Effect of rice bran supplement on Nonalcoholic Fatty Liver Disease treatment

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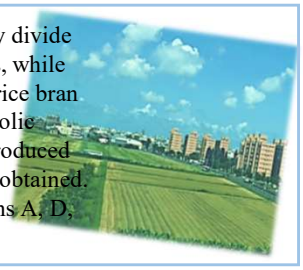
Objective

The prevalence of non-alcoholic fatty liver is 11~41% in Taiwan, is the main chronic liver disease. The effective treatment method is lifestyle modification and achieve a weight loss of more than 10%. By nutrition counseling, dietitian find client's nutritional problems and provide dietary prescription; however, following dietary prescriptions is difficulty. We want to know if high dietary fiber and γ-oryzanol containing meal replacement(rice bran) can improve dietary compliance of weight control and then improve fatty liver.

Method

The plan is to recruit 60 patients with moderate fatty liver disease (liver ultrasound index >3 points) and randomly divide them into two groups: a control group and an experimental group. Both groups will receive dietary consultations from nutritionists, while the experimental group will also be provided with one pack of rice bran (20 grams) per day to be consumed as a supplement. The rice bran can be added to soup or drinks and will be taken for a period of three months. The patients' lifestyle, dietary intake, posture, metabolic indicators, and changes in fatty liver will be tracked before and after the intervention. The rice bran is sourced from organic rice produced by the Changhua Christian Hospital Organic Farm (right picture). From 100 kilograms of rice, approximately 5-7% of rice bran is obtained. The composition of rice bran includes carbohydrates (35-50%), protein (12-17%), fat (13-22%), unsaturated fats, minerals, vitamins A, D, E, K, and B group, dietary fiber (23-30%), tocopherols, tocotrienols, lipopolysaccharides, alpha-lipoic acid, and gamma-oryzanol.



Result

This study was conducted from 2021-08-13 to 2023-11-15. A total of 60 subjects agreed to participate in this trial, of which 2 did not meet the admission conditions and 19 dropped out midway. A total of 39 subjects(21 males and 18 female) completed follow-up , 21 people in the rice bran group and 18 people in the control group, with an average age of 44.7 (29-70) years old. Table 1 show basic information between the two groups includes; there is no difference in subjects' age, BMI, body composition, fibroscan examination results, biochemical test values, calories, and protein intake. After 3 months of dietary control and tracking, the caloric intake of both groups was significantly reduced. Fat and carbohydrate intake were significantly reduced. BMI was reduced (the rice bran group dropped from 29.7 to 28.5, and the control group from 30.6 to 29.9, both with significant differences), the FFM(fat free mass) and skeletal muscle of the two groups were significantly reduced. In addition, the rice bran group had significant reductions in waist circumference and visceral fat area, and improvements triglycerides, and HbA1C. Improvement in the degree of fatty liver, and the hepatic steatosis (Controlled Attenuation Parameter score) and stiffness (elastography) measure by FibroScan® in the rice bran group dropped from 291 to 256 dB/m, p=0.001, 5.3 to 4.7 kPa, p=0.007, lower than those in the control group showing that rice bran has some effect on improving hepatic steatosis.(Table 2)

Table 1. Comparison of control group and treatment group before experimental

Variable	All Patient (N=39)	Control group (N=18)	Treatment group (N=21)	P-values
Gender(Male), n(%)	21(53.8%)	8(44.4%)	13(61.9%)	0.276
Age, yr, Median (IQR)	42(34-54)	42.5(34-49)	40(35-54)	0.791
BMI, kg/m², Median (IQR)	29.8(28.1-32.8)	30.6(28.6-34.9)	29.5(27.6-32.5)	0.223
Fibroscan(E), kPa, Median (IQR)	5.3(4.4-6.3)	5.2(4.4-6.1)	5.3(4.2-6.3)	0.967
Fibroscan(CAP), dB/m, Median (IQR)	300(278-338)	314(291-339)	291(267-334)	0.112
Body fat, %, Median (IQR)	35.7(31-41.2)	37.6(32.9-42.2)	35.2(30.8-40.8)	0.379
FFM, kg, Median (IQR)	57(48.8-61.6)	55.7(45.9-62.2)	57(49.9-61.5)	0.989
Skeletal muscle mass, kg, Median (IQR)	32.1(27.2-35.1)	31(25.2-35.2)	32.1(27.6-34.7)	0.945
Waist, cm, Median (IQR)	97.4(90.1-107.1)	99.4(90.1-108.1)	97.4(94.5-105.5)	0.989
Visceral fat area, cm², Median (IQR)	139.7(102-185.7)	138(118.7-203.6)	139.7(97.9-157.7)	0.686
GOT ,IU/ml, Median (IQR)	32(25-38)	30.5(21-42)	33(26-38)	0.835
GPT, IU/ml, Median (IQR)	45(27-66)	48.5(29-61)	41(24-66)	0.512
AC, mg/dl, Median (IQR)	100(92-109)	100.5(94-106)	100(92-111)	0.666
Triglyceride, mg/dl, Median (IQR)	131(103-178)	127(103-154)	144(119-178)	0.349
HDL, mg/dl, Median (IQR)	44(39-50)	41.5(34-47)	44(41-52)	0.183
LDL, mg/dl, Median (IQR)	112(93-145)	106(93-130)	115(93-149)	0.443
HbA1C, %, Median (IQR)	5.5(5.4-5.9)	5.6(5.4-5.7)	5.5(5.3-6)	0.828
Calorie, Kcal, Median (IQR)	2237(1699-2793)	2106.5(1835-2793)	2252(1699-2530.1)	0.728
Protein, g, Median (IQR)	77.3(66-92)	75.4(65.3-92)	78.6(68-90.7)	0.749
Fat, g, Median (IQR)	100(67-126.1)	101.3(67-126.1)	100(75-119)	0.967
Carbohydrate, g, Median (IQR)	250(179.4-297)	240.3(196-276)	278.9(179.4-297)	0.587
Dietary fiber, g, Median (IQR)	13.6(11.3-18.7)	11.66(7-16.13)	13.6(11.62-20.2)	0.349

Data are presented as median (IQR) for both groups. Statistical significance was determined at a p-value < 0.05.(*indicates a statistically significant difference (P < 0.05).

Table 2. T0 vs Tend in control group and experimental(rice bran) group

Variable	Control group(only dietary counseling)			Experimental group(dietary counseling & rice bran)		
	Time point		P-value	Time point		P-value
	T0	Tend		T0	Tend	
BMI, kg/m², Median (IQR)	30.6(28.6-34.9)	29.9(28-33.3)	0.001*	29.7(27.4-32.6)	28.5(25.5-30.1)	0.001*
Fibroscan(E), kPa, Median (IQR)	4.9(4.4-5.9)	5.4(4.7-6.2)	0.798	5.3(4.2-6.3)	4.7(4.3-5.2)	0.007*
Fibroscan (CAP), dB/m, Median (IQR)	314(290.5-333.5)	284.5(263-330.5)	0.026*	291(267-334)	256(243-291)	0.001*
Body fat, %, Median (IQR)	37.6(32.9-42.2)	38.4(31.2-41.7)	0.794	35.2(30.8-40.8)	32.2(29-35.9)	0.007*
FFM, kg, Median (IQR)	55.7(45.9-62.2)	53.5(44.5-59.7)	0.006*	57(49.9-61.5)	54(47.9-60.1)	0.002*
Skeletal muscle mass, kg, Median (IQR)	31(25.2-35.2)	29.7(24.3-33.6)	0.004*	32.1(27.6-34.7)	30.7(26.6-34)	0.002*
Waist, cm, Median (IQR)	99.4(90.1-108.1)	94.7(89.2-109.7)	0.112	97.4(94.5-105.5)	94.2(89.3-100.1)	0.006
VFA, cm², Median (IQR)	138(118.7-203.6)	132.7(118.8-190.7)	0.327	139.7(97.9-157.7)	105.1(93.3-153.8)	0.013*
GOT,IU/ml, Median (IQR)	32(21-42)	29(20-36)	0.28	33(26-38)	25(21-33)	0.044
GPT,IU/ml, Median (IQR)	47(29-61)	34(22-47)	0.08	41(24-66)	26(18-41)	0.055
AC, mg/dl, Median (IQR)	100(94-106)	90(87-100)	0.021*	100(92-111)	99(96-105)	0.421
Triglyceride, mg/dl, Median (IQR)	127(103-154)	130(105-155)	0.85	144(119-178)	124(99-136)	0.016*
HDL, mg/dl, Median (IQR)	41(34-47)	42(37-45)	0.924	44(41-52)	44(40-55)	0.276
LDL, mg/dl, Median (IQR)	100(93-130)	102(80-112)	0.107	115(93-149)	112(91-145)	0.444
HbA1C, %, Median (IQR)	5.5(5.4-5.7)	5.5(5.2-5.7)	0.085	5.5(5.3-6)	5.5(5.2-5.7)	0.033*
Calorie, Kcal, Median (IQR)	2106.5(1835-2793)	1492.8(1268.5-1812.5)	0.002*	2252(1699-2530.1)	1392(1295-1667)	0.001*
Protein, g, Median (IQR)	75.4(65.3-92)	69.4(53.9-81)	0.053	78.6(68-90.7)	72(57.6-83.2)	0.23
Fat, g, Median (IQR)	101.3(67-126.1)	80.3(65-84)	0.011*	100(75-119)	69.2(56.9-80.4)	0.015*
Carbohydrate, g, Median (IQR)	240.3(196-276)	149.2(108.1-180)	0.004*	278.9(179.4-297)	129.9(96.4-150)	<0.001*
Dietary, g, Median (IQR)	11.66(7-16.13)	13.4(8-23.9)	0.721	13.6(11.62-20.2)	21.3(16.5-26.54)	0.091

Data are presented as median (IQR) for both groups. Statistical significance was determined at a p-value < 0.05.(*indicates a statistically significant difference (P < 0.05).

Conclusion

Through this small clinical study, it was found that 20 grams of rice bran per day can improve metabolic indicators and improve fatty liver. This effect is speculated to be caused by the antioxidant effect of γ-oryzanol and dietary fiber that provides satiety and reduces caloric intake, to achieve weight control and improve fatty liver. Further research with larger sample sizes is needed to confirm these preliminary results.

Key words：NAFLD、rice bran、weight control

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