,* 2000; Habib *et al.,* 2010). Catalase is a crucial antioxidant enzyme that breaks down hydrogen peroxide and maintains cellular redox homeostasis. Based on the above findings, we conclude that in the anthropometric parameter, a significant reduction is seen in weight and a slight decrease in BMI. In the lipid profile, a significant reduction in triglycerides, VLDL, HDL, and a slight decrease in total cholesterol were seen. Other blood parameters, like haemoglobin and catalase significantly increased, and there was a slight reduction in uric acid. ALT and AST remain unchanged. This study evaluated the effects of an intervention on the AIP in an overweight and obese population. AIPis a strong predictor of cardiovascular risk. Increased AIP is associated with atherogenic dyslipidemia, small dense LDL particles, and metabolic abnormalities characteristic of obesity. The mean AIP in the control group was 0.48 ± 0.03, indicating high cardiovascular risk. AIP in the pre-intervention overweight and obese population was 0.32 ± 0.03, which is the intermediate-risk category. After the intervention, the AIP was further decreased to 0.14 ± 0.03 (Table 2), falling under the low-risk category of cardiovascular diseases. The significant reduction in AIP (*p<0.0001) shows that the intervention was indeed effective in improving lipid profiles and reducing cardiovascular risk, differentiating the outcomes of the intervention group from the control group. All appear to improve with the addition of wheat grass powder at a dosage of 3 g/day for a month. These findings demonstrated the potential impact of wheat grass powder in protecting overweight patients from possibly harmful side effects. Wheat grass powder is rich in vitamins, minerals, proteins, and certain amino acids. It can be used as a general health tonic and may even aid in the treatment of certain diseases.

5. Conclusion

Wheatgrass powder supplementation at 3 g/day for one month showed promising health benefits in overweight and obese individuals. These included significant improvements in haemoglobin, catalase, triglycerides, VLDL, and AIP, alongside modest reductions in weight and uric acid. These findings highlight wheatgrass as a nutrient-rich supplement with the potential to enhance metabolic health and reduce cardiovascular risk.

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Author contributions

MIA conceived and planned the research, and MIA and FBR contributed to the experimental design. FBR, PA, SG, AB, and SW conducted the experiments, and VJ helped provide the patient's samples. All authors have read and approved the final manuscript and declare no conflict of interest. Furthermore, the authors confirm that the manuscript has been approved for publication, with all data generated in-house and no involvement of a paper mill.

Conflict of interest

The author declares no conflicts of interest relevant to this article.

References

Adams, M.L.; Lombi, E.; Zhao, F.J. and McGrath, S.P. (2002). Evidence of low selenium concentrations in UK bread making wheat grain. J. Sci. Food Agric., **82**(10):1160-1165.

Afroz, R.; Nurunabbi, A.S. and Khan, M.I. (2014). Effects of wheatgrass (*Triticum aestivum*) juice on serum cholesterol of experimentally induced hypercholesterolaemic male long-evans rats. Bangladesh J. Physiol. Pharmacol., **27**(1-2):21-27.

Al-Abrash, A.S.; Al-Quobaili, F.A. and Al-Akhras, G.N. (2000). Catalase evaluation in different human diseases associated with oxidative stress. Saudi Med. J., **21**(9):826-830.

Alvarez, M.L.; Guelman, S.; Halford, N.G.; Lustig, S.; Reggiardo, M.I.; Ryabushkina, N.; Schewry, P.; Stein, J. and Vallejos, R.H. (2000). Silencing of HMW glutenins in transgenic wheat expressing extra HMW subunits. Theor. Appl. Genet., **100**:319-327.

Arroyo-Johnson, C. and Mincey, K.D. (2016). Obesity epidemiology worldwide. Gastroenterol. Clin. North Am., **45**(4):571-579.

Baublis, A.J.; Lu, C.; Clydesdale, F.M. and Decker, E.A. (2000). Potential of wheat-based breakfast cereals as a source of dietary antioxidants. J. Am. Coll. Nutr., **19**(3 Suppl):308S-311S.

Ben-Arye, E.; Goldin, E.; Wengrower, D.; Stamper, A.; Kohn, R. and Berry, E. (2002). Wheat grass juice in the treatment of active distal ulcerative colitis: a randomized double-blind placebo-controlled trial. Scand. J. Gastroenterol., **37**(4):444-449.

Bhikaji, P.K.; Thakare, M.P. and Meshram, D.S. (2015). The effect of wheatgrass juice on haemoglobin level WSR to Samanya-Vishesha Siddhanta. Int. J. Ayurved Pharm. Res., **3**(7):66-70.

Bray, G.A. and Ryan, D.H. (2007). Drug treatment of the overweight patient. Gastroenterology,**132**(6):2239-2252.

Centers for Disease Control. (2003). Physical activity and good nutrition: essential elements to prevent chronic diseases and obesity 2003. Nutr. Clin. Care, **6**(3):135-138.

Chowdhury, G.R.; Agarwal, S.; Sen, T.; Zaman, S. and Mitra, A. (2017). Wheatgrass: a biogem in the health care spectrum. J. Sci. Eng. Health Manag., **62**.

Ernst, B.; Thurnheer, M.; Schmid, S.M. and Schultes, B. (2009). Evidence for the necessity to systematically assess micronutrient status prior to bariatric surgery. Obes. Surg., **19**(1):66-73.

Erslev, A.J. (2000). Erythropoietin and anemia of cancer. Eur. J. Haematol., **64**(6):353-358.

Flancbaum, L.; Belsley, S.; Drake, V.; Colarusso, T. and Tayler, E. (2006). Preoperative nutritional status of patients undergoing Roux-en-Y gastric bypass for morbid obesity. J. Gastrointest. Surg., **10**(7):1033-1037.

George, P. and Nimmi, O.S. (2011). Cent per cent safe centum plants for antiobesity. Int. J. Innov. Technol. Creat. Eng., **1**(3):1-9.

Ghumman, A.; Singh, N. and Kaur, A. (2017). Chemical, nutritional and phenolic composition of wheatgrass and pulse shoots. Int. J. Food Sci. Technol., **52**(10):2191-2200.

González-Castejón, M. and Rodriguez-Casado, A. (2011). Dietary phytochemicals and their potential effects on obesity: A review. Pharmacol. Res., **64**(5):438-455.

Habib, L.K.; Lee, M.T. and Yang, J. (2010). Inhibitors of catalase-amyloid interactions protect cells from beta-amyloid-induced oxidative stress and toxicity. J. Biol. Chem., **285**(50):38933-38943.

Helvaci, M.R.; Abyad, A. and Pocock, L. (2019). The lowest is the safest value of plasma triglycerides. World Fam. Med., **17**(10):10-15.

International Institute for Population Sciences (IIPS) (2017). National family health survey (NFHS-4), 2015-16. Mumbai, India: International Institute for Population Sciences; pp:791-846.

Jin, M.; Yang, F. and Yang, I.(2012). Uric acid, hyperuricemia and vascular diseases. Front. Biosci., **17**(2):656-669.

Kaidar-Person, O.; Person, B.; Szomstein, S. and Rosenthal, R.J. (2008). Nutritional deficiencies in morbidly obese patients: A new form of malnutrition? Part B: minerals. Obes. Surg., **18**(8):1028-1034.

Kang, J.G. and Park, C.Y. (2012). Antiobesity drugs: A review about their effects and safety. Diabetes Metab. J., **36**(1):13-25.

Kimmons, J.E.; Blanck, H.M.; Tohill, B.C.; Zhang, J. and Khan, L.K. (2006). Associations between body mass index and the prevalence of low micronutrient levels among US adults. Med. Gen. Med., **8**(4):59.

Klop, B.; Elte, J.W. and Cabezas, M.C. (2013). Dyslipidemia in obesity: mechanisms and potential targets. Nutrients, **5**(4):1218-1240.

Kumanyika, S.K.; Obarzanek, E. and Stettler, N. (2008). Population-based prevention of obesity: the need for comprehensive promotion of healthful eating, physical activity, and energy balance: A scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (formerly the expert panel on population and prevention science). Circulation, **118**(4):428-464.

Liu, Y.; Sun, M.; Yao, H.; Liu, Y. and Gao, R. (2017). Herbal medicine for the treatment of obesity: an overview of scientific evidence from 2007 to 2017. Evid. Based Complement. Alternat. Med., **2017**:8943059.

Lv, H.; Lin, Y.; Liu, P.; Liang, W.; Wei, K.; Pu, J. and Zhang, H. (2019). Protective effects and potential underlying mechanisms of sodium copper chlorophyllin against ethanol-induced gastric ulcer in mice. ActaBiochim. Biophys. Sin., **51**(9):925-933.

Madan, A.K.; Orth, W.S.; Tichansky, D.S. and Ternovits, C.A. (2006). Vitamin and trace mineral levels after laparoscopic gastric bypass. Obes. Surg., **16**(5):603-606.

Mujoriya, R. and Bodla, R.B. (2011). A study on wheatgrass and its nutritional value. Food Sci. Qual. Manag., **2**:1-8.

Niroumand, S.; Khajedaluee, M.; Khadem-Rezaiyan, M.; Abrishami, M.; Juya, M.; Khodaee, G. and Dadgarmoghaddam, M. (2015). Atherogenic index of plasma (AIP): A marker of cardiovascular disease. Med. J. Islam. Repub. Iran., 29:240.

World Health Organization (2000). Obesity: Preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ. Tech. Rep. Ser., 894:i-253.

O'Malley, A.J. and Zou, K.H. (2006). Bayesian multivariate hierarchical transformation models for ROC analysis. Stat. Med., **25**(3):459-479.

Prochaska, M.T.; Newcomb, R.; Block, G.; Park, B. and Meltzer, D.O. (2017). Association between anemia and fatigue in hospitalized patients: Does the measure of anemia matter? J. Hosp. Med., **12**(11):898-904.

Raina, G.S. (2011). Obesity being the major health burden needed to be chased: A systematic review (2000-2010). J. Appl. Pharm. Sci., **1**:238-245.

Rutter, C.M. and Gatsonis, C.A. (2001). A hierarchical regression approach to meta-analysis of diagnostic test accuracy evaluations. Stat. Med., **20**(19):2865-2884.

Sareen, M.; Baghla, P.; Dhaka, P.; Mathur, E.; Sobti, P. and Khajuria, S. (2014). Wheat grass: A wonder herb. Syst. Rev. Pharm., **5**(1):4.

Stalenhoef, A.F. and de Graaf, J. (2008). Association of fasting and nonfasting serum triglycerides with cardiovascular disease and the role of remnant-like lipoproteins and small dense LDL. Curr. Opin. Lipidol., **19**(4):355-361.

Strychar, I. (2006). Diet in the management of weight loss. CMAJ, **174**(1):56-63.

Tenenbaum, A.; Klempfner, R. and Fisman, E.Z. (2014). Hypertriglyceridemia: a too long unfairly neglected major cardiovascular risk factor. Cardiovasc. Diabetol., 13:1-10.

Toor, B.S.; Singh, R. and Kaur, A. (2020). Nutritional and bioactive potential of wheat grass juice powder. Chem. Sci. Rev. Lett., **9**(35):821-828.

Ye, X.; Kong, W.; Zafar, M.I. and Chen, L.L. (2019). Serum triglycerides as a risk factor for cardiovascular diseases in type 2 diabetes mellitus: a systematic review and meta-analysis of prospective studies. Cardiovasc. Diabetol., **18**(1):48.

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