

Hypocholesterolaemic Effect of Oatbran and Barley on Six Clinically Assessed Familial Hypercholesterolaemic Subjects

Md. Abdul Kadir Khan¹, Abu Zafar², A. Mannan³ and Q. Omar Faruq⁴

1 & 2. National Institute of Cardiovascular Diseases, Sher-e-Bangla Nagar, Dhaka, Bangladesh. 3. Sir Salimullah Medical College and Mitford Hospital, Dhaka, Bangladesh. 4. Rheumatic Fever and Rheumatic Heart Disease Control Project, Dhaka, Bangladesh.

Introduction

Blood lipid like serum cholesterol promotes atherosclerosis. Low density lipoprotein (LDL) which contains 45% cholesterol enhances atherosclerosis; but high density lipoprotein (HDL) protects life from this danger⁽¹⁾. Familial Hyperlipidaemia or hypercholesterolaemia is a predisposing condition of atherosclerosis, leading to coronary heart diseases⁽²⁾. Though several medicines are claimed to be effective in the treatment of this condition; yet serious side effects of those medicines could not be avoided. The investigators have given a short time trial on six clinically assessed familial hypercholesterolaemic subjects with oatbran and barley having considerable hypocholesterolaemic (Cholesterol lowering) effects on them^(3,4,5).

Materials and Methods

The six subjects from the same family approached to our clinicians with complaints and clinical features of familial hypercholesterolaemia. They were dealt with the following procedures.

(a) The subjects were clinically assessed by detailed present, past, personal and family

history. On clinical examination xanthomatous plaques on different parts of the body were observed in all subjects, except mother (subject No.2). They were thoroughly examined and their signs symptoms were recorded by the physicians. Electrocardiogram, chest x-ray were done to exclude other diseases (Table-1).

(b) Some relevant laboratory investigations were done to exclude hypercholesterolaemia secondary to other diseases. Fasting blood was collected from the subjects and the serum was separated by centrifugation. Sera were kept at 4° for 16 hours to observe the changes along with other laboratory investigations. The laboratory investigations were done to screen out other diseases, gave the clue to establish the subjects as familial hypercholesterolaemic cases (Table-2). Sugar was estimated by method of winckers and Jacobs (1971)⁽⁶⁾, BUN by urease Indophenol method⁽⁷⁾ and serum creatinine and uric acid were estimated by usual methods in our laboratory.

(c) In estimating the serum total cholesterol, we followed the methods of Watson^(8,9) and triglycerides estimation was performed by the modified method according to Wahlefeld⁽¹⁰⁾. High density lipoprotein

(HDL) was estimated by the method of Burstein, M. et al, (1970) ⁽¹¹⁾. From the method of estimation of HDL cholesterol, LDL cholesterol was calculated by a formula ⁽¹²⁾. Calculation of LDL - cholesterol in mg/dl : LDL-Cholesterol= total cholesterol -triglyceride/5-HDL-Cholesterol. All these methodologies for LDL and HDL were obtained from Boehringer Mannheim GmbH Diagnostica along with their diagnostic kits. Very low density lipoprotein (VLDL) could not be calculated. Roughly we could subtract LDL-cholesterol from total cholesterol for getting VLDL. That is why we omitted the results of VLDL.

(d) The subjects were given instructions not to take oatbran and barley and allied products for three weeks before trial; but to take usual diet daily. They were also advised not to take any kind of medicines for the same period. The subjects were given total amount of 100g of oatbran (Quakeroat)- 50g with breakfast and 50g with dinner for 7 days. Blood was collected on 8th day of the trial. Some relevant laboratory investigations were done like serum total cholesterol, triglycerides, LDL-Chol. HDL-Chol (Table 2 & 3). Then, from the 8th day of the trial, 50g of oatbran and 50g of barley were given to the patients with usual breakfast and dinner everyday for another 7 days. On completion of further 7 days trial, blood was again collected. The partners under investigation were analysed and analysed (Table-3) & (Fig.1). The patients were asked to take normal diet and come later on. Blood was collected after 5 months from those patients

and the results were recorded after proper laboratory investigations (Table-4), (Fig. 1,2,3).

Results

After intake of oatbran in the 1st week, serum total cholesterol was notably reduced in 4 cases. In the 1st case, serum cholesterol decreased abruptly by 60.2%. There were reductions of cholesterol 21.57%, 22.67% and 38.19% in the 3rd, 4th and 6th cases respectively. In the 2nd and 5th cases, the reductions were 3.20% and 6.21% respectively in the 1st schedule of the trial (Fig. 2). Variable changes in the triglycerides and HDL-Chol were observed. Decrease in LDL-Chol was also noted remarkably in five cases except 5th one (Table-3). In the next week's trial with 50g of oatbran and 50g of barley, the results showed further reduction in the serum total cholesterol level. Results of triglycerides and HDL-Chol showed no remarkable changes; rather variable changes were observed. High density lipoprotein (HDL) was slightly increased in five cases, while results remained same in 1 case Low density lipoprotein-cholesterol (LDL) levels were decreased notably in five cases; but it was decreased in one case slightly (Table-3) (Fig.4). Further the results of serum cholesterol was recorded after 5 months; while subjects were on normal diet. Serum cholesterol level was found increased in 5 subjects except the 2nd subject who showed slight reduction of serum total cholesterol level in the blood (Table-4) (Fig. 1,2,3).

Table-1 Showing age, sexs important sign, electrocardiogram and X-ray chest (PA View) to exclude other diseases.

Sl. No.Of Patient.	Age (Years)	SEX	ECG	X-ray chest	Important Signs/ Symptoms. (if any)
1	43	Male	Normal	Normal	Xenthoma-Present
2	32	Female	Normal	Normal	Zenthoma-Absent
3	13	Male	Normal	Normal	Xenthoma-Present
4	11	Female	Normal	Normal	Xenthoma-Present
5	9	Male	Normal	Normal	Xenthoma-Present
6	4	Male	Normal	Normal	Xenthoma-Present

Key words : ECG=Electro cardiogram, Xenthoma=Xenthomaius plaque on the body.

Table-2 : Screening Laboratory Tests before Trials.

Sl. No.of Patient.	Serum Obs at 4.c for 16 hours	Blood gar (F) mg/dl	BUN (Blood wica Nitrosen mg/dl	Serum creat. mg/dl	Serum Uric mg/dl	Serum Chot (F) mg/dl	Serum TG. (F) mg/dl	LDL-Chot mg/dl	HDL-Chot mg/dl
	N=Clear	N=60-110	N=5-20	N=0.4-1.3	N=3.4-7.3	N=150-250	N=40-180	N=>150	N=<35
1	Clear	67	12	1.1	7.2	910	270	315	24
2	Clear	81	6	0.9	4.5	405	166	186	28
3	Clear	75	5	0.8	4.9	709	190	206 th	36
4	Clear	62	5	0.9	5.1	838	208	228	34
5	Clear	64	6	1.1	3.4	322	178	184	20
6	Clear	68	5	1.0	4.8	312	170	182	24

Key words :N=Normal level expressed in mg/dl

TG=Triglyceride.

BUN=Blood urea Nitrogen.

*= Standing plasma tast.

Table-3 : Shows changes of S. Chol. TG, LDL-C, HDL-C after 1st & 2nd trials.

Sl.No.	Screening Results Cholesterol. (SR)	Serum Cholesterol (1st Trial)	Serum Cholesterol (2nd Trial)	Serum TG (1st Trial)	Serum TG. (2nd Trial)	Serum LDL. chol (1st Trial)	Serum LDL Chol. (2nd Trial)	Serum HDL. Chol. (1st Trial)	Serum HDL. Chol (2nd Trial)			
	N=150-250	N=150-250	N=150-250	SR	N=40-180	N=40-180	SR	N=> 160	N=> 160	AR	N= <35	N=<35
1	910	362 (60.21%)	314 (13.25%)	270	268 (1.98%)	260 (7.76%)	315	204 (35.23%)	182 (10.78%)	24	25	28
2	405	392 (3.20%)	350 (10.71%)	166	135 (25.21%)	162 (32.40%)	186	176 (5.37%)	172 (2.27%)	28	27	35
3	709	556 (21.57%)	490 (11.87%)	190	180 (9.47%)	170 (9.44%)	206	196 (4.85%)	194 (1.02%)	36	35	35
4	838	648 (22.67%)	600 (7.40%)	208	250 (40.28%)	290 (46.40%)	228	207 (9.21%)	190 (8.21%)	34	38	39
5	322	302 (6.21%)	280 (7.28%)	178	175 (2.94%)	182 (7.28%)	184	182 (1.08%)	173 (4.94%)	20	25	28
6	312	193 (38.19%)	161 (16.58%)	170	150 (17.64%)	130 (17.33%)	182	162 (10.98%)	154 (4.93%)	24	26	32

Key words : N = Normal level expressed in mg/dl.
 Trial = Trial with Oatran (1st Trial)
 Trial with Oatbran and Braby (2nd Trial)
 Screening = Initial results before Trial.
 SR = Screening Results = Inereaud
 = Decreaud

Table -4

Sl. No.	Serum Cholesterol After 2nd Trial (After two Weeks)	Serum Cholesterol After Normal diet (after Five Months)
1	314 mg/dl	342 mg/dl
2	350 mg/dl	314 mg/dl
3	490 mg/dl	685 mg/dl
4	600 mg/dl	628 mg/dl
5	282 mg/dl	400 mg/dl
6	161 mg/dl	188 mg/dl

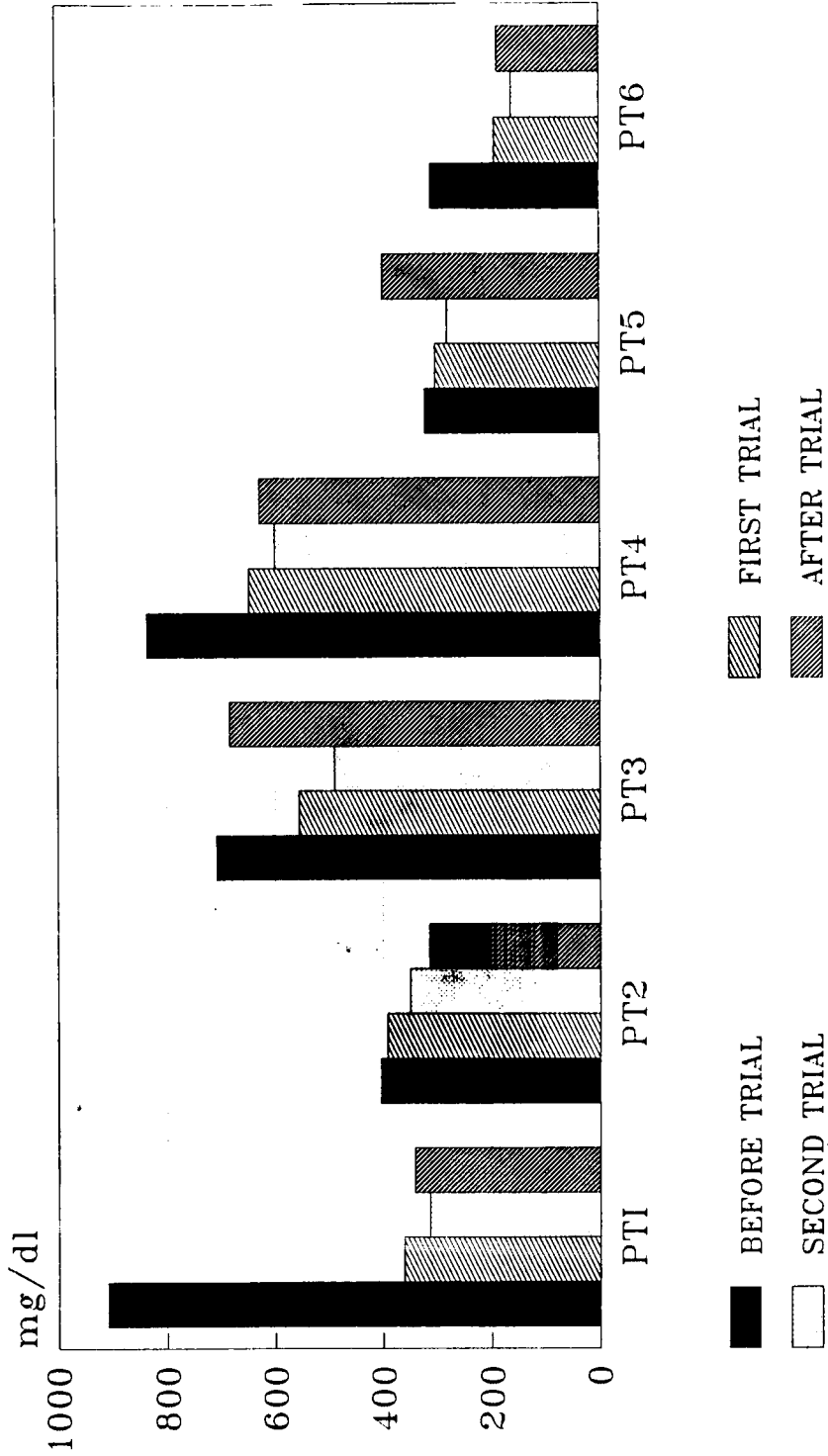
Table shows the results of serum cholesterol oevls after second (Final) Trial and also the results obtained after five months.

Discussion

In a Patient with familial hypercholes- terolaemia, an elevated low density lipoprotein (LDL) in the blood is the result

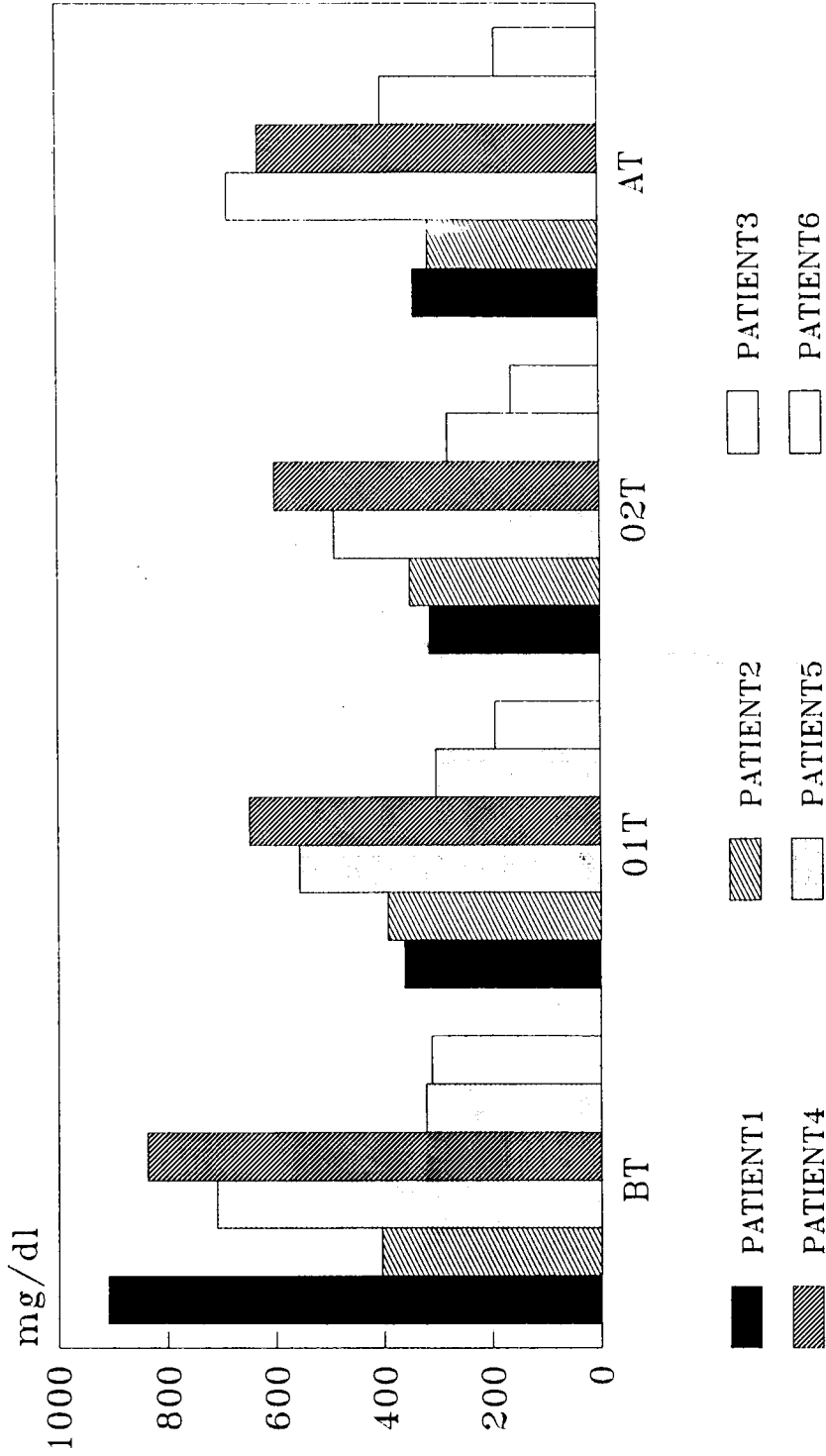
of impaired liver function. This might be due to either the liver is not producing enough LDL-receptors or the existing receptors are not functioning properly. Both the cases could involve a defect inherited by the patient from one of his/her parents⁽¹³⁾ Low-cholesterol diet or drug which aim at Stimulating LDL-receptors' activity in the liver has recently acheived the popularity in the treatment of hypercholesterolaemia. Total blood cholesterol in our selected six familial hypercholesterolaemic subjects showed very high results (Table-2). This is possible in case of familial hyperlipidaemia Type-IIb; particularly, in the rare heterozygote subjects². John. Bernad Henry MD in 1979 claimed that in the rare heterozygote plasma

Fig. 1. Familial Cholesterol Study
Diet Effect on Hypercholesterolemia



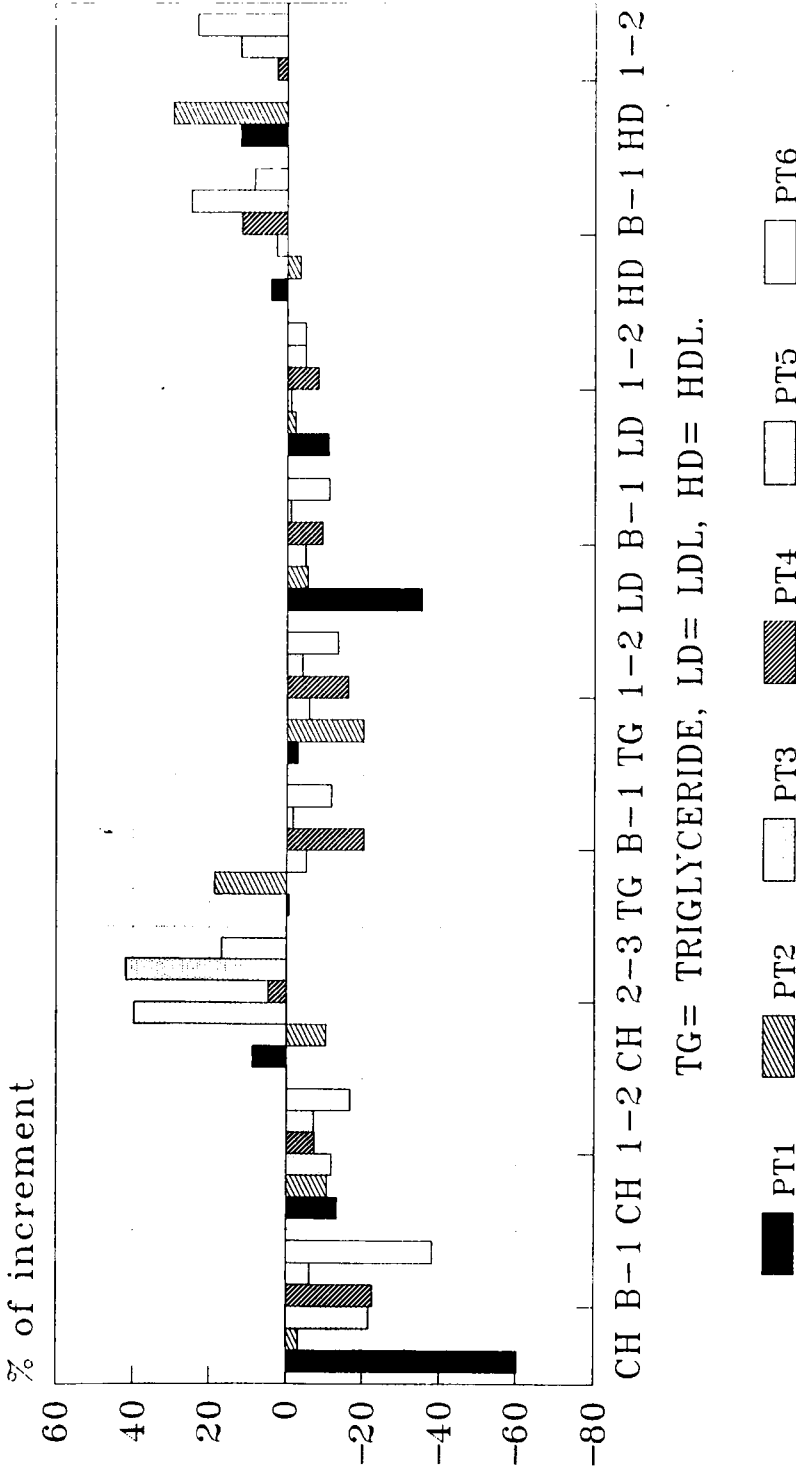
PATIENT NO 1= PT1, PATIENT NO 2= PT2,
PATIENT NO 3= PT3, AND SO PT4,PT5,PT6.

Fig. 2. Familial Cholesterol Study
Diet Effect on Hypercholesterolemia



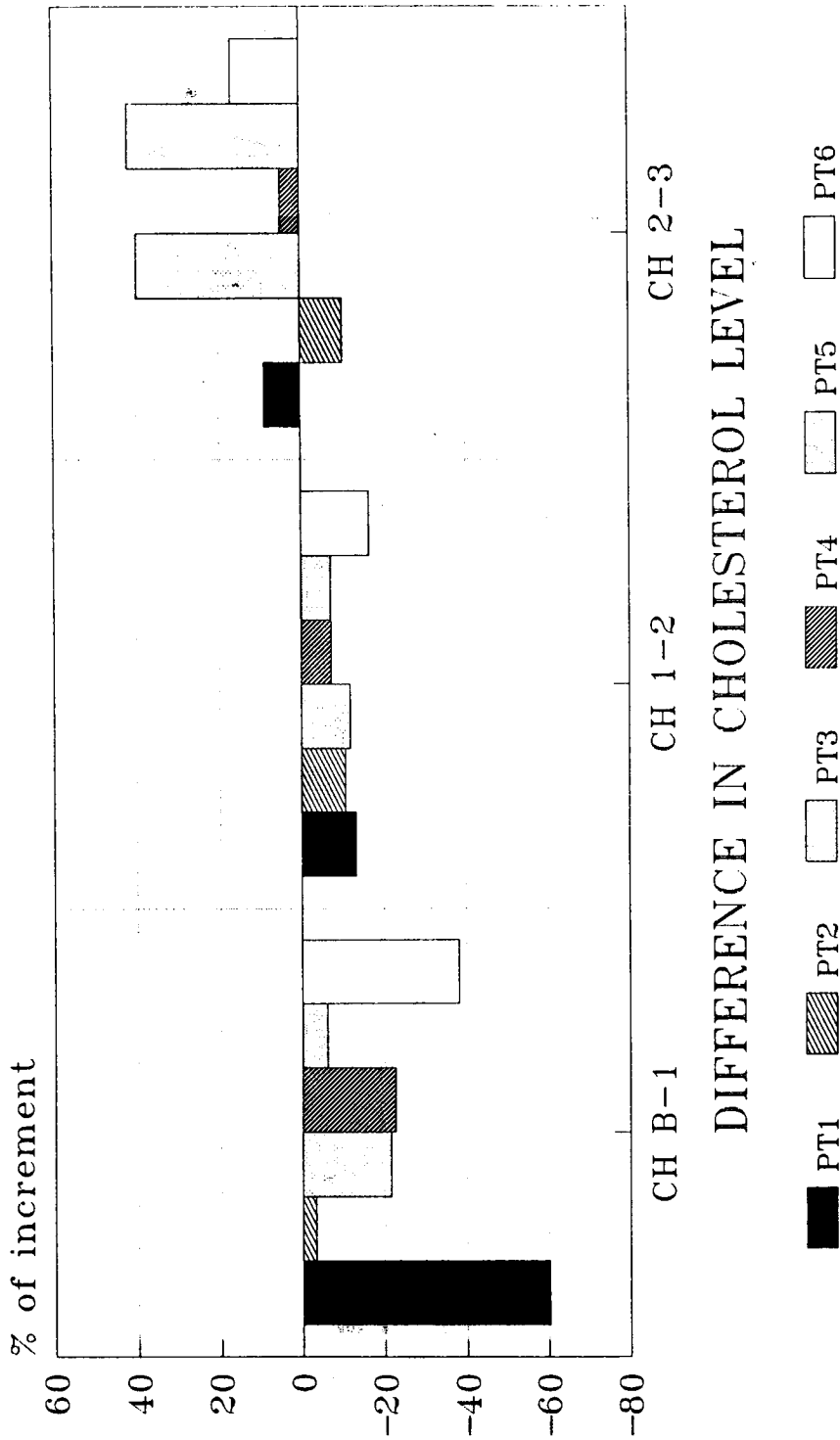
BT=BEFORE TRIAL, 01T=1ST TRIAL,
02T= 2ND TRIAL, AT =AFTER TRIAL.

Fig. 3. Familial Hypercholesterolaemia
 Effect of Diet on Hypercholesterolaemia
 Difference in Cholesterol, TG, LDL and HDL



B-1 = BEFORE - 1ST TRIAL, 1-2 = 1ST - 2ND
 2-3 = 2ND TRIAL - AFTER TRIAL.

Fig. 4. Familial Hypercholesterolaemia
Effect of Diet on Hypercholesterolaemia



DIFFERENCE IN CHOLESTEROL LEVEL

DIFFERENCE BEFORE & AFTER TRIAL= CH B-1

DIFFERENCE AFTER 1ST & 2ND TRIAL= CH1-2

DIFFERENCE 2ND & 3RD TRIAL= CH 2-3

cholesterol was often above 20 mmol/L (above 800mg/dl)². It has been also mentioned that in the Type-IIb pattern both LDL, VLDL concentrations were raised. Plasma cholesterol and triglycerides were high. Our six clinically assessed familial hypercholesterolaemic (Hyperlipidaemic) subjects showed similar results (Table-2 & 3). Robert W. Kibry et. al. reported on the cholesterol-lowering effect of oatbran⁵. Anderson et. al found hypocholesterolaemic effect of plant fibre, short term effect of oatbran or bean³ Some reports have also been mentioned in FASEB future services about these results⁴. In recent years, investigators have discovered that eating certain plant fibres, the indigestible part of the plant food lowers cholesterol level³. Oatbran contains 3.5g fibre/100g which may be favourable for lowering the serum cholesterol level¹⁵. Oatbran and barley also contain Niacin (Nicotinic acid), 0.9g/100g and 5.5g/100gm respectively^{1, (14, 15)} In addition to dietary measures, Niacin (Nicotinic acid) is believed to decrease cholesterol synthesis^{1, 15}. As a result, cholesterol level is reduced in the blood. In our study, we added barley as well as oatbran as because barley is easily available in Bangladesh and this is popularly known as patha (Adjuvant) along with medicine, usually in the village. The investigators found lower total serum cholesterol and LDL in the seven of their eight selected men who were fed with 100g of oatbran daily for 10 days. They also observed no changes in the HDL⁴. Our study correlates with possible findings of Brown M.S. Goldstein J.L.¹³. Our six subjects clinically diagnosed as familial hypercholesterolaemia might have

deficiencies in LDL-receptors or might have defect in functioning of the LDL-receptors in the liver. In our study, 3 subjects with serum cholesterol level more than 500mg/100ml, had a remarkable decrease of the serum cholesterol after intake of 100g of oatbran in the 1st schedule of 7 days. In other 3 subjects who had serum cholesterol level less than 500mg/100ml in the blood during screening tests, changes were less significant. This might be due to increased activity of the LDL-receptors or more production of the same in the liver by some factors produced by the dietary stimulation by oatbran and barley^{3, 4}. There were slight variable changes in triglycerides. There were considerable decrease in low density lipoprotein (LDL) in the 1st schedule and slight increase in HDL levels in the 1st schedule. In the 2nd week of trial, the subjects were given 50gm of oatbran and 50 gm of barley twice daily for another 7 days. The results of serum cholesterol and low density lipoprotein (LDL) did not come down as in the 1st schedule; the results of the other parameters were variable and non-significant. Five subjects had increased level of serum cholesterol in the blood after 5 months while they were on normal diet. One subject (2nd subject) who had minimum fall in serum cholesterol, 3.1% during 1st trial (Table-3) had a slight decrease in the serum cholesterol level. The notable thing in this simple study was selection of familial hypercholesterolaemic subjects; because the treatment of these type of patients is a burning problem in the society. So, the investigators tried the cholesterol lowering dietary measure by giving oatbran and barley in this study. Barley is popular in Bangladesh, particularly in villages as "Disease diet".

Barley was tried along with oatbran to observe the hypercholesterolaemic effect; but we did not try barley separately as to observe its hypercholesterolaemic effects in this study due to some unavoidable circumstances. Further research is needed to see how this type of diet acts in lowering the serum cholesterol level in familial hypercholesterolaemia and whether barley can alone lower serum cholesterol level as well as other lipid parameters in the blood.

Summary

Six clinically assessed familial hypercholesterolaemic (Hyperlipidaemic) subjects were given trial by oatbran and barley on two schedule, oatbran alone for seven days and oatbran and barley together for another seven days. Highly raised total cholesterol levels decreased notably in those subjects whose total cholesterol levels were more than 500mg/dl in comparison with those subjects whose total cholesterol levels were below 500mg/dl. Hypocholesterolaemic effects of oatbran were observed in simple hypercholesterolaemic subjects by different researchers but not in familial hypercholesterolaemic subjects. Fibres in the oatbran lower the serum cholesterol level. In this small trial barley was added along with oatbran to observe the results of fibres as well as niacin content which is believed to reduce the cholesterol level. Barley contains more niacin (Nicotinic acid) than oatbran; Through barley could not be given in this trial separately to see its hypocholesterolaemic effects.

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