FIBER MIX SUPPLEMENTS TO REDUCE WEIGHT AND CONSTIPATION

A

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CERTIFICATE – II

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ABSTRACT

Constipation and overweight are common health problem of youngsters and their cure is possible through change in food habits. Inclusion of dietary fibers in the diet reduces the constipation and its complications like overweight, cancer etc. The main objective of the present study is to evaluate the effect of fibers present in a mixture of wheat bran, coriander seeds, drumstick and flaxseed toward curing constipation. The total forty subjects male and female of age between 20-30 years were selected from Post Graduate Hostel O.U.A.T, Bhubaneswar for this study and all were sufferer of constipation at the stage of mild to severe. The result shows reduction of constipation patients by 80% in 20-25 year male and 100% in 20-25 year female, 25-30 year male and female after supplementation of a mixture of Flaxseed, Coriander, Wheat Bran, and Drumstick (ratio of 1.5, 3.0, 5.5, 0 and1.5, 2.5, 4.0, 2.0) to the diet after completion of the study. The reduction rate in number of meals was highest 20% in 20-25 year male and lowest 4% in 20-25 year female. The increase in water intake was 42%, 26%, 22.22% and 42% in male of 20-25 year, female of 20-25 year, 25-30 year male and 25-30 year female respectively after 3rd month. Also the maximum reduction in total body weight was observed in 25-30 years female by 3.4% and found statistically significant in experimental group. Negligible changes in reduction of constipated patient, body weight, number of meal and total water intake in control group after 3rd month indicates the curing effect of fibers present in the powder mixture supplemented to the constipation patient. Thus inclusion of these fibers in the regular diet is suggested to overcome constipation in human beings.

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ABBREVIATION

CHO- Carbohydrate

Kcal- kilo calorie

gm. – Gram

m^2 – meter squire

Kg- kilogram

no. number

BMI- Basal metabolic rate

M. oleifera- *Moringa oleifera*

Chapter 1
INTRODUCTION

INTRODUCTION

Dietary fiber is a term used to describe a variety of plant substances that are resistant to digestion by alimentary enzymes in humans and most animals. It is found only in plant foods: fruits, vegetables, grain products (Oat and Wheat bran), legumes, nuts and concentrated plant sources. Meat, milk and eggs do not contain fiber. The form of food may or may not affect its fiber content. Canned and frozen fruits and vegetables contain just as much fiber as raw ones. Other types of processing may reduce fiber content. Drying and crushing, destroy the water-holding qualities of fiber.

The removal of seeds, peels or hulls also reduces fiber content. Different types of plants vary in their amount and kind of fiber. Dietary fiber includes a number of nonstarch polysaccharide substances including cellulose, hemicellulose, β-glucans, pectins, mucilages and gums plus the nonpolysaccharide lignin. These fiber components have unique chemical structures and characteristic physical properties like provides, bulk/volume, viscosity, water-holding capacity, adsorption/binding or fermentability.

There are two different types of fiber - Soluble and Insoluble. Both are important for health, digestion, and preventing diseases.

- **Soluble fiber** attracts water and turns to gel during digestion. Soluble fiber may help lower cholesterol.
- **Insoluble fiber** Insoluble fiber binds water as it passes through the digestive tract, making stool softer and bulkier and appears to help food pass more quickly through the stomach and intestines fiber especially that found in whole grain is helpful in the treatment and prevention of constipation, haemorrhoids and diverticulosis.

2002 the Food and Nutrition Board of the National Academy of Sciences Research Council issued the Dietary Reference Intake (DRIs) for fiber provide standard recommended amounts for nutrients.

The recommended daily intake of fiber for healthy adults is between 20 and 35 g/d; however, much lower intakes of fiber have been reported (Pilch 1987).

There are several ways in which dietary fiber may affect obesity development (Ali *et al.* 1982) because obesity represents the long-term result of an imbalance between energy intake and energy expenditure, the most obvious link between dietary fiber and obesity development is through its effects on energy intake control mechanisms.

The ingestion of fiber has been hypothesized to suppress energy intake by inducing satiation and satiety (Blundell and Burley 1987). The significance of this lower intake of fiber to obesity development is suggested by epidemiologic and cross-sectional studies, indicating that diets low in dietary fiber are associated with increased risk for obesity (Alfieri *et al.* 1995, Burkitt and Trowell 1975, Van Itallie 1978) an inverse relationship between intake of dietary fibre and weight gain and obesity, while fibre consumption is associated with increased satiety and decreased energy intake (Freeland *et al.* 2009).

Incorporation of viscous fibers into a mixed meal at sufficient levels increases the viscosity of Gastro Intestinal contents. Increasing viscosity of intestinal contents slows gastric emptying and small bowel transit, interferes with the mixing of food stuffs and digestive enzymes, disrupts micelle formation, and alters diffusion and interaction of nutrients with mucosal surface (Schneeman and Tietjen 1994, Vahouny *et al.* 1988).

Dietary fiber may help reduce the risk of some cancers, especially colon cancer. This idea is based on information that insoluble fiber increases the rate at which wastes are removed from the body.

Water, fat and fiber are the main food constituents contributing to energy density. In general, fiber-rich diets, whether achieved through fiber supplementation or incorporation of high fiber foods into meals, have a reduced energy density compared with high fat diets. This is related to fibers ability to add bulk and weight to the diet Fiber itself has no calories, yet provides a "Full" feeling because of its water-absorbing ability. If people consume a constant weight of food rather than a constant quantity of energy as some studies have suggested (Rolls *et al.* 1998, Seagle *et al.* 1997), the effect of dietary fiber on other qualities of food(s), such as texture may also reduce energy intake. Textural qualities of some fibrous foods may increase the work effort and time required for mastication. This increase in chewing effort and time may result in a variety of cephalic and gastric phase responses and signals, leading to early satiation and reduced food intake (Duncan *et al.* 1983, Heaton 1980, Sakata 1995).

1.1 ***Overweight***

Overweight is having more body fat than a healthy person. Overweight is common especially where calorie rich food supplies are plentiful and lifestyles are sedentary. It is a disorder increases risk of diseases and health problems such as obesity, heart disease, diabetes and high blood pressure. Overweight can also affect a person's bone joints, breathing, sleep, mood, and energy levels. So overweight can impact a person's entire quality of life.

- Individual's body weight 10% and 20% above the ideal weight are known as overweight and obese respectively.
- Body Mass Index or Quetelet index is an indicator of overweight and obesity which is obtained by dividing weight in kg by the squire of height in meters (BMI; in kg/m^2).
- An adult who has a BMI equal to 25 or between 25 and 29.9 is considered overweight.
- An adult who has BMI equal to 30 or greater than is considered obese.

Being overweight is generally caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, endocrine disorders, medications, or psychiatric illness.

Signs and Symptoms of Overweight and Obesity are high weight gained than the ideal body weight. Deposition of extra fat around the waist & hip higher than normal body mass index and waist circumference. Overweight and obesity are associated with elevated mortality from all causes in both men and women, and the risk of death rises with increasing weight.

Obesity especially abdominal obesity, is central to the metabolic syndrome and is strongly related to polycystic ovary syndrome (PCOS) in women. Obese women are particularly susceptible to diabetes, and diabetes in turn puts women at dramatically increased risk of cardiovascular disease (CVD). Obesity substantially increases the risk of several major cancers in women, especially postmenopausal breast cancer and endometrial cancer.

Overweight and obesity, as well as their related non-communicable diseases, are largely preventable. Supportive environments and communities are fundamental in shaping people's choices, making the healthier choice of foods and regular physical activity the easiest choice (accessible, available and affordable), and therefore preventing obesity.

Curbing the twin epidemics of overweight and obesity for not only changes in diet and lifestyle at individual levels but also changes in policy, physical and social environment, and cultural norms.

1.2 *CONSTIPATION*

Constipation is defined as the increased resistance to movement of intestinal contents and there is distention and infrequent or difficult evacuation of faeces from the intestine. Constipation having a bowel movement fewer than three times per week. With constipation stools are usually hard, dry, small in size, and difficult to eliminate.

Constipation is a chronic problem in many patients all over the world. In some groups of patients such as the elderly, constipation is a significant health-care problem, but in the majority of cases chronic constipation is an aggravating, but not life-threatening or debilitating, complaint that can be managed in primary care with cost-effective control of symptoms.

1.3 *COMMON CAUSES OF CONSTIPATION*

Insufficient fluids/dehydration, too little fiber and high sugar diet are three of the most common causes. Without enough fluids and bulk, and a high sugar diet, the peristaltic muscles become sluggish, and stool becomes hard and develops rough edges. These rough edges can cause a rectal fissure, a painful microscopic tear in the rectum.

1. Too much fat in the diet & laxative abuse.
2. Lack of physical exercise.
3. Holding back the urge to defecate.
4. High stress levels and anxiety.
5. Food sensitivities and intolerances. Cow's milk can cause hard, dry stools in children.
6. Medications such as iron pills, antacids, diuretics, pain killers and anti depressants.

Health benefit by wheat bran fibre is sufficiently characterised. Wheat bran fibre contributes to an increase in faecal bulk, reduction in intestinal transit time and also contribution to the maintenance or achievement of a normal body weight.

Coriander is a major seed spice widely cultivated and used in India for its characteristic flavour and health benefits. It finds its applications both as a culinary herb & in traditional Chinese and Ayurveda medicines. The essential oil obtained from coriander fruit is widely used in aromatherapy for healing digestive problems, including flatulence, indigestion and

constipation. Coriander seeds are rich in dietary fibers and contain 41.9 g of fiber in 100 grams of seeds quantity. This fiber is metabolically inert insoluble fiber and this helps in increasing the bulk of stool by absorbing the water throughout the digestive system and thus eases the constipation. When taken regularly, it helps in complete elimination of constipation. Flaxseed or linseed (*Linumusitatissimum L.*) has been used as food and medicines in many countries Flaxseed has received attention for its anti-inflammatory and antioxidant role.

The present study hypothesizes if flaxseed added to a weight loss diet could improve the lipid and metabolic profiles and decrease risk factors related to cardiovascular disease. Ground flaxseed consists of 40% of dietary fiber, 2/3 of which is insoluble and 1/3 is soluble fiber. Insoluble fiber binds water and thus increases the bulk in colon. Soluble fiber from flaxseed mucilage has similar effects than guar gum or ispaghula, e.g. delay in gastric emptying, improvement in glycaemic control and alleviation of constipation. Flaxseed supplement of 10-20 g/d would increase the intake to the recommended level of 25-30 g/day. Flaxseed contains soluble and insoluble fiber. These help to lower blood cholesterol levels, let stool pass more quickly, and help in bowel movements. Flaxseed is low in carbohydrates and very low in calories. Thus it is useful for weight loss. The botanical name for drumstick tree is "*Moringa oleifera*". *Moringa* pods are a nutritional powerhouse and provide a great range and amount of essential proteins, vitamins and minerals. It contains very low amount of fats and offers no harmful cholesterol. It contains 0% cholesterol and very low fat but rich in dietary fibre, protein, energy, Vitamin A, Vitamin C, Thiamine, Riboflavin, Folate, Sodium, Potassium, Calcium, Iron, Magnesium, Phosphorus, Selenium, and Zinc.

Constipation was significantly more frequent in females (20%) than in males (13%) in Chandigarh India.In Northern India there were 4,767 participants (mean age 34.6 ± 10.8, males 50%) in which 555 (11.6%) had constipation.

The youngsters residing in hostel are fond of taste and used to take junk food/ fast food. Thus they consume excess calorie and at the same time less fiber through these foods and finally they suffer from constipation and gain weight.

1.4 *Objectives*-Thus we have selected theseObjectives of this study-

- To reduce the constipation among girls.
- To reduce the body weight by giving supplementation.
- To increase the overall health status of girls.

Chapter 2

REVIEW OF LITERATURE

REVIEW OF LITERATURE

1. Neveda Oinam *et al.* (2012) taken Forty male Wistar rats, body weighs 130 – 140 g randomly divided into 5 groups of eight each, and fed experimental diets for 8 weeks. Group I group II receiving standard diet that is palm oil (PO), peanut oil(PN) respectively served as control, while groups III (PODL- palm oil drumstick leaves), IV(PNDL- Peanut oil drumstick leaves) and V(POPNDL- palm oil, peanut oil drumstick leaves) diets were supplemented with vitamin E derived from drumstick leaves and reported that the Two control Group (PO and PN) have more weight gain than Three experimented group (PODL, PNDL, POPNDL) wistar rats due to supplementation of Drumstick powder in diet.

2. Saman Khalesi *et al.* (2011) conducted experiment on Male Sprague Dawley rats, 7-8 weeks of age and 170 to 180 g of weight, divided into 7 groups in which 1 Control group: BS (control diet); and 6 experimental groups, Flaxseed diet was given which is prepared by adding 10%, 20% and 30% of flaxseed (FL) either heated or raw to BS that is H10: (10% heated FL in BS); H20: (20% heated FL in BS); H30: (30% heated FL in BS); R10: (10% raw FL in BS); R20: (20% raw FL in BS); R30: (30% raw FL in BS). Rat were first fed with basal diet (BS) of commercial mouse pellet, fed with experimental diet for a period of 30 days where water was given as libitum, each rat consumed 25.67 ± 1.67 g foodand after 30 days consumption of flaxseed concluded that food consumption was lower in groups with higher percentage of flaxseed because flaxseed has high level of fat and fiber, no significant difference was observed between the average food intake between any treatment group and control group. There is no significant difference in the percentage of weight gain between and within groups observed.

3. MartinH. Floch 4 *et al.* (1978) they were concluded their study that is mean intake of crude fiber rose to at least 10 g/day, and stool volume increased significantly. In their study they take Six healthy subjects in which four males and two females, were studied for 8 weeks first for a 3-week control period, followed by 3 weeks of 5.4 g of crude fiber supplementation daily (Kellogg's "All Bran"), and then by a 2-week control period with daily dietary history.

4. Twenty-four obese adult aged 20-50 year; BMI ≥30 kg/m2were assigned to the treatment group (8 women, 4 men) or the placebo group (9 women, 3 men), treatment group received 6 capsules (2 capsules at 3 time in a day) of a dietary supplement containing a proprietary blend of glucomannan, chitosan, fenugreek, *G sylvestre*, and vitamin C daily for 6 weeks, and the placebo group received 6 capsules of rice flour daily for 6 weeks. Dietary fibers such as glucomannan provoke body weight and fat loss by acting as a bulking agent, increasing satiety and reducing caloric intake, ingestion rate, and nutrient absorption. Chitosan is a indigestible, non-plant fiber that may aid in body weight loss by reducing fat absorption in the intestinal tract. The addition of ascorbic acid to chitosan has been shown to improve the ability of chitosan to bind to dietary fats and inhibit their digestion. Fenugreek and *G sylvestre*, induce body weight and/or fat loss in humans. The leaf of *G sylvestre* has been shown to inhibit body weight gain in rats fed a high-fat diet and to significantly decrease fat digestibility. Compared with the placebo group, the treatment group lost significantly more body weight (-2.3 kg v/s 0.0 kg), significantly greater reduction in upper abdominal circumference (-4.5 cm v/s -0.7 cm), waist circumference (-4.1 cm v/s 0.1 cm), and hip circumference (-2.9 cm v/s 0.6 cm) by Derek *et al. (2003).*

5. M. A. Eastwood *et al.* (1973) were conducted experiment on healthy males, age range 25-43 years, where experiment comprised eight subjects who were supplemented by 8 g of wheat bran twice a day. Experiment B-Four of the subjects who were supplement by Whatman's chromatography cellulose (CF1) 8 g twice a day. Wheat bran or cellulose was added to the diet for four weeks (16 g/day). Information was obtained during the final seven days of each period and reported that "The wet and dry weight of stool increased significantly after the ingestion of bran." (107 g + 44 S.D. to 174 g ± 51)".

6. Rigaud *et al.* (2014) were studied on "Impact of Wheat Bran Supplementation on Body Weight, Blood Pressure, Blood Glucose and Blood Lipids Among Obese Diabetic Women in Holy Makkah"and reported that "The mean body weight of the studied group was reduced significantly ($p<0.05$) from 82.46 ± 13.28 kg before intervention to 81.48 ± 13.42 kg after intervention"

7. Mohammad Abd Elmoneim Elmadbouly *et al.* (2014) were taken a total of thirteen subjects of obese women with uncontrolled type 2 diabetes age range between 20 -64 years and body mass index (BMI ≥30 kg/m2)were selected for this study measures of body weight, height and BMI [weight (kg)/ height (m2)] were undertaken before start the intervention. The intervention phase consisted of 8 weeks in which subjects were received 2 g wheat bran three times daily to provide a fiber supplement of about 6 gm/d and concluded that mean body weight of the studied group was reduced significantly from 82.46 ± 13.28 kg before intervention to 81.48 ± 13.42 kg after intervention. The results of the study illustrated that the mean (BMI) values reduced significantly.

8. Roberta Soares Lara Cassani *et al.* (2015) the inclusion criteria in his experiment were male gender, age between 20-60 years-old, waist circumference ≥ 90 cm; Body Mass Index (BMI) ≥ 25 k g/m2. 27 subject were divided in to two groups that is 13 in GriceLC (mean age was 33 ± 10 years) and 14 in GflaxLC (40 ± 9 years) for intervention, Diet plans were provided to each group as follows GriceLC group received 35% carbohydrate, 46% fat, 19% protein and 60 g of raw rice powder/day and GflaxLC group received 32% carbohydrate, 47% fat, 21% protein and 60 g of flaxseed powder/day. Both groups showed a reduction of approximately 56% of energy intake compared to baseline and revealed that Hip circumference reduction was greater in GriceLC group. BMI decrease in Gflax -2.3 ± 7, GriceLC -1.9 ± 2 and weight loss achieved by GriceLC and GflaxLC were 7 ± 2 and 6 ± 6 kg (mean ± SD), respectively. Reducing carbohydrate intake has been related to ameliorated biochemical and hormonal profiles, regardless weight loss some of these benefits is due to addition of flaxseed.

9. Alison M. Gray *et al.* (1999) in their study used 21-24 week of male mice divided in to 3 groups where six normal mice and six STZ-treated mice taken as control and coriander given with STZ mice administered in the diet(62.5 g/kg) and drinking water (2.5 g/l) taken as experimental group reported that there is decrease in body weight in experimental group as compared to control (4.7 viz 2.60).

10. Study was conducted using adults two different group 19 to 50 years and 51+ y age. Body weight measures in adults 19-50 years of age (n = 7,039) and 51+ y (n = 6,237). Participants were categorized by whole grain consumption: ≥ 0 to b0.6, ≥ 0.6 to b1.5, ≥ 1.5 to b3.0, and ≥ 3.0 servings/day. Main measures included body mass index (BMI), waist circumference (WC),and prevalence of overweight/obesity. Two models were developed and compared. Model 1 covariates included age, gender, ethnicity, and total energy intake and Model 2 was extended to include cereal fiber. Mean whole grain consumption among adult's 19-50 y and 51+ y was 0.63 and 0.77 servings/day respectively. Approximately 72% of adult's 19-50 y and 66% of adults 51+ y consumed less than 0.6 servings of whole grains. A significant trend was observed in both age groups for increased consumption of whole grains with lower BMI, WC, and percentage overweight/ obese (Model 1) and significant trend was not observed when cereal fiber was added as a covariate (Model 2). In this study, there was a statistical trend that higher consumption of whole grains was inversely associated with BMI, WC, and the prevalence of overweight/obesity. Subjects in the highest whole grain consumption group had the lowest prevalence of overweight/obesity by Carol E. O'Neil *et al.* (2010)

11. Graeme H McIntosh *et al.* (2003) Subjects undertook 3 interventions of 4-wk duration each in a randomized crossover design with 28 overweight men aged 40–65 y, had no history of bowel disease against a background intake of 14 g dietary fiber (DF), the men were fed low-fiber cereal grain foods providing 5 g DF for a total of 19 g DF/d. High-fiber wheat foods provided 18 g DF, and high-fiber rye foods provided 18 g DF, both giving a total of 32 g DF/d. Fecal samples (48-h) were collected at the end of each period and assayed. The low-fiber foods aimed to provide 6 g DF /d to the diet and =20% energy. The high-fiber foods aimed to provide 21 g DF/d to the diet and =20% energy. The rye and wheat interventions aimed to provide < 100 g/d of whole rye or wheat flour effects of the diets on fecal values are summarized. There was a significant increase in daily fecal weights on both the high-fiber rye (37%) and wheat (27%) diets relative to the low-fiber diet (203 g feces/d). Both high-fiber rye and wheat increased fecal bulking.

12. NazninAra *et al.* (2008) in his experiment animals were randomly divided into four groups. Group I were control rats gives normal saline, group II were adrenaline induced e rats (AIR), group III was consisted *Moringa oleifera* leaves extract treated adrenaline induced rats and group IV was atenolol treated adrenaline induced rats. Each group consisted of six animals. Body weight of group I and group II rats were measured before treatment. *Moringa oleifera* leaves extract and commercial drug atenolol were administered in adrenaline induced rat through intraperitoneal (i.p) route in everyday morning for one week at a dose 30mg/155 ± 15 g body weight and 0.1 mg/155 ± 15 g body weight of rat respectively and found out significant reduction in body weight (Day1 &Day8) of Moringa treated and atenolol treated animals. *Moringa oleifera* leaves extract and atenolol had a greater hypolipidemic potential and may be an indication of progressive metabolic control of *Moringa oleifera* leaves extract on mechanisms involved in elimination of the lipids from the body.

13. Sebely Pal *et al.* (2010) carried his work on Seventy-two (37 men and 35 women) Overweight and obese individuals with a BMI between 25 and 40 kg/m2 and aged between 18 and 65 years were randomly assigned to one of the four test groups. Viz control (20g/day), simply adding psyllium fibre supplementation to a normal diet (FIB group,55 g/d) , consuming healthy diet with moderate fibre intake (HLT group, 30 g) or consuming both the fibre supplement and the healthy diet (HLT–FIB, 59 g) for 12 weeks. When comparing control group at week 12, body weight BMI and Percentage total fat in the FIB, HLT and HLT–FIB groups were significantly reduced. If increase of 14 g/d of fibre over a standard diet resulted in a 10% decrease in energy intake and a 1·9 kg decrease in body weight over 3·8 months. Present study suggests that larger amounts of fibre (>30 g) required to alter energy balance sufficiently for weight loss and to bring about changes in body composition.

14. Thirty healthy subjects, aged 17-62 year, nineteen men and eleven women, were selected and allocated into four groups and given a controlled diet for 3 week periods each of which was to receive a different amount of bran-enriched (30, 60, 110, 170 g/day) bread and study suggested that stool weight on the basal diet was significantly related to sex but not to age. Stool weight in men (162 (SE11) g/d) was approximately double that in women (83 (SE11) g/d). The increase in stool weight with fibre was significantly related to dose (t 4.18) with approximately 1 g non-starch polysaccharides increasing stool weight by 5g/d similar diets, women have much lower stool weights and slower transit times than men. Wheat fibre used in this study, stool weight increases in linear proportion to the dose of fibre added to the diet" by Alison M S *et al.* (1987).

15. Souravh Bais *et al.* (2014) study the methanolic extract of *Moringa oleifera* leaves (MEMOL) which was evaluated for antiobesity activity in rats. The antiobesity potential of MEMOL was studied against high fat diet-induced obesity (HFD) in rats. Animals of control group were feed on a standard chow diet and water *ad libitum*, whereas animals used for evaluation of obesity are feed on a HFD and water *ad libitum.* The animals were distributed in five groups of 10 animals each and were fed a HFD. Rats receiving the MEMOL extract were dosed for 7 week two doses of the *Moringa oleifera* leaf extract were selected as 200mg and 400mg/kg results indicate that treatment of obese rats with MEMOL for 49 days resulted in a significant change in body weight without any change in the feed intake and also elicited significant thermogenic effect and to act as hypolipidemic and thermogenic property in obesity related disorders. Extract of M. oleifera is beneficial to the weight management.

16. David J. A. Jenkins MD *et al.* (2002) A total of 23 subjects with type 2 diabetes (16 men and 7 postmenopausal women) aged 63 ± 1 years (mean BMI 26.7 ± 1.1 kg/m2) completed two 3-month phases of a randomized crossover study. Then they are categories into two groups that is test group (11 subject of 23) and control group (remain12 subject). In the test phase, high wheat bran bread and breakfast cereals were provided with 5.9% energy as fat, 18.8% protein, and 75.4% available carbohydrate, and 19 g dietary fiber per day. In the control phase, supplements were low in fiber profile with 4.2% energy as fat, 18.4% protein, and 77.5% available

carbohydrate, and 4 g dietary fiber per day. Subjects consumed 97 ± 2 and 96 ± 2% of the total test and control supplements respectively and result found that weight changes on both control and cereal fiber supplements were similar (control 0.0 ± 0.1 kg, cereal fiber 0.1 ± 0.2 kg), and these changes were not significantly.

17. Hongyu Wu *et al.* (2010) work on 283 participants (150 men and 125 women) for the 12-wk intervention. Subjects age range between 25–65 y. Participants were block randomized to 1 of the 3 intervention arms: 1) LC; 2) LC with 30 g/d of flaxseed supplementation (LCF); or 3) LC with 30 g/d of walnuts (LCW) supplementation. Two isocaloric breads were provided for each participant every day. The breads were similar except that 30 g of flaxseed or walnuts were incorporated into the 100g weight bread for the LCF or LCW groups, respectively. The 2 breads provided 1600–2100 kJ/d energy. Body weight, height, waist circumference were measured and BMI calculated before intervention. After feeding result found that total energy intakes decreased from baseline and in all groups. The percentage of individuals with Metabolic Syndrome decreased from baseline by 16.9, 20.2, and 16.0% in the LC, LCF, and LCW groups respectively. The percentage of participants with each Metabolic Syndrome component also decreased significantly from baseline. Continuation reversion rate of central obesity was higher in the LCF (19.2%) and LCW (16.0%) groups than in the LC group (6.3%). Weight loss seems greater in the LCF group compared with the LC group. The participants assigned to 30 g/d flaxseed or walnut-supplemented diets did not gain weight, and participants in the LCF group showed a tendency to lose more weight than those in the LC group. LC plus flaxseed or walnuts have additional benefits on central adiposity compared with LC only.

18. "Efficacy of ground flaxseed on constipation in patients with irritable bowel syndrome" by S Tarpila *et al.* (2003) in their whole study 55 patients were taken suffering from constipation predominant irritable bowel syndrome. During the treatment period 26 patients received flaxseed and 29 received psyllium 6-24g/day for 3 month.The starting dose of both flaxseed and psyllium was 6 g twice daily. The maximum daily dose was determined to be 24 g which is divided into four doses and found that in flaxseed group, constipation and abdominal symptoms were decreased significantly whereas in psyllium group the reduction was not statistically significant.

The difference between groups was statistically significant in constipation and in bloating and pain. After the additional open period of 3 months, these symptoms were further significantly reduced. These results obtain because ground flaxseed is capable to act simultaneously as bulk laxative relieving constipation than psyllium. This is explained by the larger amount of insoluble fiber in flaxseed.

19. Christiane Ishikawa Ramos MS *et al.* (2015) in their experiment controlled trial was conducted for 4 week. They were taken Fifty constipated patients (29% male, 51 ± 12 years) diagnosed by the Rome III criteria were randomly assigned to receive mineral oil (control group; n = 17), olive oil (n = 16), or flaxseed oil (n = 17). The initial oil dose was 4 ml/day. The frequency of the constipation symptoms evaluated by the Roma III criteria at baseline were comparable among the groups and included ''incomplete evacuation'' (92%), ''lumpy or hard stools'' (72%) and ''anorectal obstruction'' (70%). The Rome III score improved significantly in patients receiving mineral oil (10.5 ± 5.0 to 4.1 ± 4.0), olive oil (10.3 ± 4.2 to 3.2 ± 3.8), and flaxseed oil (9.6 ± 4.2 to 6.0 ± 5.1), after feeding they revealed that the scores of 5 from 6 constipation symptoms reduced similarly in the mineral oil and olive oil groups, whereas only the frequency of evacuation and the consistency of stools improved in the flaxseed oil group.They concluded their study daily use of olive oil or flaxseed oil was as effective as mineral oil in the treatment of constipation.

20. Denen Atsukwei *et al.* (2014) used extract of *Moringa oleifera* in experimentally induced hypercholesterolemic rats. Thirty six (36) wistar rats of both sexes weighing 130.53 ± 4.86 were used for the study. These animals were completely randomized into six groups (A-F) comprising 6 animals in each Groups A, B and C comprise female rats and D, E and F comprise male rats both are administered 1 ml of distilled water, high dose of 600 mg/kg and low dose of 300 mg/kg body weight of the extract respectively. The study revealed that only the high dose (600 mg/kg body weight) female group lost or maintained their body weight significantly, the rest did not. Body weight was not significantly different in the male group administered low and high doses, showing that these doses of the extract slightly affected their body weight.

21. Sharon M Tramonte *et al.* (1979) in his study "The Treatment of Chronic Constipation in Adults" 25 different laxative or dietary fiber therapy for chronic constipation were evaluated in the 36 randomized trial, multiple type of therapies studied such as psyllium and dietary bran supplementation approximately 40% of trial participants were more than 60 years of age and more than 70% were women of the 36 trial, 20 compared single active agent such as laxative or fiber to a placebo control diet and 16 directly compared between active agents, in the 21 trial evaluating bulk forming laxative or dietary bran supplementation, the amount supplemented ranged from 0.5-24 g/day revealed that 20 trial compared single agent showed that those agent cause increased in bowl movement frequency that were statistically significant compared with control group. Average bowl movement frequency per week for treatment and control group were 5.0 and 3.5 respectively. Fiber and bulk laxatives decreased abdominal pain and improved stool consistency compared with placebo.

22. June L. Kelsay *et al.* (1988) took Twelve men 37 to 58 years and weighing 68.1 to 95.0 kg in the study. Participants were consumed two diets for a period of 26 days each in a cross-over design. The high fiber diet contained fruits and vegetables and the lower fiber diet contained fruit and vegetable juices. Neither diet contained whole grain cereals or nuts. During the first period of the study (26 days) six men consumed the high fiber diet containing fruits and vegetables (diet A) and six men consumed the low fiber diet containing fruit and vegetable juices (diet B). After feeding result showed that the inclusion of fiber from fruits and vegetables in the diet decreased transit time ($P < 0.05$), increased number of defecations ($P < 0.001$), increased faecal weight ($P<0.001$), and increased water in the feces ($P < 0.001$). However, the percent of water in the feces did not differ significantly between the low fiber and high fiber diets. Fruits and vegetables have the same colonic effects as wheat fiber and also increase fat excretion. Individuals who do not choose to eat whole grain products can obtain the fruit and vegetable effects from the fiber in fruits and vegetables.

23. M Kristensen *et al.* (2008) in his study "Whole flaxseeds but not sunflower seeds in rye bread reduce apparent digestibility of fat in healthyvolunteers" Thirteen healthy young male subjects (24.6 ± 2.7 years; body mass index 22.5 ± 1.7 kg/m2) were selected for study which comprised four intervention periods of 7 days. During the intervention periods, all subjects received the same basal diet plus 300 g of rye bread. Four different rye breads were composed: C, whole grain rye bread (control); SU, control with SU; FL, control with FL; and SU–FL: low extraction rate (flour produced of a lower percentage (67%) of the rye grain) rye bread with SU and FL. Sunflower seeds (6.2/100 g bread) and FL (6.2/100 g bread) substituted the whole grain rye flour in the SU and FL rye breads respectively, whereas in the SU–FL rye bread, SU (6.8/100 g bread) and FL (6.1/100 g bread) substituted the low extraction rate rye flour. Result found that there was no significant changes occurring in average body weight during the 8 week's of study period. Whereas faecal dry weight and faecal water content were significantly affected by diets. The faecal dry weight was significantly higher in subjects receiving the rye bread FL (84.0 ± 6.6 g/day) compared to the rye bread C (62.0 ± 6.6 g/day) and SU (61.1 ± 6.6 g). The average transit time of 33.3 ± 2.0 h was not affected by diet and effect on energy digestibility of FL was more pronounced than that of SU. In vitro fat digestibility of rye breads and whole diets show fat-binding properties of FL when compared to the rye bread diet ($P<0.05$). Addition of FL to rye bread increases the amount of lipids and oils of the insoluble fraction after in vitro digestion representing the indigestible material. This increase in the share of insoluble material corresponds to the undigested fraction of the food, which is recovered in the faeces.

24. Pauline Koh-Banerjee *et al.* (2004) their study was conducted in a prospective cohort of 27082 men aged 40–75 y at baseline in 1986. Data on lifestyle factors were obtained periodically by using self-reported questionnaires, and participants measured and reported their body weight in 1986 and 1994. In multivariate analyses, an increase in whole-grain intake was inversely associated with long-term weight gain (P for trend < 0.0001). A dose-response relation was observed, and for every 40-

g/d increment in whole-grain intake from all foods, weight gain was reduced by 0.49 kg. Bran that was added to the diet or obtained from fortified-grain foods further reduced the risk of weight gain (*P* for trend = 0.01), and for every 20 g/d increase in intake, weight gain was reduced by 0.36 kg. Changes in cereal and fruit fiber were inversely related to weight gain. No associations were observed between changes in refined-grain or added germ consumption and body weight. The additional components in whole grains may contribute to favourable metabolic alterations that may reduce long-term weight gain.

25. NxCareInc *et al.* (2003) in their study "Effects of a Stimulant-Free Dietary Supplement on Body Weight and Fat Loss in Obese Adults: A Six-Week Exploratory Study" reported that "Compared with the placebo group, the treatment group lost significantly more body weight (-2.3 kg v/s 0.0 kg; $P < 0.01$), percentage of body fat(-1.1% v/s 0.2%; $P < 0.05$), and absolute fat mass (-2.0 kg v/s 0.2 kg; $P < 0.001$). The treatment group also experienced a significantly greater reduction in upper abdominal circumference (-4.5 cm v/s -0.7 cm), waist circumference (-4.1 cm v/s 0.1 cm), and hip circumference (-2.9 cm v/s 0.6 cm) compared with the placebo group ($P < 0.05$ for all)."

26. Huaidong Du, Daphne *et al.* (2010) conducted a prospective cohort study with 89,432 European participants, aged 20–78 y, whowere followed for an average of 6.5 y. They collected Dietary information was by using validated country-specific food-frequency questionnaires. Finding of result shows that total fiber was inversely associated with subsequent weight and waist circumference change. For a 10-g/d higher total fiber intake, the pooled estimate was 239 g/y (95% CI: 271, 27 g/y) for weight change and 20.08 cm/y (95% CI: 20.11, 20.05 cm/y) for waist circumference change. A 10-g/d higher fiber intake from cereals was associated with 277 g/y (95% CI: 2127, 226 g/y) weight change and 20.10 cm/y (95% CI: 20.18, 20.02 cm/y) waist circumference change. Fruit and vegetable fiber was not associated with weight change but had a similar association with waist circumference change when compared with intake of total dietary fiber and cereal fiber.

27. Rania AbouSamra *et al.* (2007) Healthy men aged 20–35 y with a body mass index (in kg/m2)of 20–27 were recruited to participate in 2 experiments Sixteen subjects were recruited for experiment 1 and another 15 different subjects participated in experiment 2. Four treatments were tested, including high-fiber (HF) cereal (71 g, 33 g insoluble fiber), low-fiber (LF) cereal (30 g, 1 g fiber; Countr Cornflakes), white bread (WB), and 500 mL water as control. The HF and LF cereals were served in milk, whereas the WB treatment was served with milk on the sidel. In the second experiment, a preset pizza meal (850 kcal) was consumed at 75 min. Appetite and blood glucose were measured for 150 min at fasting and at 15 min intervals before and after the fixed meal after the intervention result found out that in experiment 1, ad libitum food intake was lower after the HF cereal and WB than after the LF cereal and water (937 ± 86, 970 ± 65, 1109 ± 90, 1224 ± 89 kcal, respectively; $P<0.001$). Appetite was lower ($P<0.05$) after the HF cereal than after the WB but not different from the LF cereal.

28. Vladimir Vuksan *et al.* (2015) were conducted experiment on 23 persons (12 Male and 11 Female) aged 35 ± 12 y (range: 19–59 y). The study involved the investigation of 4 different types of fibers given in the form of breakfast cereals (2.5 servings/d). The test fibers included 4 high-fiber cereals—Water-insoluble dietary fibers i.e. All-Bran (AB), Bran Buds with Corn (BBC), and their mixtures with water-soluble fibersie, Bran Buds with Psyllium (BBP) (all: Kellogg Company, Battle Creek, MI), and BBC plus a VFB—and a low fiber control (VFB is a proprietary fiber blend) for 3 week. In this study Seven-day stool collections and a symptom diary were obtained during the last week of each study arm and revealed that all cereals induced significant ($P < 0.05$) increases in fecal bulk from the control diet at 128 ± 38 g to 199 ± 56, 199 ± 57, 247 ± 87, and 197 ± 63 g with consumption of AB, BBC, BBP, and VFB, respectively; less intestinal transit time; and significantly ($P <0.05$) greater bowel movement frequency. BBP was more effective than other cereals in terms of increasing fecal wet weight ($P < 0.05$).

29. Prakash S Shetty *et al.* (2015) were conducted experiment on Eight young, healthy male subjects, aged between 18 and 22 year, were admitted to a metabolic facility and maintained on controlled diets for 24 days. During the initial 8 days the subjects were equilibrated on individualized diets following the initial equilibration period constituted the control period after which all subjects received an additional 410 kcal daily in their diet in the form of a corn starch gruel for a further 7 days. This preparation also provided an additional 1.8 g of dietary fiber per day. Dietary analysis revealed that increasing the carbohydrate intake by starch supplementation with little change in dietary fiber intake increased fecal weights significantly, mean daily fecal weights rose significantly, while there was no significant change in transit time. Fecal solids increased significantly however the percent moisture remained the same after the high caloric intake. Colonic bacterial flora have a major role to play in fecal bulking by degrading dietary fiber for their energy needs. It is generally accepted that up to 20% of dietary starch enters the colon. Increases in dietary starch intake could result in more starch entering the colon and thus making available more substrates for bacterial growth which would in turn increase fecal bulk.

30. Jacqueline Brown *et al.* (1998) were taken 18 healthy male volunteers, aged 21–59 y, weighing 66–100 kg, height 1.72–1.92 m and body mass indices 21–31 kg/m2. Those consuming the weight-reducing diet were slightly overweight initially, having a body mass index between 25 and 31 kg/m2. The predictions of metabolizable energies were compared with determinations made in energy balance studies with three maintenance diets (12 MJ/d); onethree maintenance diets (12 MJ/d); one of the diets was moderate in non-starch polysaccharide (NSP; 2.1% of gross energy) and two were higher in NSP (3.5–4.6% of gross energy). A fourth diet was a sub maintenance (6 MJ/ d) high NSP (7% gross energy) diet. Body weights were unchanged by diets consumed at maintenance intakes; at the end of the balance period all values were within -1± 2 (group mean dietary value ± SD, n =6) also predictably, significant (P <0.05) body weight loss occurred in subjects consuming the sub maintenance diet. The mean weight loss was 8.3 (±1.9, range 6–11.3) kg over the 28 day of treatment.

31. Mohsen Mazidi 1 *et al.* (2014) were studied on "Hydro alcoholic extract of *Coriandrum sativum* had no effect on ghrelin hormone in rat" to measure the ghrelin level in rats, Twelve rats were randomly selected and were divided into 2 groups, each containing of 6 rats. After anaesthetized for a short time one group received the orexigenic dose of *Coriandrum sativum* which is interventional group and other received distilled water by gavage which was control group. And result showed that ghrelin levels in 5 time intervals (0.5, 1, 2 and 4 hours after extract gavage) were compared between case group (received 150 mg/kg *Coriandrum* solution) and vehicle group. "There was no significant difference ($p>0.05$) in ghrelin levels after intervention" (Ghrelin is a recently discovered orexigenic peptide produced by endocrine cells in the oxyntic glands of the stomach, also appears to have a role in the stimulation of appetite). Coriander possesses the insulin-releasing and insulin-like activity in mice which justify the increased food intake by rats in this study.

32. David J. Baer *et al.* (1997) were taken five or six subjects were randomly assigned to a set of three diet Each set of three diets, within each level of fat (18, 34 or 47% of energy), contained different levels of dietary fiber i.e. low, medium and high fiber (3, 4 or 7% of diet dry matter) and were consumed for 2 week (14 d for each diet). Food consumption was measured and all urine and feces were collected during a 5-d period and analysed. Metabolizable energy and apparent digestibility coefficients were calculated. Overall, increasing fiber intake decreased fat and protein digestibility. As a consequence of these interactions, the Metabolic Energy content of the diets decreased as fiber intake increased.

Chapter 3
MATERIALS AND METHODS

MATERIALS AND METHOD

3.1 *Location of site for experiment*

The research work entitled "Fiber rich supplement reduce weight and constipation" was carried out in Hostel No- 06 and Hostel No- 03, Orissa University of Agriculture and Technology for period of 03 months.

3.2 *Data collection*

By the cross-sectional survey data were collected about the nutrition and health status of the Over-weight and constipated patient in OUAT Hostel no - 03 and Hostel no - 06 population using a complex, multi-stage, sampling design. Interviewers conducted in-person 24-hour dietary recalls to record dietary intake data from participants

Respondents were screened on the basis of the following selection criteria: age 20-30 year (Divided into two group 20-25 and 25-30 year) no history or presence of gastrointestinal, renal, or hepatic disease of any cause; and no current consumption of any over-the-counter medication such as laxatives or antibiotics that could interfere with the validity of the study. And all subjects were non-smokers. The subjects were instructed to keep their physical activity levels constant and to abstain from alcohol throughoutthe study. All subjects were given oral information about the study before intervention.

Exclusion criteria were the use on a regular basis (≥ 1/wk) of any form of drug therapy, medication, or supplements that may interfere with bowel function.

Fifty subjects were selected and forty six completed the study. 4 subjects failed to complete the study for unrelated health reasons in which three subjects withdrew during the first week of the study because they were unable to make the necessary dietary modifications.

Forty sex number of middle adult age group were selected and was divided in two groups. Control and experimental group that is 10 Male and 10 Female and 10 Male and 16 Female respectively. Male subject were selected from Hostel No-06, and Female from Hostel No-03 were selected.

Selection is done in 2 steps-

1- Overweight middle adulthood subject were randomly selected on the basis of personal observation.

2- Selection on the basis of personal interview.

3.3 *Period of Study*

The study was conducted in a time period of 3 months.

3.4 *Experimental Programme*

Designed a questionnaire which include general and specific information and routine work of subject. General information include name, age, sex, qualification, food like and dislike, number of meal in a day, type of food consumption (vegetarian and non-vegetarian). Total amount of water intake and food intake in a day. Food groups including in a day that is calorie rich food or protein rich, fast food taken in a day, amount of fiber taken in a day, type of work that is sedentary, moderate or heavy.

Specific information include Physical examinations that is measurements of standing their height (Height in meter by measuring rod), weight(Weight in kg by Weighing scale) and WC were obtained, Body mass index values were calculated as body weight (kilograms) divided by height (meters) squared. Overweight was defined as a BMI value greater than or equal to 25 kg/m2 and less than 30 kg/m2 and obesity was defined as a BMI greater than or equal to 30 kg/m2 stools pass in a day (consistency).
Patient with obese and cronic constipation were excluded from the study. Before 4^{th} , 8^{th} and 12^{th} week of study for all participants and as their part of routine physical examination that is height, weight, BMI and consistency of stool measured.

The initial Intervention result was used as a baseline for a sample.

3.5 *Preparation of Fiber Supplement*

Raw material used for preparation of supplement is Flaxseed, Drumstick, Coriander, Wheat Bran, which are purchased from Unit-2 market, BBSR.

Composition of experimental diet includes 15% Flaxseed, 30% Coriander, 55% Wheat Bran for first 8 weeks which contain Energy-73 kcal, CHO-14 g, Protein-4g, Fat-4 g, Fiber-10 g and 15% Flaxseed, 25% Coriander, 40 % Wheat, 20% Drumstick, Bran for last 4 weeks which contain Energy-63 kcal, CHO-10.45 g, Protein-3 g, Fat-3.25 g, Fiber-10 g.

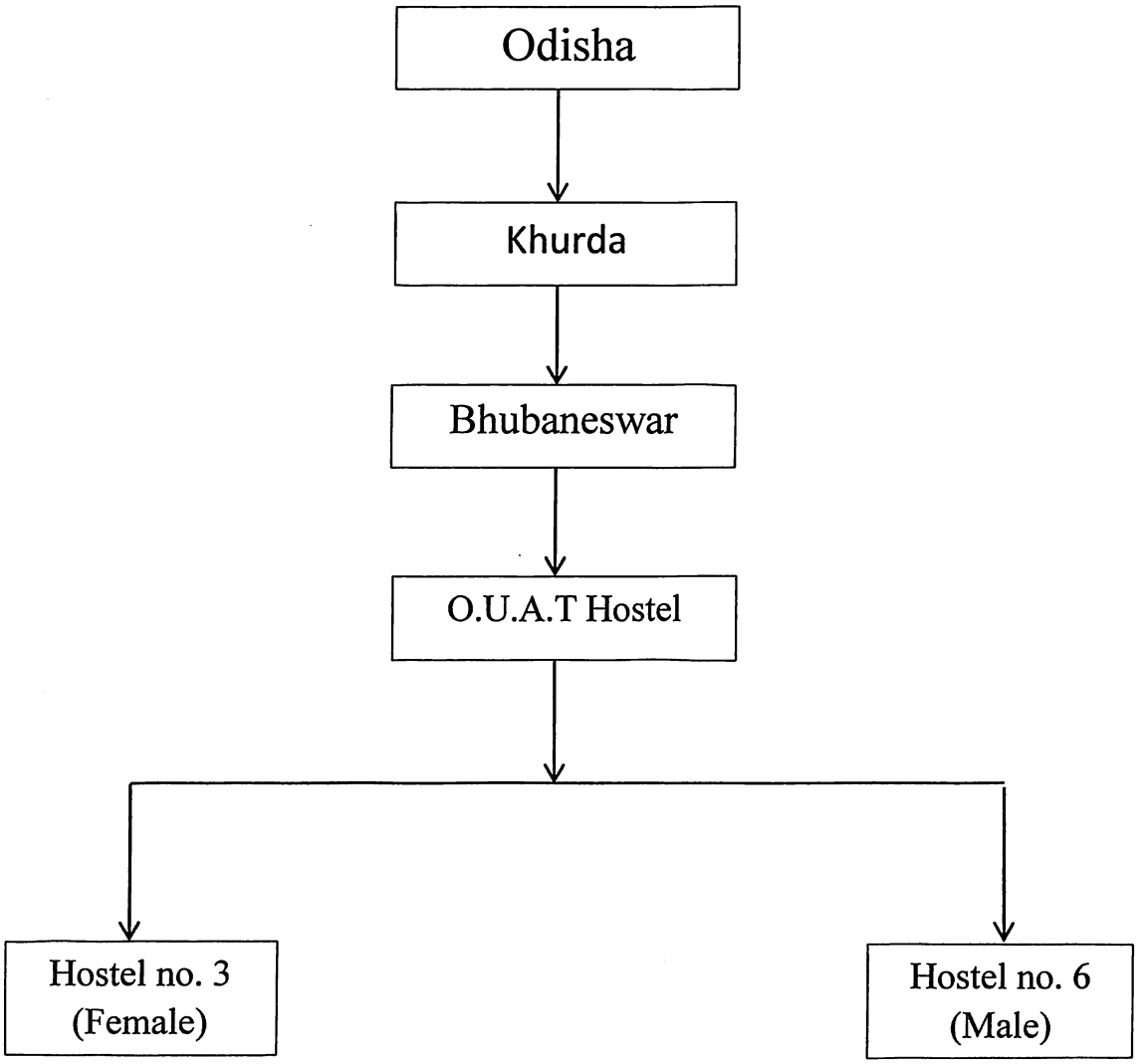
1- Drumstick washed in fresh water, cut into small pieces and dried in hot air oven and after that grind to make a fine powder.

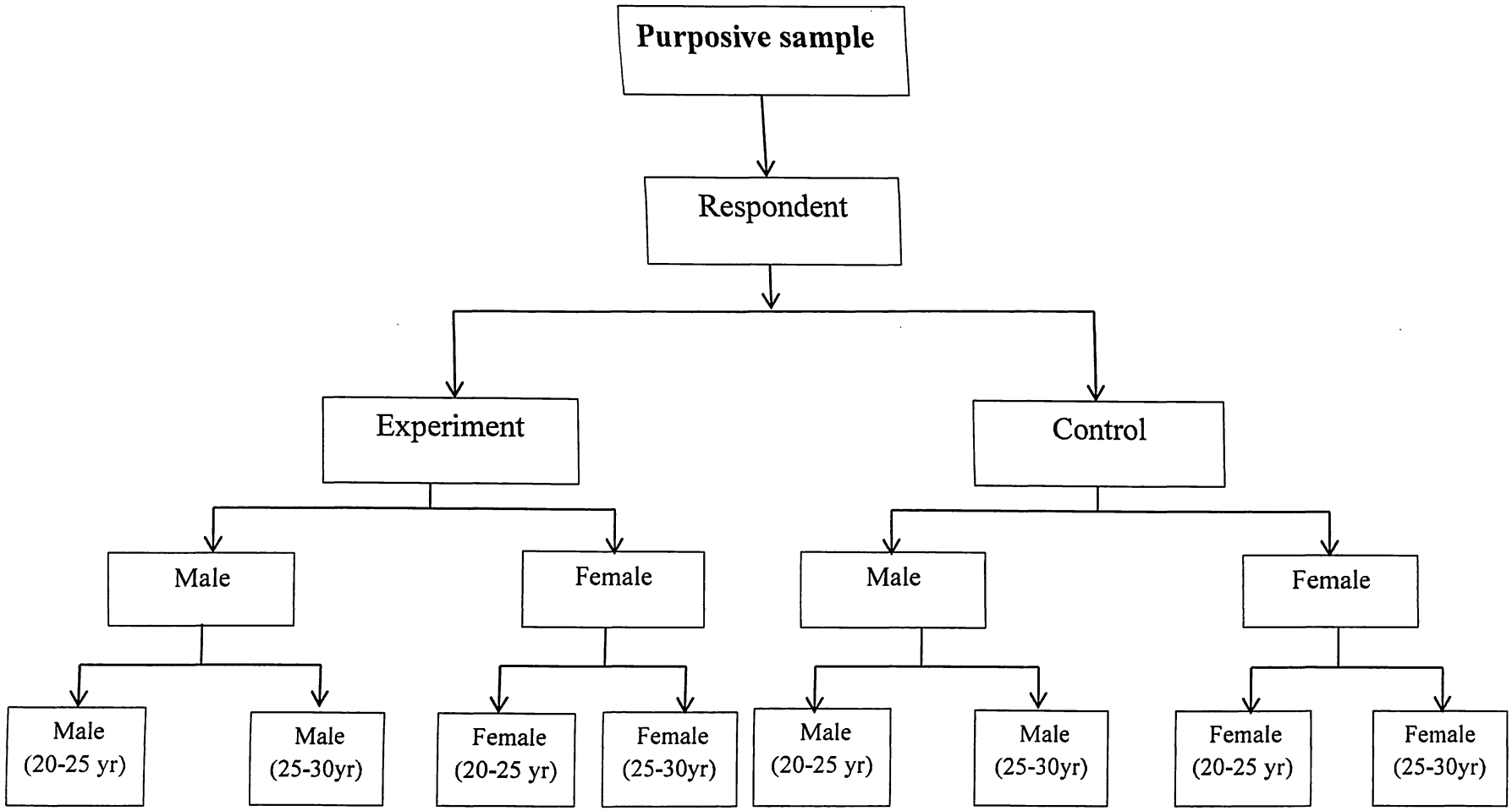
2- Flaxseed and Coriander was first roasted then grind into fine powder.

3- Together these all mixed along with wheat bran and sieved and packet were made for 15 days in the amount 375 g.

3.6 *Intervention*

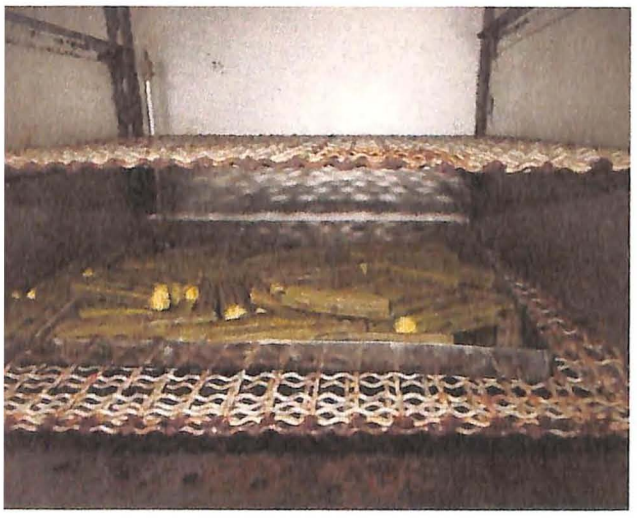
The intervention phase consisted of 12 weeks in this period the subjects were advised to continue their regular diet curtailing equicalorie from their existing diet as well as 25 g of supplement powder that is 12.5 g twice a day which contain 10 g fiber content. Subjects were instructed to take supplement with lukewarm water or by mixing it with diet. Adherence to fiber supplement and any possible side effect was checked on regular monthly interview. Equicalorie reduction was suggested to the experimental group when supplementation was provided. Flaxseed contains 20.29 kcal so this calorie was reduced by containing cereals amount from their diet.




Purposive sample
Respondent
Experiment
Control
Male
Female
Male
Female
Male (20-25 yr)
Male (25-30yr)
Female (20-25 yr)
Female (25-30yr)
Male (20-25 yr)
Male (25-30yr)
Female (20-25 yr)
Female (25-30yr)

Raw whole Drumstick

Cut Drumstick



Drying in Hot Air Oven

Dry Drumstick

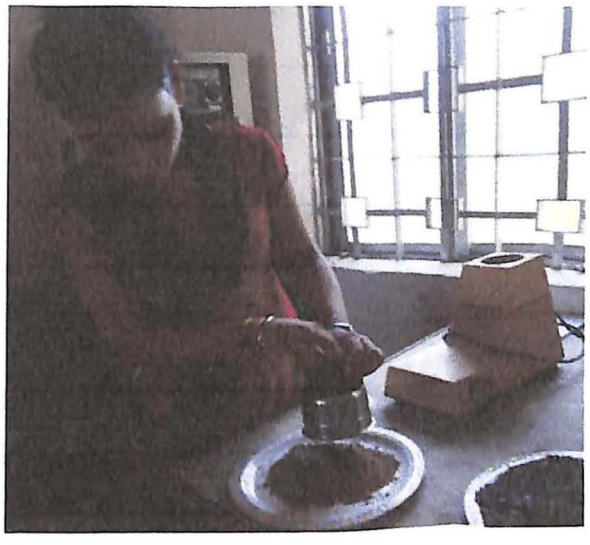
Whole and Powder Flaxseed

Whole and Powder Coriander

Whole and Powder Coriander

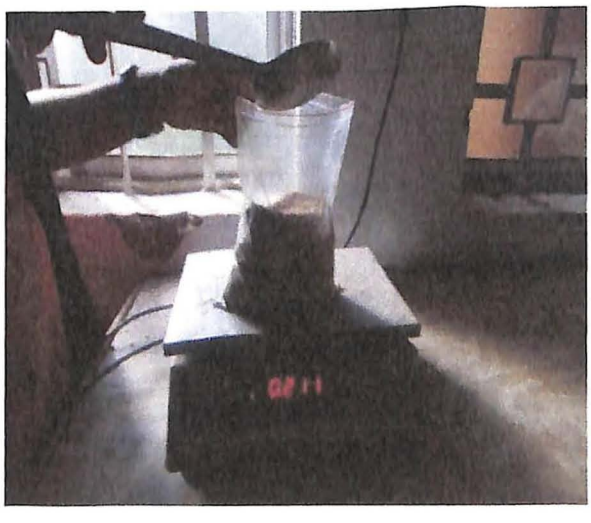
Roasted Wheat Bran

Roasting

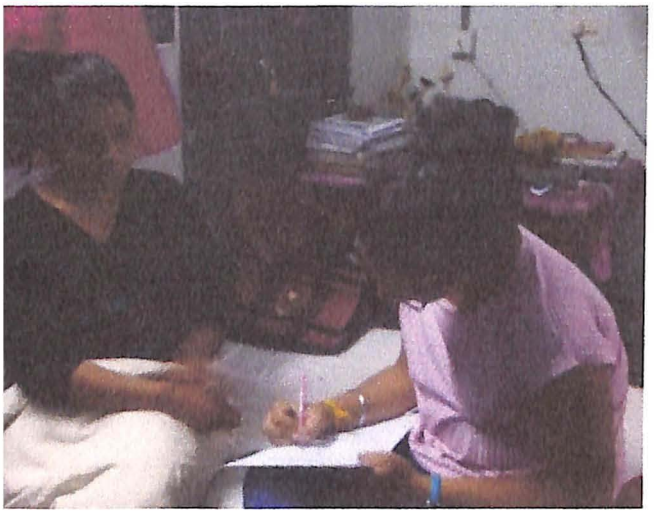


Mixing

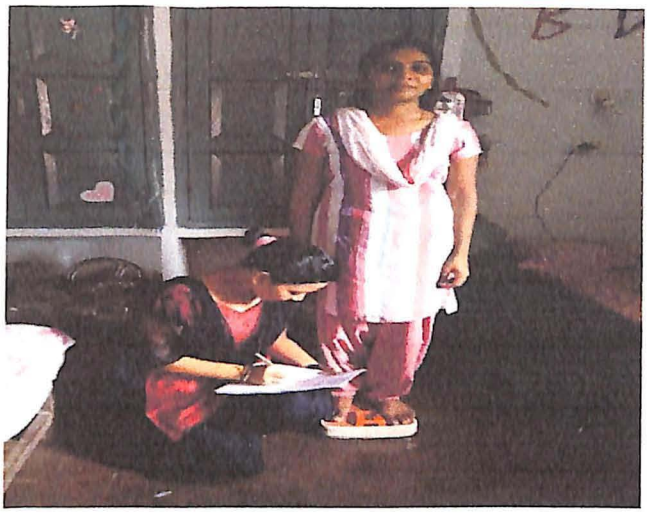
Sieving



Packing



Taking Report



Anthropometric measurement

Anthropometric measurement

Distributing Supplement powder

Chapter 4

RESULTS AND DISCUSSION

RESULT AND DISCUSSION

After completion of 3rd month of supplementation to overweight and constipated patient, the effect of fiber mix supplement was investigated, the changes in number of meal, water intake, number of constipated patient and over weight of subjects were observed in experimental group and compared with the control group and were presented in a tabular and graphical forms. Data collected were also analysed and presented in a summarised way.

Table 1: Pattern of Fiber intake in male and Female

Age	Green leafy veg	Parboiled Rice	Other veg
20-25 year male	Twice in a week	Daily	5 Day in a week
25-30 year male	Twice in a week	Daily	5 Day in a week
20-25 year female	Once in a week	Daily	4 Day in a week
25-30 year female	Once in a week	Daily	4 Day in a week

Table 1: Shows the demographic study of fiber intake through different food sources. Subject of all groups were deficient in fibers because of less consumption of fiber rich food.

Table 2:Demographic analyses of food habits

Age	Veg	Non-Veg
20-25 year male	2	3
25-30 year male	1	4
20-25 year female	3	5
25-30 year female	2	6

Table 2: Reveals that maximum subject are non-vegetarian which are deficient in fibers. This may be the reason behind subjects suffering with constipation and overweight.

Table 4: Comparison of No. of Meal before and after intervention

Age	Control group (No. of meals per day)				Experimental group (No. of meals per day)					
	Initial	After 3 month	Final Changes	% Decrease	Initial	After 1 month	After 2 month	After 3 month	Final Change	% Decrease
20-25 year male	4.6	4.6	0	0	5	5	4	3	2	40%
25-30 year male	5	4	1	20%	5.2	4.9	4	3.6	1.6	30.77%
20-25 year female	5.5	5	0.5	9%	5	4.5	4	3.8	1.2	24%
25-30 year female	4.6	4.6	0	0	4.5	4.5	4	3.4	1.1	24.40%

Significant,(P≤0.01)

Table 4: Depict that the total no. of meal were reduced slowly after intervention in the experiment group. The highest reduction was observed that is 40% in 20-25 years of age group of male, and the minimum reduction was 24% in 20-25 years of female. In control group there was slightly reduction in number of meal intake after three months i.e 20% in age group of 25-30 age years of male. The reduction of no. of meal were statistically significant (p≤0.01).

Table 3: Fast food intake

Age	Bakery	Chinese food (like noodles)	Sweets item
20-25 year male	1 time in a week	Daily	0
25-30 year male	3 time in a week	3 time in a week	Once a week
20-25 year female	Daily	4-5 time in a week	2 time in a week
25-30 year female	Daily	2 time in a week	4 time in a week

By the Analysis of data collected the fast food intakes was more in 20-25 years male and female, the highest inclusion of fast food, the highest will be sufferer of weight and constipation. Which was depicted in Table number: 3

Table 4: Comparison of No. of Meal before and after intervention

Age	Control group (No. of meals per day)				Experimental group (No. of meals per day)					
	Initial	After 3 month	Final Changes	% Decrease	Initial	After 1 month	After 2 month	After 3 month	Final Change	% Decrease
20-25 year male	4.6	4.6	0	0	5	5	4	3	2	40%
25-30 year male	5	4	1	20%	5.2	4.9	4	3.6	1.6	30.77%
20-25 year female	5.5	5	0.5	9%	5	4.5	4	3.8	1.2	24%
25-30 year female	4.6	4.6	0	0	4.5	4.5	4	3.4	1.1	24.40%

Significant,($P \leq 0.01$)

Table 4: Depict that the total no. of meal were reduced slowly after intervention in the experiment group. The highest reduction was observed that is 40% in 20-25 years of age group of male, and the minimum reduction was 24% in 20-25 years of female. In control group there was slightly reduction in number of meal intake after three months i.e 20% in age group of 25-30 age years of male. The reduction of no. of meal were statistically significant ($p \leq 0.01$).

Table 5: Increase in total Water intake

Age	Control group Total water intake per day (in litres)				Experimental group Total water intake per day (in litres)					
	Initial	After 3 month	Final Changes	% Increase	Initial	After 1 month	After 2 month	After 3 month	Final Changes	% Increase
20-25 year male	1.9	2.1	0.2	10.50%	1.9	2	2.45	2.7	0.8	42%
25-30 year male	2.7	2.7	0	0%	2.7	2.7	3.1	3.3	0.6	22.22%
20-25 year female	1.9	2.1	0.2	10.50%	2.3	2.5	2.8	2.9	0.6	26%
25-30 year female	2.1	2.1	0	0	1.9	2.2	2.65	2.7	0.8	42%

significant ($P \leq 0.00087$)

Table 5: Showed that the maximum increase in water intake was 42% in 20-25 years of male and 25-30 years of female of experimental group and minimum was 22.22% in 25-30 years group. There was little increase of water intake after 3 months i.e 10.5% in 20-25 age group of male and female and no change was observed in 25-30 age group of male and female in control group. The Increase in water intake was significantly higher ($P \leq 0.00087$) in the experimental group compared with the control group.

Table 6: Changes in body Weight after intervention

Age	Control group				Experimental group					
	Initial	After 3 month	Final Change	% Change	Initial	After 1 month	After 2 month	After 3 month	Final Change	% decrease
20-25 year male	61.8	62	0	0.00%	66.4	67.5	66.5	66.15	0.25	0.38%
25-30 year male	68.4	88.3	0.1	0.14%	68.8	68.8	68	68	0.75	1.00%
20-25 year female	57.8	57.4	0.4	0.70%	56.2	56	55.45	54.45	1.75	3.11%
25-30 year female	60.2	60.2	0	0	58.8	57.5	57.2	56.5	2	3.40%

significantly higher($P < 0.022$)

Table 6: Reveals that the weight was maximum changed in 25-30 age group of female 3.4% and it was lowest in 20-25 age group of male 0.38% but in control group there was only 0.14% reduction in body weight of 20-25 years male and 0.7% in 20-25 years female which was negligible. The decrease in body weight was significantly higher ($P < 0.022$) in the experimental group compared with the control group.

Table 7: (a) Recovery of patient belong to 20-25 year Male

Days	Severe	Mild	Normal	total no. of patient	% of cure
Initial	2	3	0	5	80%
15 day	2	1	2	3	
30 day	2	1	2	3	
45 day	1	2	2	3	
60 day	1	1	3	2	
75 day	0	2	3	2	
90 day	0	1	4	1	

Initially 2constipated male subjects of age 20-25 years were under sever condition and 3 were under mild condition but slowly these sever condition was improved in 45 days and gone to mild group and in 90 days 4 of them have completely recovered.

Which showed in Table 7: (a)

Table 7: (b) Recovery of patient belong to 25-30 year Male

Days	Severe	Mild	normal	total no. of patient	% cure
Initial	2	3	0	5	
15 day	2	1	2	3	
30 day	1	1	3	2	
45 day	1	0	4	1	
60 day	0	1	4	1	
75 day	0	1	4	1	
90 day	0	0	5	0	100%

Table 7:(b) showed that 2 severe and 3 mild constipated male patient of age 25-30 years. After 30 days of feeding trials, 1 severe patient was reached to mild condition group and both of them were cured completely in 90 days.

Table 7:(c) Recovery of patient belong to 20-25 year Female

Days	Severe	Mild	normal	total no. of patient	% of cure
Initial	2	6	0	8	
15 day	2	5	1	7	
30 day	1	4	3	5	
45 day	1	2	5	3	
60 day	0	3	5	3	
75 day	0	1	7	1	
90 day	0	0	8	0	100%

Table 7:(c) Showed the complete recovery of severe patient in 75 days of supplementation of mixture. The number of mild patient was also reduced slowly from 6 to 1 number in 75 days of supplementation and in 90 days all constipated patient were recovered.

Table 7: (d)Recovery of patient belong to 25-30 year Female

Days	Severe	Mild	Normal	total no. of patient	% of cure
Initial	3	5	0	8	
15 day	2	5	1	7	
30 day	2	4	2	6	
45 day	0	3	5	3	
60 day	0	1	7	1	
75 day	0	1	7	1	
90 day	0	0	8	0	100%

Table 7: (d) Showed the shifting of severe patient of 25-30 year female in mild group completely in 45 days whereas it was in 60 days approximately same pattern of recovery for mild patient was observed in 25-30 year female.

Table 7: From (a) to (d) reveal that male's age group of 25-30, females group aged 20-25 and 25-30 years were 100% cured whereas males age group of 20-25 years were 80% cured and 20% were remain in the mild group.

Table 8: Improvement in Bulky stomach in 3 month

Age	Control group (No. of suffered subjects)				Experimental group (No. of suffered subjects)					
	Initial	After 3 month	Final Diff	% Change	Initial	After 1 month	After 2 month	After 3 month	% Change	Improvement in symptoms
20-25 year male	5	4	1	20%	5	3	2	0		100%
25-30 year male	5	5	0	0%	5	2	3	0		
20-25 year female	5	5	0	0%	8	6	2	0		
25-30 year female	5	4	2	20%	8	6	2	0		

significantly (P< 0.01)

Table 8: Showed that in 2nd month 2-3 patients had bulky stomach and in 3rd month every subjects have stomach clean in early morning. But in control group of 25-30 years male and of 20-25 years female, every subject were with bulky stomach and in age group 20-25 years male and 25-30 years female, 20% of subject were having bulky stomach. The Experimental group Improvement in symptoms significantly (P<0.01) compared with the control group.

Figure 1: (a) Percent Reduction rate for constipated patients

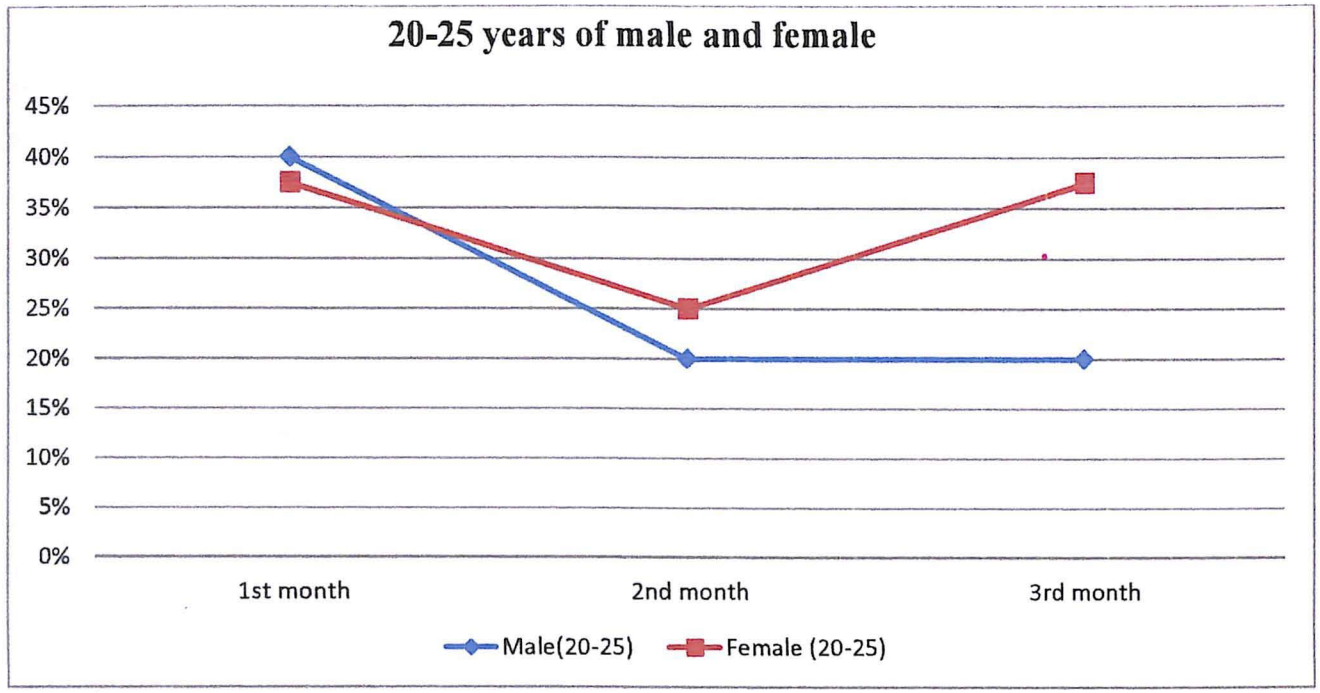


Fig. 1:(a) Showed that the reduction rate in constipation male subjects of 20-25 years was high in 1st month i.e. was 40% whereas 2nd and 3rd month reduction rate was decreased i.e. was 20% in each month and in female age group between 20-25 years percent reduction was 37.5% in 1st month, in 2nd month reduction rate lowest i.e. was 25% and in 3rd month reduction rate was increased i.e. was 37.5%.

Figure 1:(b)

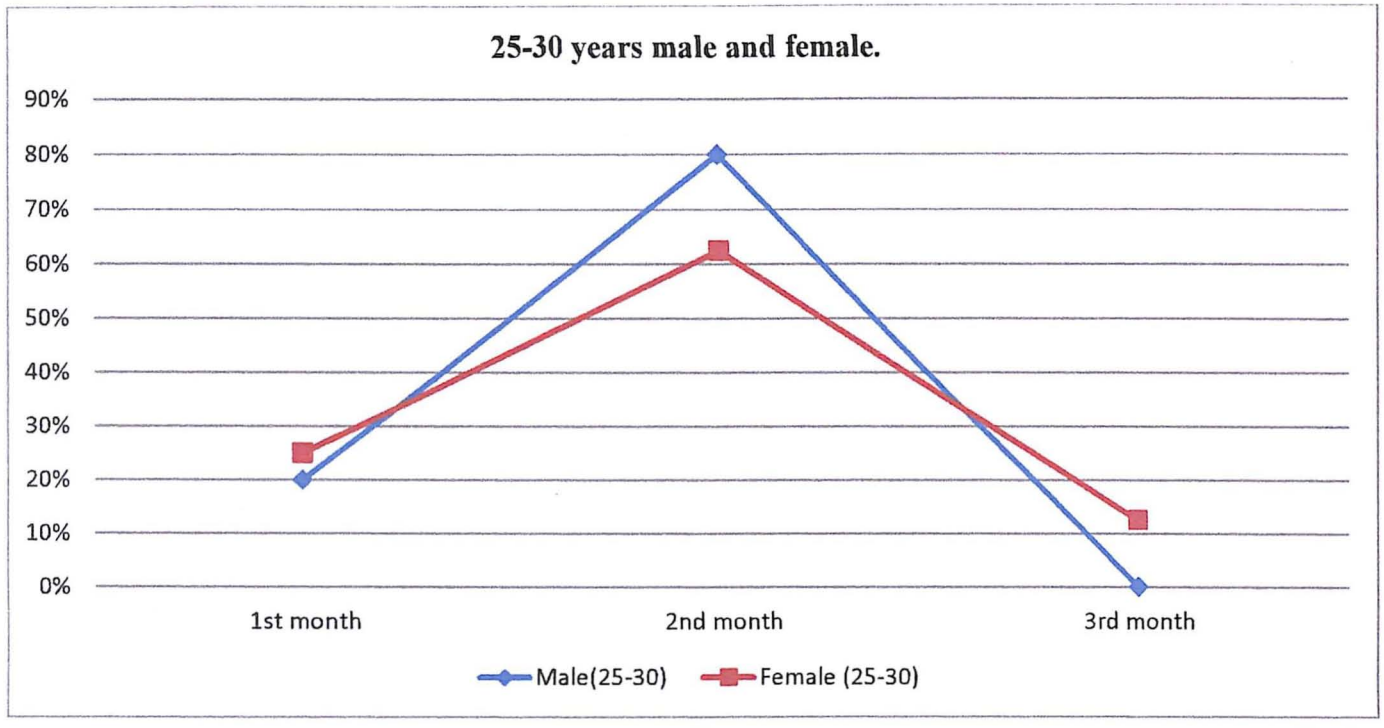


Fig.1:(b) Showed that in Male age group between 25-30 years the reduction rate in 1st month was 20% and in 2nd month reduction rate was increased to 80% and thus all were recovered in 2nd month and the same pattern was maintained up to 3rd month. In female age group between 25-30 years reduction rate was 25% in 1st month, in 2nd month reduction rate was increased up to 62.5%, 3rd month reduction rate was decreased to 12.5%.

Figure 2:(a) Percent Reduction rate in number of meals

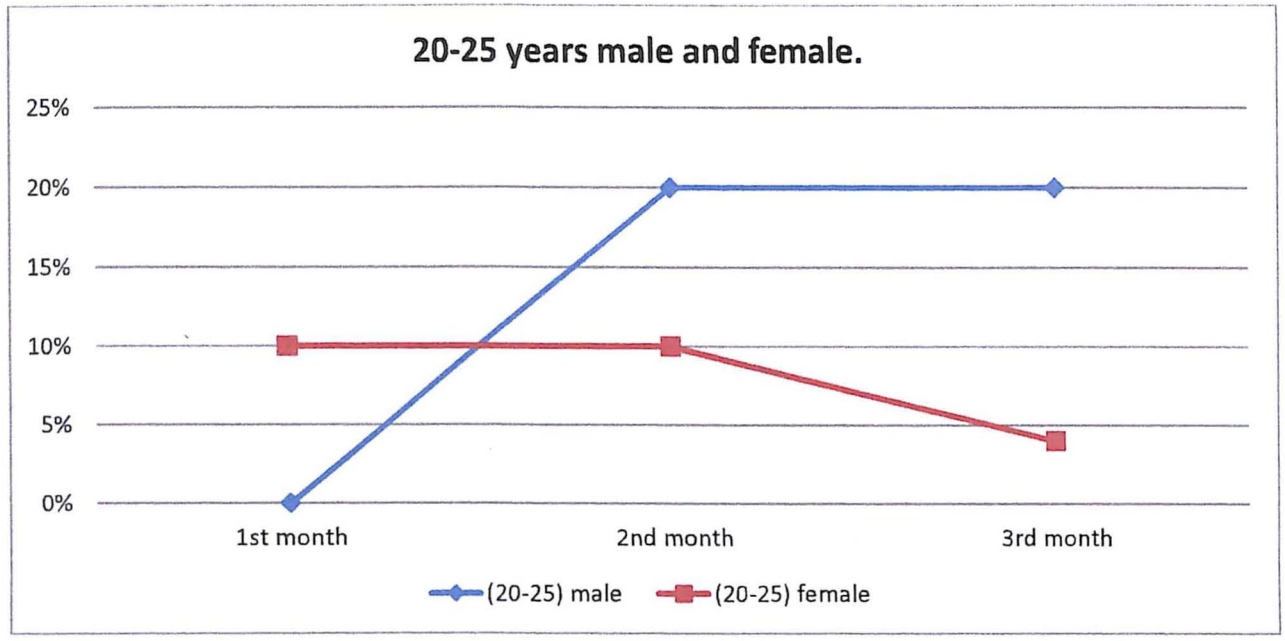
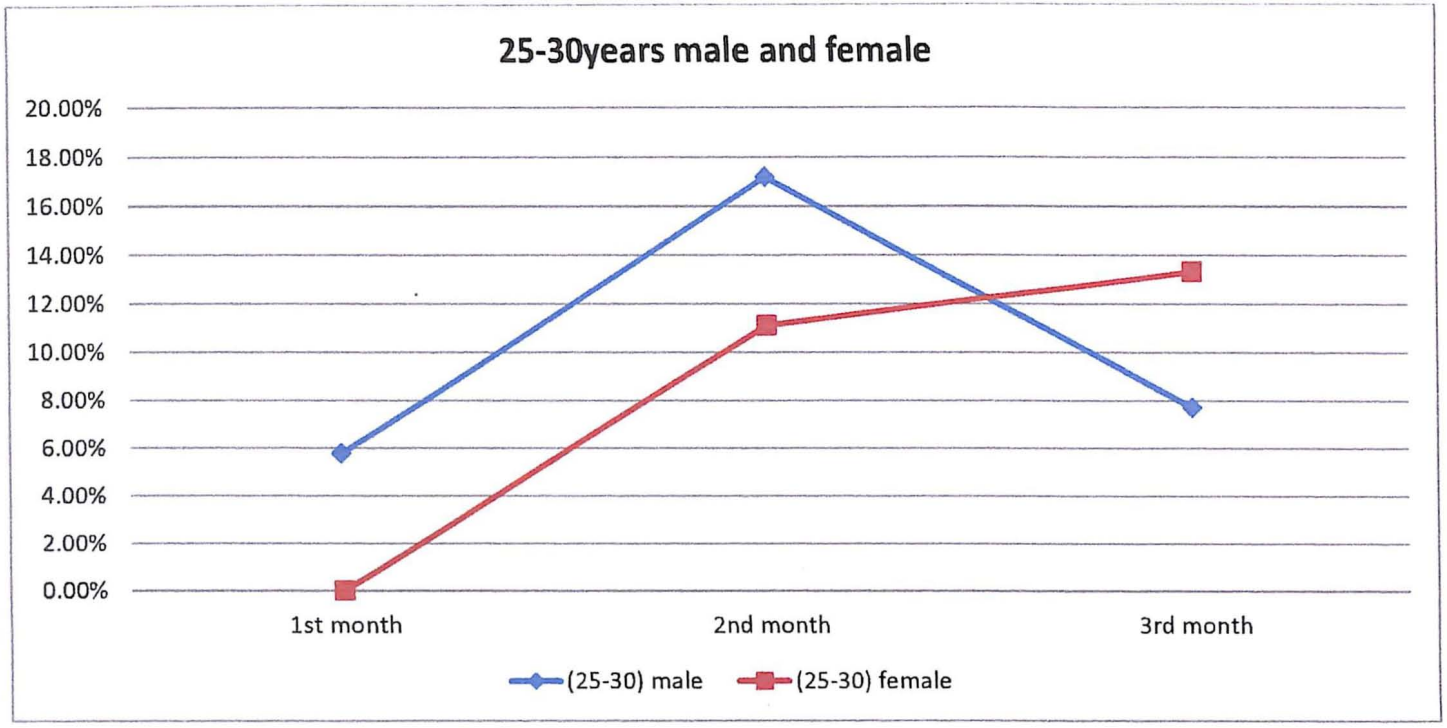


Fig.2: (a) Showed that Male age group between 20-25 years there was no change in meal rate in 1st month, 20% change in 2nd month and same pattern was observed in 3rd month. In female 20-25 years was 10% change in 1st month which was constant in 2nd month and during 3rd month there was decrease in reduction rate of meals i.e. was 4%.

Figure 2: (b)



Age group of 25-30 years male reduction rate of meal in 1st month was 5.77%,whereas in 2nd month it was increased 17.2%, in 3rd month their was decrease in number of meal which was 7.7% and female age group between 25-30 years there was no change in 1st month and was increased 11.11% in 2nd month and during 3rd month their was maximum reduction rate i.e. 13.33% which was clearly showed in Fig 2:(b)

Figure 3: (a) Rate of water intake in different month

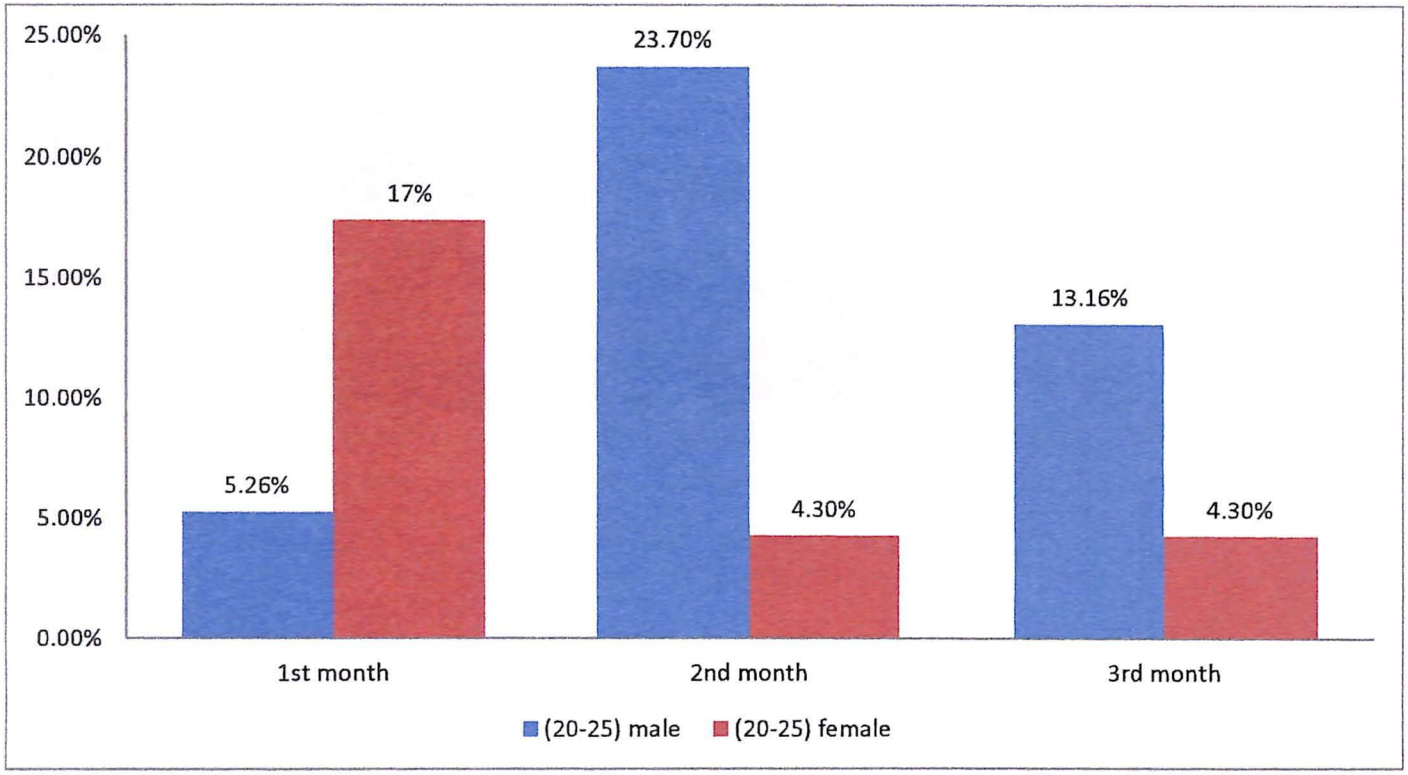


Fig 3: (a) Showed that in 2nd month water intake rate was highest (23.7%) whereas it was only 4.3% in the same age of females and was remain constant in 3rd month.

Figure 3: (b)

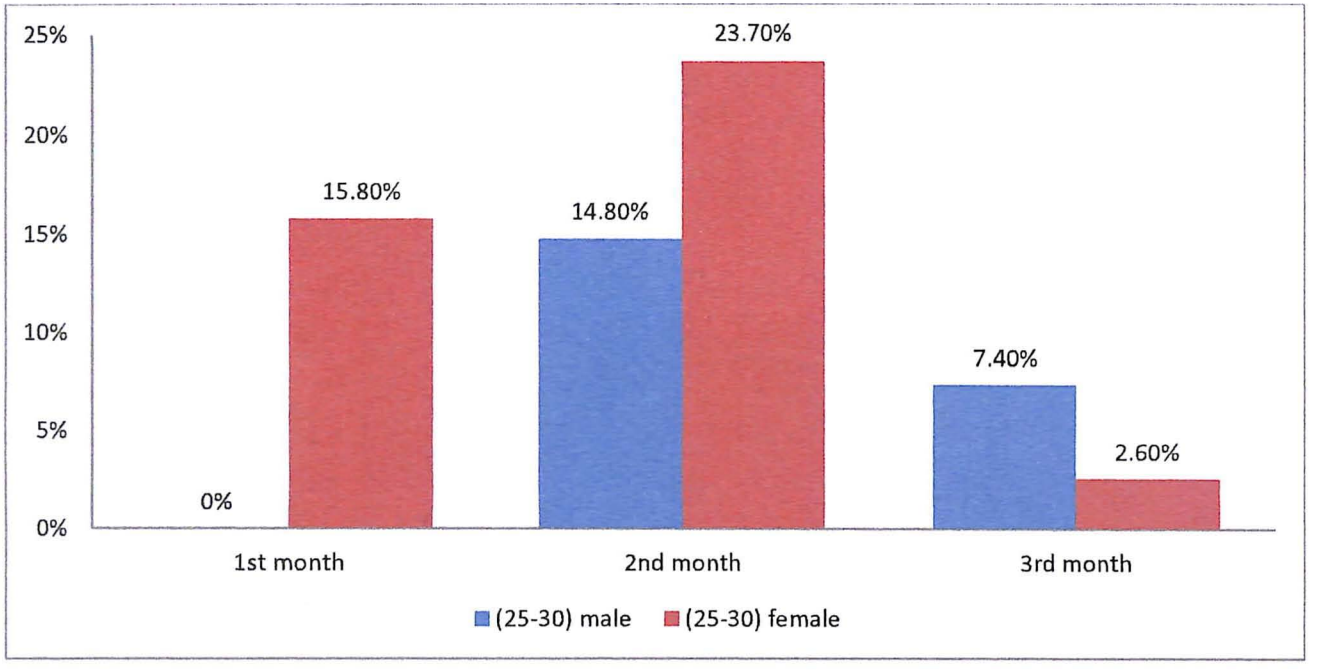


Fig 3: (b) In 1st month there was no change in male group and it was 15.80% in female group, in 2nd month percent rate was change is increased in male and in female it was highest i.e. 23.7%, in 3rd month their was decrease in percent rate in both male and female and reduction was observed in female i.e. was 2.6%.

Figure 4 :(a) Compression between Male and Female patient toward cure

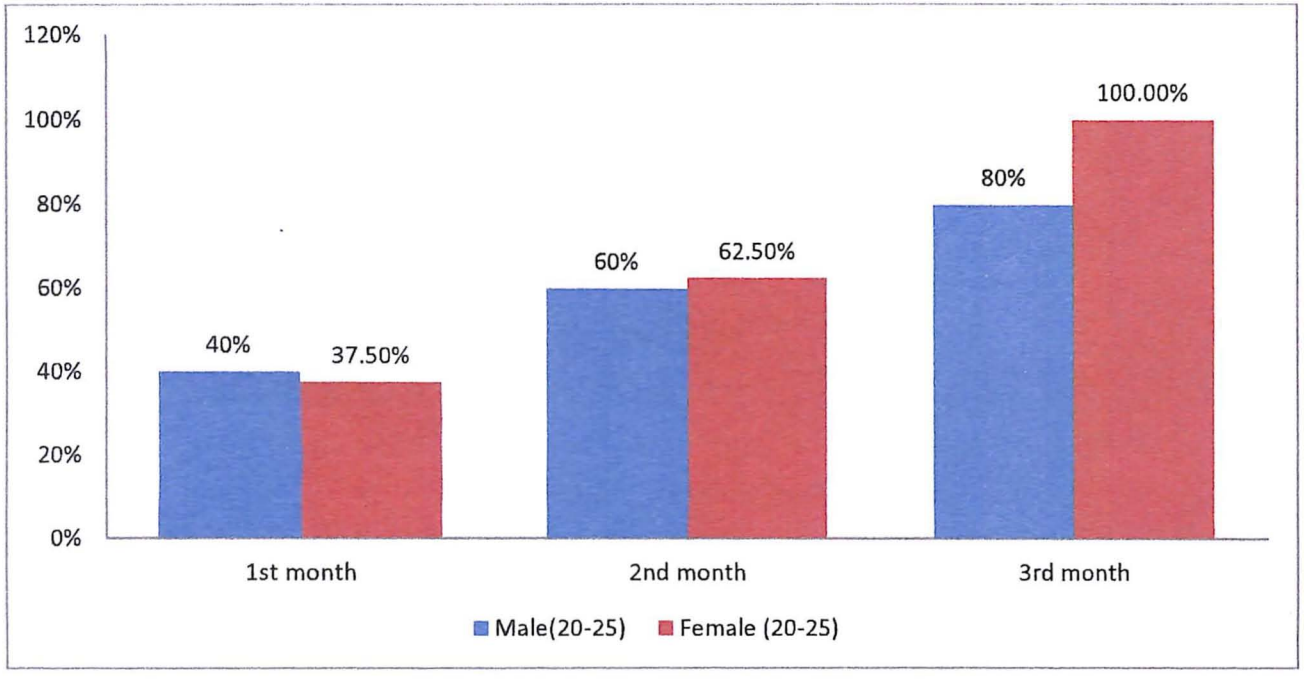


Fig. 4: (a) Showed that highest level of improvement was observed in female i.e. was 100% whereas it was only 80% in male in 3rd month. But the improvement was highest (40%) in male and lowest (37.5%) in female in 1st month. Here 100% females were cured in this study.

Figure 4: (b)

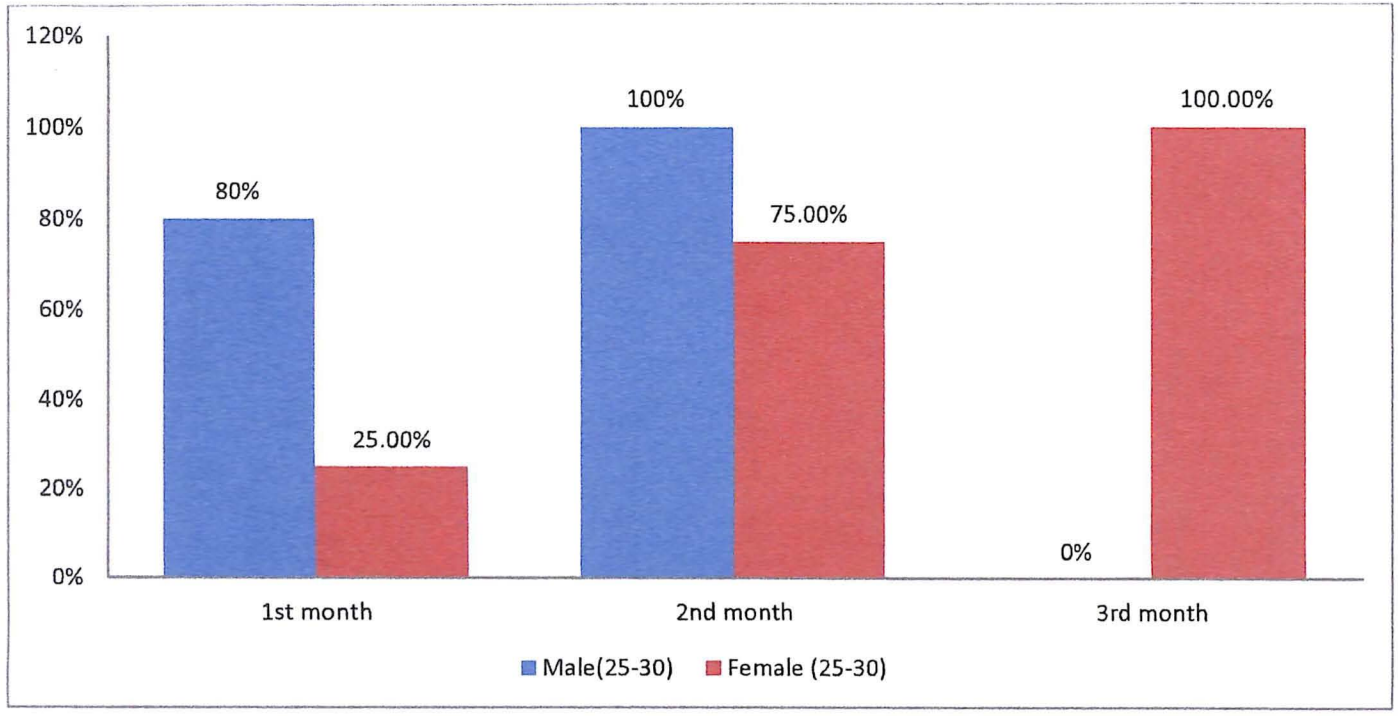


Fig. 4: (b) Showed the improvement in male i.e. was 80% and 100% in 1st and 2nd month respectively. Whereas improvement in female was 25%, 75%, and 100% in 1st, 2nd and 3rd month respectively. Here in both male and female of 25-30 years, the recovery was 100%.

Figure 5: (a) Trend of reduction of stool frequency per day

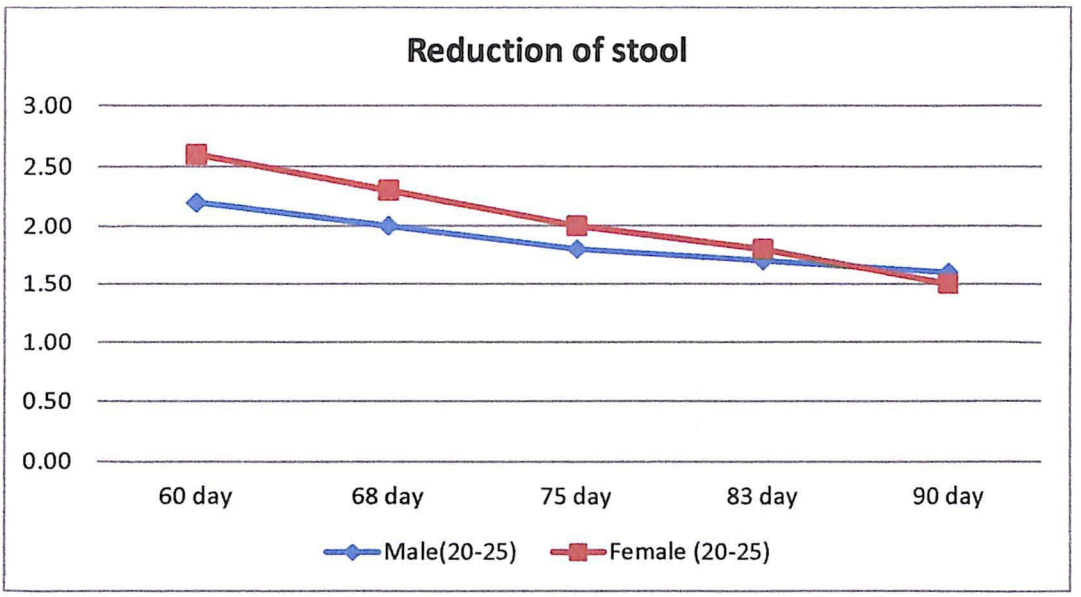


Fig. 5: (a) Showed the reduction in rate in stool from 60 days to 90 days for male and female of 20-25 year of age.

Figure 5: (b)

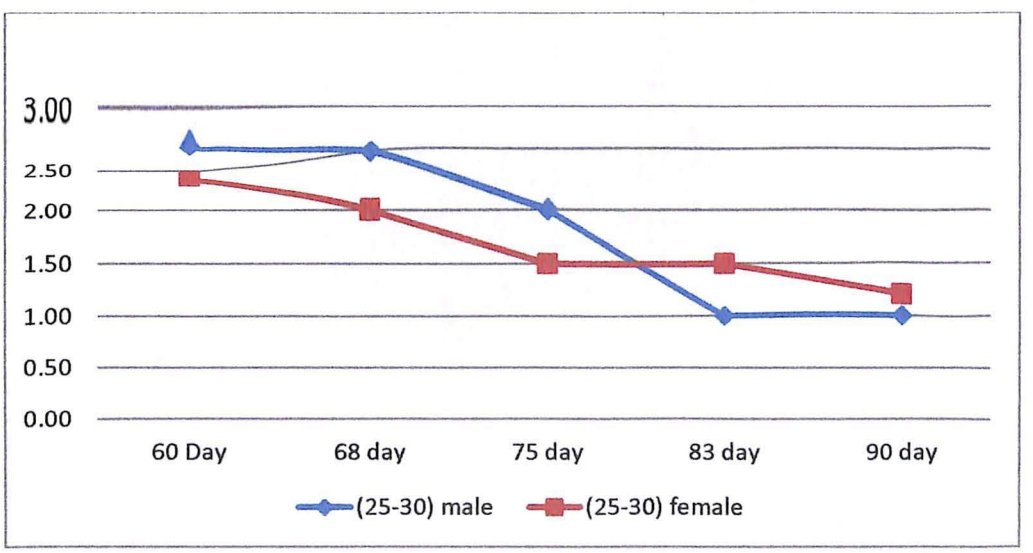


Fig. 5:(b) In this frequency of stool was more decreased in male than the female i.e.was 1.8 to 1.2, which was constant in male from 83 to 90 days in male and in female it was decreasing continuously.

Figure 6: Percentage Weight decrease after intervention

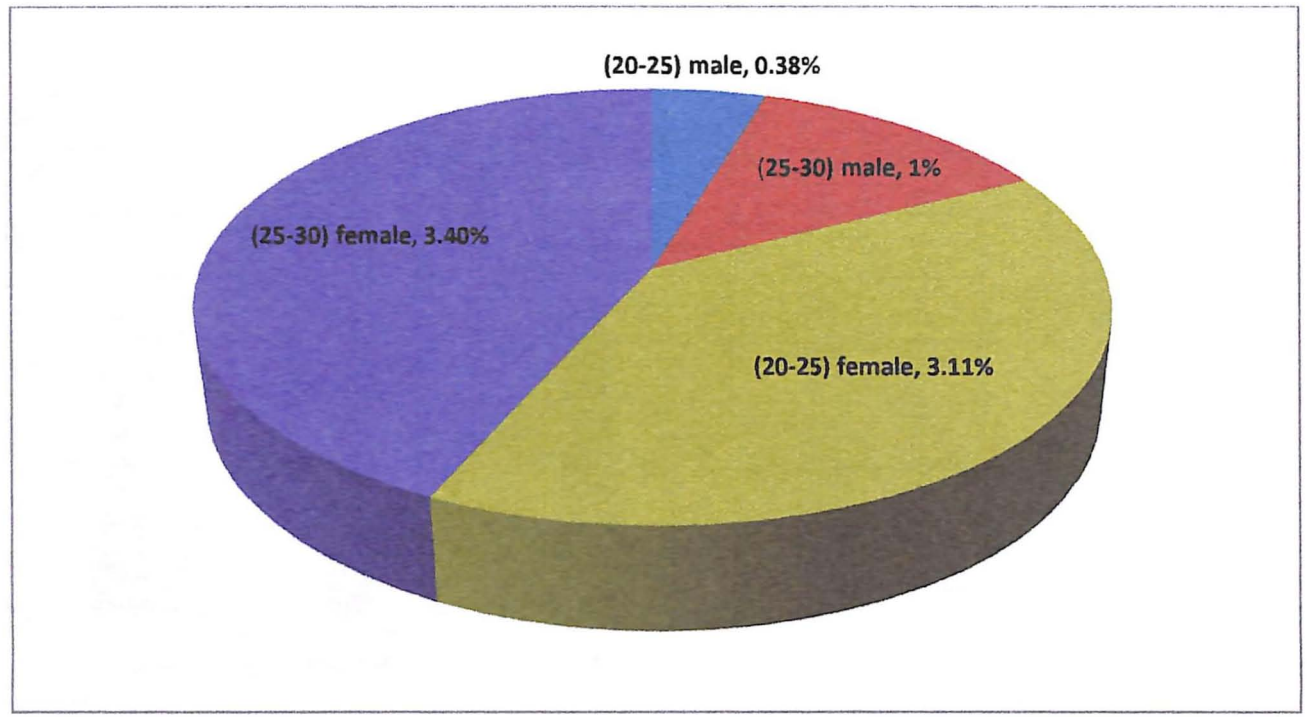


Figure 6: Indicates the maximum weight reduction in female age group of i.e 3.4% and minimum weight reduction in male of 20-25 years i.e. was 0.38%.

Figure 7: Number of Recovered patient Control Vs. experimental group

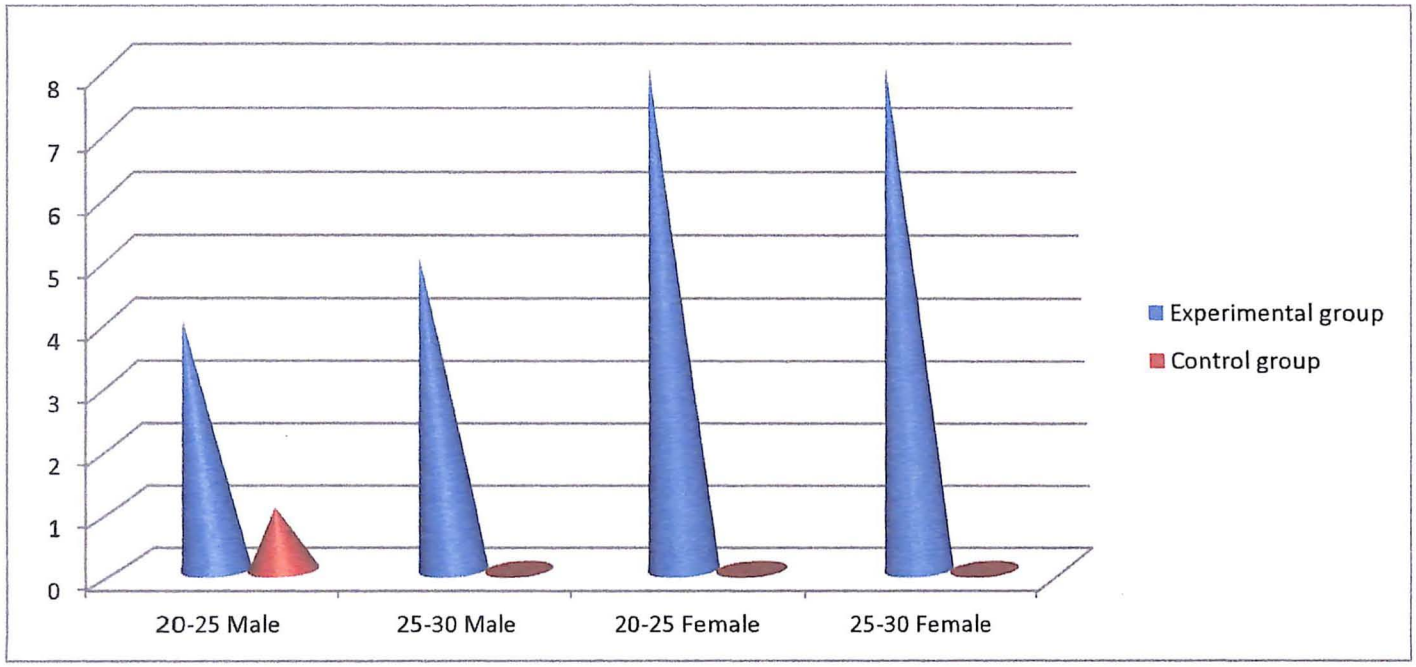


Figure 7: Reveal that All subjects of male's age group of 25-30, females group aged 20-25 and 25-30 years were cured whereas only 1 subject were remain in themales age group of 20-25 yearsin mild group.But in control group 1 subject were cure, age group of 20-25 year male.

DISCUSSION

Analysis of results shows that supplementation of a mixture consisted of wheat bran, Flax seed, Coriander seed, Drumsticks to the diet of constipation patient reduces the number of severe patient to mild patient and mild to normal.

The present study also shows significant change in faecal output, food intake, water intake and body weight in the test group as compared to the control group.

The highest reduction was observed that is 40% in 20-25 years of age group of male, and the minimum reduction was 24% in 20-25 years of female. In control group there was slightly reduction in number of meal intake after three months i.e. 20% in age group of 25-30 age years of male. The reduction of no. of meal was statistically significant ($p \leq 0.01$). Reduction of number of meal in the experimental group shows reduction of total food intake and thus it affects the subject's appetite and finally resulting in weight reduction. The maximum increase in water intake was 42% in 20-25 years of male and 25-30 years of female of experimental group and minimum was 22.22% in 25-30 years group. There was little increase of water intake after 3 months i.e. was 10.5% in 20-25 age group of male and female and no change was observed in 25-30 age group of male and female in control group. The Increase in water intake was significantly higher ($P \leq 0.00087$) in the experimental group compared with the control group. Increase in water intake shows the positive sign of curing constipation. Higher the water intake higher will be the thrust and thus makes the stool bulky resulting in easy evacuation of stool and making the stomach clear.

The weight was maximum changed in 25-30 age group of female 3.4% and it was lowest in 20-25 age group of male 0.38% but in control group there was only 0.14% reduction in body weight of 20-25 years male and 0.7% in 20-25 years female which was negligible. The decrease in body weight was significantly higher ($P < 0.022$) in the experimental group compared with the control group. The feed was rich in fiber and had high satiety value. Thus helped in reducing body weight.

Male's age group of 25-30, females group aged 20-25 and 25-30 years were 100% cured whereas males age group of 20-25 years were 80% cured and 20% were remain in the mild group. Here the improvement was observed faster in male of 25-30 years in comparison to male of 20-25 year.

Now a day's people are consuming more non vegetarian diet, fast food, sweets and less fibers diet by which they are suffering from overweight and constipation. It is believed that dietary fibers, including Wheat bran, drumstick, which are rich in insoluble fiber and flaxseed, coriander which contain large amount of soluble fiber may provoke body weight loss by acting as bulking agents, thereby increasing the satiety and reducing caloric intake, ingestion rate, and fat absorption. Soluble fiber allows more water to remain in stool, making waste softer, larger, and thus, easier to pass through large intestines. Insoluble fiber adds bulk to faecal material, which hastens its passage through gut and prevents bulky stomach feeling and thus reducing constipation.

Composition of experimental diet was 15% Flaxseed, 30% Coriander, 55% Wheat Bran for and 25g it was supplemented for first 8 weeks which contain Energy-295 kcal, CHO-68.5g, Protein-10g, Fat-12 g, Fiber-39g and the another mixture was consisted of 15% Flaxseed, 25% Coriander, 40 % Wheat Bran, 20% Drumstick, and 25g it was supplemented for last 4 weeks which contain Energy-295 kcal, CHO-68.5g, Protein-10g, Fat-12 g, Fiber-39g. Finally 10g of total fibers was consumed by subject continuously for 12 weeks that is for 3 month.

Dietary fibers are well documented to possess various physiologic and biomechanical properties that may aid in body weight loss and improvement in constipation symptoms.

The study was done on 13 subjects of obese women who were supplements by fiber of about 6gm/day upto 2 month. The author Mohammad Elmadbouly found that the mean body weight of the studied group was reduced significantly ($p<0.05$) from 82.46 ± 13.28kg to 81 ± 13.42 kg (1.46kg reduced) after intervention. In this present study body weight reduced by 0.25kg, 0.75kg, 1.75kg and 2 kg. in 20-25 year male, 25-30 year male, 20-25 year female, and 25-30 year female respectively after consumption of 10g of fiber supplement per day by overweight constipated adult (male and female) which showed the significant effect after 90 days($P=0.022$).

Another study done by Sebely Pal, Alirezakhosssousi *et al.* showed significant changes in all four groups of their study comparing with control group at 12 week, after the administration of fiber in normal and healthy diet. In this study body weight was reduced significantly after the intervention for 3 month.

The study of S Tarpila, A Tarpila, P Grohn *et al.* showed that that the improvement in constipation and abdominal symptoms in 2 groups of human subjects after the oral consumption of 6-24g/day ground flaxseed to the one group and Psyllium to second group for 3 month (90 days). The constipation and abdominal symptom were decreased significantly in flaxseed group ($P \leq 0.01$). Here also constipation subject were decreased by 100% in 25-30 year male, 20-25 female and 25-30 year female, and by 80% in 20-25 year male after consumption of 25g. Supplement powder and result was significant ($P<0.01$).

The study of Rania AbouSamra and G Harvey Andrson described the effect of 33g insoluble fiber on appetite and food intake consumed 75 min later they found that the significantly reduction of appetite after high fiber cereal intake ($P<0.05$) than the low fiber intake (white bread and water). Food intake significantly reduce ($P<0.001$) after consumption of high fiber cereal (937 ± 86). The current study depict number of meal reduced up to 40%, 30.77%, 24%, and 24.4% in 20-25 year male, 25-30 year male, 20-25 year female and 25-30 year female respectively. Reduction was statistically significant. Reduction of number of meal in the experimental group shows reduction of total food intake and thus resulting in low appetite and weight reduction.

The study was done on Male mice, Coriander powder incorporated in to diet (62.5mg/kg) and Drinking water (2.5gm/litter) of group of animal 5 day before and after Intra-peritoneal administration of Strraptozotocin (STZ) for test. The author Alisam. M. g Gray *et al.* found that fluid intake significantly increase within 20 days from 5.0 ± 0.61 to 12.6 ± 0.46. ($P<0.001$). In this present study water intake was significantly increased ($P=0.00087$) after taking of 25 g fiber supplement for 3 months in all age group 20-25 year male, 25-30 year male, 20-25 year female and 25-30 year female by 42%, 22.22%, 26%, 42% respectively.

Chapter 5

SUMMARY & CONCLUSION

SUMMARY AND CONCLUSION

Dietary fiber is a term used to describe a variety of plant substances that are resistant to digestion by alimentary enzymes in humans and most animals. It is found only in plant foods: fruits, vegetables, grain products such as - Oat and Wheat bran, legumes, nuts and concentrated plant sources. Fibers are two types - Soluble and Insoluble. Both are important for health, digestion, and preventing diseases. **Soluble fiber** attracts water and turns to gel during digestion. This slows digestion. Soluble fiber is found in oat bran, barley, nuts, seeds. **Insoluble fiber** binds water as it passes through the digestive tract, making stool softer and bulkier and appears to help food pass more quickly through the stomach and intestines. Fiber itself has no calories, yet provides a "Full" feeling because of its water-absorbing ability. If people consume a constant weight of food rather than a constant quantity of energy, a benefit is the associated lower risk for certain diseases such as obesity. Inclusion of fiber in the diet promotes satiation and prolongs satiety, aids in long-term compliance to low energy diets, and encourages "healthy" food choices and eating habits. There are several ways in which dietary fiber may affect obesity development because obesity represents the long-term result of an imbalance between energy intake and energy expenditure, the most obvious link between dietary fiber and obesity development is through its effects on energy intake control mechanisms. Dietary fiber may help reduce the risk of some cancers, especially colon cancer.

Now a day's people are consuming more non vegetarian diet, Fast food, sweets and less fibers diet by which they are suffering from overweight and constipation.

The research work entitled "Fiber rich supplement reduce weight and constipation" was carried out in Hostel No - 06 and Hostel No - 03, Orissa University of Agriculture and Technology for period of 03 months.Total number of subject were divided into two group, One was considered as experimental group another one as control group. Experimental group are supplemented with fiber mix supplement powder for three month and control group was taken the normal diet, for the intervention subjects were advised to continue their regular diet as well as 25 g of supplement that is 12.5 g twice a day which contain 10 g.

Changes observed and data collected were also statistically analysed.

The highest reduction was observed that is 40% in 20-25 years of age group of male, and the minimum reduction was 24% in 20-25 years of female. In control group there was slightly

reduction in number of meal intake after three months i.e. 20% in age group of 25-30 age years of male. The reduction of no. of meal was statistically significant ($p \leq 0.01$). Reduction of number of meal in the experimental group shows reduction of total food intake and thus it affects the subject's appetite and finally resulting in weight reduction.The maximum increase in water intake was 42% in 20-25 years of male and 25-30 years of female of experimental group and minimum was 22.22% in 25-30 years group. There was little increase of water intake after 3 months i.e. was 10.5% in 20-25 age group of male and female and no change was observed in 25-30 age group of male and female in control group. The Increase in water intake was significantly higher ($P \leq 0.00087$) in the experimental group compared with the control group. Increase in water intake shows the positive sign of curing constipation. Higher the water intake higher will be the thrust and thus makes the stool bulky resulting in easy evacuation of stool and making the stomach clear.

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Supplemented to the constipated patients thus inclusion of these fibers in the regular diet is suggested to overcome constipation in human being.

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Supplemented to the constipated patients thus inclusion of these fibers in the regular diet is suggested to overcome constipation in human being.

CONCLUSION

It is concluded that a contribution of soluble and insoluble fibers have direct relation to constipation and overweight. Consumption of fibers present in wheat bran, flaxseed, coriander seed and drumstick is found to very effective to correct constipation and reduce appetite and thus decrease body weight, reduction in number of meals decrease in appetite, increase in total water intake is associated with clear stomach, bulky stool and finally easy evacuation of stool and care constipation. Wheat bran, Flax seed, Coriander and drumstick are rich in fiber and their consumption in the regular diet is suggested to improve peristaltic movement of the gastro intestinal tract and to cure constipation.

The study is based only a 3 month observation and not over very large number of people. Better result can be obtained by carrying out the study for a longer period over a large group of people.

Chapter 6
REFERENCES

REFERENCES

Abdulrahman O. Musaiger, "Overweight and Obesity in Eastern Mediterranean Region: Prevalence and Possible Causes" Hindawi Publishing Corporation Journal of Obesity Volume 2011, Article ID 407237, 1-17 page.

Abraham I. Sengev, "Effect of *Moringaoleifera*Leaf Powder Supplementation on Some Quality Characteristics of Wheat Bread" *Food and Nutrition Sciences*, 2013,Volume- 4, Page no. 270-275

ALISON M. GRAY AND PETER R. FLATT "Pancreatic and extra-pancreatic effects of the traditional anti-diabetic plant, *Medicagosativa*(lucerne)" *British Journal* of *Nutrition* (1997), Volume: 78, page no. 325-334.

Alison M. Gray. and Peter R. Flatt, "Insulin-releasing and insulin-like activity of the traditional anti-diabetic plant *Coriandrumsativum*(coriander)." *British Journal of Nutrition* (1999), Volume81, Page no.203–209

Alison M. Stephen, H. S. WIGGINS', H. N. ENGLYST', T. J. COLE2, B. J. WAYMAN3 AND J. H. CUMMINGS1 "The effect of age, sex and level of intake of dietary fibre from wheat on large-bowel function in thirty healthy subjects" *British Journal of Nutrition* (1986), Volume *56, Page no.* 349-361

ArpitaMandal, "Prevalence of overweight and obesity among the urban adolescent English Medium School girls of Kolkata, India" Italian Journal of Public Health - 2012, Volume 9, Page no. e 7535-1-e 7535-5

BargaleSushantSukumar "Constipation Cure And Treatment Through Diet, Yoga, Home Remedies" International Journal of Ayurveda and Pharma Research" *2014; Vol.2(5), pp.6-11*

Britt Burton-Freeman, "Dietary Fiber and Energy Regulation" 2000 American Society for Nutritional Sciences.PP 272S-273S.

C.Gopalan "Nutrient Requirements And Recommended Dietary *Allowances For Indians*" Indian Council Of Medical Research 2009.

Carol E. O'Neila, Michael Zanoveca, Susan S. Chob, Theresa A. Nicklasc "Whole grain and fiber consumption are associated with lower body weight measures in US adults: National Health and Nutrition Examination Survey 1999-2004" Nutrition Research 30 (2010) PP 815–822

.

ChaynikaVerma, "Applications And Utilization Of Coriander – A" volume 4, issue 3 (march 2014) (issn 2249-3905) page no. 85-93

Christiane Ishikawa Ramos, MS, Aline F_atima Andrade de Lima,† Daniela Gimenes Grilli,† and Lilian Cuppari, RD, PhD "The Short-Term Effects of Olive Oil and Flaxseed Oil for the Treatment of Constipation in Hemodialysis Patients" Journal of Renal Nutrition, Vol 25, No 1 (January), 2015: pp. 50-56

DAVID J. A, HERB LAU, MD PHILIP W. CONNELLY, PHD, JEROME TEITEL, M WILLIAM SINGER, MD "Effect of Wheat Bran on Glycemic Control and Risk Factors for Cardiovascular Disease in Type 2 Diabetes" *Diabetes Care volume*25: Page 1522–1528, Year 2002.

David J. Baer, William V. Rumpler, Carolyn W. Miles and George C. Fahey, Jr "Dietary Fiber Decreases the Metabolizable Energy Content and Nutrient Digestibility of Mixed Diets Fed to Humans" American Society for Nutritional Sciences. (1997) Page no.579-586

DenenAtsukwei, Ejike Daniel Eze1, *, Moses Dele Adams2, Seriki Samuel Adinoyi1, Chiamaka Nnenna Ukpabi "Hypolipidaemic effect of ethanol leaf extract of *Moringaoleifera*Lam. in experimentally induced hypercholesterolemicwistar rats" International Journal of Nutrition and Food Sciences 2014; Vol 3(4): Page no. 355-360

Derek E. Wood M.Sc and Julie A. Conquer, PhD gate "Effects of a Stimulant-Free Dietary Supplement on Body Weight and Fat Loss in Obese Adults: A Six-Week Exploratory Study" Current Therapeutic Research, volume 64, no. 4, april 2003

EFSA Panel on Dietetic Products, "Scientific Opinion on the substantiation of health claims related to wheat bran fibre and increase in faecal bulk (ID 3066), reduction in intestinal transit time (ID 828, 839, 3067, 4699) and contribution to the maintenance or achievement of a normal body weight (ID 829) pursuant to Article 13(1) of Regulation (EC) No 1924/20061 EFSA Journal 2010;8(10):1817

Floch MH "Modification of stool content by increased bran intake" Am J ClinNutr. (1978) US National Library of Medicine National Institute of Health. 1978 Oct;31(10 Suppl):S185-S189

Garvita Jain, "To study the prevalence of overweight and obesity among school children (13-17yrs) in relation to their socioeconomic status and Eating habits" International Journal of Scientific and Research Publications, Volume 2, Issue 6, June 2012 1 ISSN 2250-3153, Page no-1-3

Graeme H McIntosh, Manny Noakes, Peter J Royle, and Paul R Foster "Whole-grain rye and wheat foods and markers of bowel health in overweight middle-aged men" *Am J ClinNutr*2003; 77 Page 967–74. American Society for Clinical Nutrition.

Hongyu Wu, An Pan, Zhijie Yu, Qibin Qi, Ling Lu, Geng Zhang, Danxia Yu, Wendy Demark-Wahnefried, Frank B., "Lifestyle Counseling and Supplementation with Flaxseed or Walnuts Influence the Management of Metabolic Syndrome" The Journal of Nutrition Nutrition and Disease, (2010) American Society for Nutrition Page no. 1937-1942

Huaidong Du, "Dietary fiber and subsequent changes in body weight and waist circumference in European men and women" Am J ClinNutr 2010 Volume 91, Page no. 329–36.American Society for Nutrition.

Jacqueline Brown, Geoffrey Livesey,*3 Mark Roe,* Richard Faulks,* Sally Poppitt,† Jacqueline Wilkinson* and Marinos Elia† Metabolizable Energy of High Non-Starch Polysaccharide-Maintenance and Weight-Reducing Diets in Men: Experimental Appraisal of Assessment Systems" 1998 American Society for Nutritional Sciences Page no.9 86-995

JAGMEET MADAN "Hypolipidemic Dietary Components" Current Research in Nutrition and Food Science Vol. 1(1),Page 59-70 (2013) Constipation: a global perspective World Gastroenterology Organisation, 2010 Page no. 3-11

James M. Lattimer, "Effects of Dietary Fiber and Its Components on Metabolic Health"*Nutrients* 2010, Volume *2*,pp 1266-1289; doi:10.3390/nu2121266

James W Anderson, "Health benefits of dietary fiber" Nutrition Reviews Vol. 67(4), pp.188–205.

June L. Kelsay, Ph.D., Kay M. Behall,3 MS., and Elizabeth S. Prather,4 Ph.D." Effect of fiber from fruits and vegetables on metabolic responses of human subjects I. Bowel transit time, number of defecations, fecal weight, urinary excretions of energy and nitrogen and apparent digestibility of energy, nitrogen, and fat" *The American Journal of Clinical Nutrition* 31: JULY 1978, pp. 1149-1153.

Larry A. Tucker and Kathryn S. Thomas "Increasing Total Fiber Intake Reduces Risk of Weight and Fat Gains in Women" The Journal of Nutrition Nutritional Epidemiology (2009) American Society for Nutrition Vol:139, PP 576–581.

LEO STEVENSON, "Wheat bran: its composition and benefits to health, a European perspective" International Journal of Food Sciences and Nutrition, December 2012; Vol-63(8):pp. 1001–1013

M Kristensen, TW Damgaard1, AD Sørensen1, A Raben2, TS Lindeløv3, AD Thomsen3, C Bjergegaard4, H Sørensen4, A Astrup1 and I Tetens "Whole flaxseeds but not sunflower seeds in rye bread reduce apparent digestibility of fat in healthy volunteers" European Journal of Clinical Nutrition (2008) volume 62,Page 961–967.

M. A. EASTWOOD, J. R. KIRKPATRICK, W. D. MITCHELL, ANN BONE, T. HAMILTON "Effects of Dietary Supplements of WVheat Bran and Cellulose on Faeces and Bowel Function" British Medical Journal, 1973,Volume 4,Page no. 392-394

MinakshiBhagat, "Obesity measures, metabolic profiles, blood pressure and intake of dietary fatty acids in rural women of Asian Indian origin: Santiniketan women study" Journal of Cardiovascular Disease Research Vol. 2 / No 1 PP 61-66

Mohammad AbdElmoneimElmadbouly "Impact of Wheat Bran Supplementation on Body Weight, Blood Pressure, Blood Glucose and Blood Lipids Among Obese Diabetic Women in Holy Makkah" 2014 Volume 3 (Issue 1): Pages 5-9

Mohsen Mazidi, Mohsen Nematy 2*, Sara Baghban Taraghdari 2, Mohammad Soukhtanloo 2, Mahmoud Hosseini 3, Hassan Rakhshandeh 4, Abdolreza Norouzy 2, Habibollah Esmaily "Hydroalcoholic extract of *Coriandrumsativum*had no effect on ghrelin hormone in rat" Journal of Medicinal Plants Studies" Year: 2014, Volume: 2, Issue: 2 First page: (147) Last page: (150)

N. Babio, R. Balanza1,2, J. Basulto1, M. Bulló1,2 and J. Salas-Salvadó " Dietary fibre: influence on body weight, glycemic control and plasma cholesterol profile" Nutrcian Hospital .Year- 2010, Vol-25(3),page no.327-340

NazninAra, Mamunur Rashid1 and Md. Shah Amran2 "Comparison of *Moringaoleifera*Leaves Extract with Atenolol on Serum triglyceride, Serum Cholesterol, Blood glucose, heart weight, body weight in Adrenaline Induced Rats" Saudi Journal of Biological Sciences Volume: 15 (2) Page no.: 253-258, December, 2008

NevedaOinam, Asna Urooj2, Preetham Paul Phillips1, Narayan Prasad Niranjan "Effect of Dietary Lipids and Drumstick Leaves (*Moringaoleifera*) on Lipid Profile & Antioxidant Parameters in Rats" *Food and Nutrition Sciences*, 2012, Vol 3, pp 141-145

Pauline Koh-Banerjee, Mary Franz, Laura Sampson, Simin Liu, David R Jacobs Jr, Donna Spiegelman, Walter Willett, and Eric Rimm" Changes in whole-grain, bran, and cereal fiber consumption in relation to 8-y weight gain among men" *Am J ClinNutr*2004; volume80: page no. 1237–45. 2004 American Society for Clinical Nutrition

PrakashS Shetty MD, *PhD and Anura V Kurpad MB, BS* "Increasing starch intake in the human diet increases fecal bulk" *Am J ClinNuir Year*1986 ; 43:2 10-212. American Society for Clinical Nutrition.

Rania Abou, G Harvey Anderson "Insoluble cereal fiber reduces appetite and short-term food intake and glycemic response to food consumed 75 min later by healthy men" *Am J ClinNutr Year* 2007 Volume 86 Page no. 972–9. American Society for Nutrition

Roberta Soares Lara Cassani, Priscila Giacomo Fassini2*, Jose Henrique Silvah2, Cristiane Maria Mártires Lima2 and Júlio Sérgio Marchini2 "Impact of weight loss diet associated with flaxseed on inflammatory markers in men with cardiovascular risk factors: a clinical study" Nutrition Journal 2015, 14:5 page no. 2-8

S. Bhat, "Coriander (*Coriandrumsativum*L.): Processing, nutritional and functional aspects" American Journal of Plant Science, Vol. 8(1), pp. 25-33, Year 2014

S. Ghasi, E. Nwobodo b, J.O. Ofili "Hypocholesterolemic effects of crude extract of leaf of *Moringaoleifera*Lam in high-fat diet fed wistar rats" Journal of Ethnopharmacology 69 (2000) pp.21–25

S. Tarpila, A. Tarpila, P. Gröhn, T. Silvennoinen, and L. Lindberg "Efficacy of Ground Flaxseed On Constipation in Patients with Irritable Bowel Syndrome" Nutritional Genomics & Functional Foods Vol. 1, No. 1, pp. xx-xx, 2003

Saman Khalesia, Rosita Jamaluddina*, Amin Ismailab " Effect of Raw and Heated Flaxseed (LinumUsitatissimum L.) On Blood Lipid Profiles in Rats" *International Journal of Applied Science and Technology Vol. 1 No.4; July 2011*

Sebely Pal, Alireza Khossousi, Colin Binns, Satvinder Dhaliwal and Vanessa Ellis "The effect of a fibre supplement compared to a healthy diet on body composition, lipids, glucose, insulin and other metabolic syndrome risk factors in overweight and obese individuals" British Journal of Nutrition (2011), 105,PP 90–100

Sharon M. Tramonte." The Treatment of Chronic Constipation in Adult" J GEN INTERN MED Year 1997: Volume 12: Page 15-24

SouravhBais, Guru Sewak Singh,2 and Ramica Sharma2 "Antiobesity and Hypolipidemic Activity of *Moringaoleifera*Leaves against High Fat Diet-Induced Obesity in Rats" Volume 2014, Article ID 162914, 9 pages

USDA National Nutrient Database for Standard Reference Release 27 Basic Report 11533, Tomatoes, red, ripe, canned, stewed Report Date:May 03, 2015 21:08 EDT Nutrient values and weights are for edible portion.

Vladimir Vuksan, Alexandra L Jenkins, David JA Jenkins, Alexander L Rogovik, John L Sievenpiper, and Elena Jovanovski Alexandra, "Using cereal to increase dietary fiber intake to the recommended level and the effect of fiber on bowel function in healthy persons consuming North American diets" *Am J ClinNutr*2008 Volume 88 Page no.1256–62. American Society for Nutrition

APPENDICES

Research Questionnaire

General information

- Name-
- Age-
- Qualification- +2
  Graduate
  Post Graduate
  Other

- Occupation- Study
  Business
  Service
  House wife

- Type of work- Sad entry
  Moderate
  Heavy

- Hobby-Dancing
  Watching movie
  Wanering on computer

- Exrcise- 1 hour
  2 hour
  More than 2 hour

- Family income group-low
  Medium
  High

- No. of family member-

- Food group included in meal- Cereal
  Pulses
  Veg
  Fat
  Milk& Milk product
  Meat & meat product
  Sugar & jaggery
  Nuts & oil seed

- Food like-
- Food dislike-
- No. of meal in a day-

SPECIFIC INFORMATION

- Height
- Weight
- BMI
- Water intake in a day
- Food intake in a day
- Fast food intake in a day
- Consistency of stool
- Stomach clear in morning – yes ( )/no( )
- Any psychological factor- Tobacco ( ), Bed tea( ), Water ( )

FOOD	SOLUBLE FIBER (g)	INSOLUBLE FIBER (g)
Cereals		
Psyllium husk, 10g	**7.1**	0.9
Benefit, 3/4 cup	**2.8**	2.2
Oat bran, cooked, 3/4 cup	**2.2**	1.8
Oatmeal, dry, 1/3 cup	**1.4**	1.3
Brown rice, coked, 1/2 cup	**1.3**	0
Flax seed, 10g	**1.2**	1
Vegetables		
Green plantain, 100g	**5.8**	0.2
Artichoke, medium, cooked	**4.7**	1.8
Lima beans, cooked, 1/2 cup	**3.5**	3.0
Kidney beans, cooked, 1/2 cup	**2.9**	2.9
Brussels sprouts, 1/2 cup	**2.0**	1.3
Squash, winter, cooked	**1.9**	1.4
Asparagus, cooked, 1/2 cup	**1.7**	1.1
Broccoli, cooked	**1.2**	1.2
Onions, cooked, 1/2 cup cooked	**1.2**	0.8
Carrots, cooked, 1/2 cup	**1.1**	0.9

Table 2: List of foods rich in INSOLUBLE fiber

FOOD	INSOLUBLE FIBER (g)	SOLUBLE FIBER (g)
Cereals		
Bitter gourd, 100g	**13.5**	3.1
Wheat bran, 1/2 cup	**11.3**	1.0
Fiber One™, 1/2 cup	**11.1**	0.8
All-bran™, 1/3 cup	**7.2**	1.4
Raisin bran, 1 cup	**7.2**	1.2
Shredded wheat, 1cup	**4.5**	0.7
Barley, cooked, 1/2 cup	**3.3**	0.9
Wheat germ, 3 tbsp	**3.2**	0.7
Wholegrain bread, 1 slice	**2.8**	0.1
Millet, cooked, 1/2 cup	**2.7**	0.6
Bulgur, cooked, 1/2 cup	**2.4**	0.5
Popcorn, 3 cups	**2.3**	0

Flaxseeds, 1 tbsp	**2.2**	1.1
Oatmeal, 1 cup	**2.0**	1.8
Rye bread, 1 slice	**1.9**	0.8
Rolled oats, cooked, 3/4 cup	**1.7**	1.3
Oat flakes, 1 cup	**1.6**	1.5
Whole wheat bread, 1 slice	**1.6**	0.3
Pumpernickel bread, 1 slice	**1.5**	1.2
Graham creckers, 2	**1.4**	0
Whole wheat, 1 slice	**1.2**	0.3
Rye bread, 1 slice	**1.0**	0.8
White bread, 1 slice	0.3	0.3
Vegetables		
Field beans, cooked, 100g	**9.3**	2.1
Broad beans, cooked, 100g	**7.3**	0.8
Lentils, cooked, 1/2 cup	7	1
Pinto beans, cooked, 1/2 cup	**5.5**	1.9
Beet root	**5.4**	2.4
Chick peas, cooked, 1/2 cup	**4.9**	1.3
Parsnips, cooked, 1 cup	**4.0**	0.4
White beans, cooked, 1/2 cup	**3.8**	0.4
Black beans, cooked, 1/2 cup	**3.7**	2.4
Pita, wheat, 7?	**3.7**	0.7
Spinach, cooked, 100g	**3.5**	0.6
Green peas, cooked, 2/3 cup	**3.3**	0.6
Turnip, cooked, 1/2 cup	**3.1**	1.7
Okra, cooked, 1/2 cup	**3.1**	1.0
Soybeans, cooked, 1/2 cup	**2.8**	2.3
Sweet potatoes, 1/2 cup	**2.4**	1.4
Potato with skin, medium	**1.7**	1.2
Zucchini, cooked, 1/2 cup	**1.4**	1.1
Squash, summer, cooked, 1/2 cup	**1.2**	1.1
Lima beans, cooked, 1/2 cup	**1.2**	0.2
Cabbage, green, cooked, 1/2 cup	**1.0**	0.8