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A PROSPECTIVE STUDY ON PRACTICAL APPROACH FOR DIAGNOSIS OF FATTY LIVER AND ITS CLINICAL OUTCOMES IN TERTIARY CARE HOSPITAL

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ABSTRACT

Background of the study: In India and other western nations, fatty liver disease is now the most common reason for liver illness. The frequency and incidence are rising as a result of poor eating patterns, weight gain, and sedentary lifestyle. In western countries like USA, UK and many other nations, fatty liver disease is the most frequent reason for abnormal liver function tests. Between 10-30% of Americans have fatty liver disease, which is comparable to the rates in Asia and Europe. According to evidence, 25% of healthy attendants have fatty livers that abdomen ultrasonography may detect. A condition known as fatty liver disease is characterized by the presence of >5-10% hepatic steatosis and is frequently accompanied by one or more metabolic syndrome symptoms, such as obesity, diabetes mellitus, and dyslipidemia. One unrecognized cause of cryptogenic cirrhosis is "burned out" fatty liver disease. In order to prevent liver damage that might lead to liver failure, it is crucial to diagnose and treat fatty liver disease early and address any underlying risk factors. **Aims and objectives:** To conduct a systematic assessment of the current and upcoming methods for fatty liver disease staging and diagnosis in order to assist doctors and other health care professionals in accurately diagnosing and treating fatty liver. The evaluation of food quality for the treatment and prevention of fatty liver disease is another goal of this study. **Results:** Multiple non-invasive techniques such as

Ultrasonography, Transient Elastography or Fibroscan, computed Tomography scan, Magnetic Resonance Imaging and serum Biomarkers like controlled attenuation parameter, CK-18 (cytokeratin-18) are now available, even though liver biopsy remains the gold standard test for detecting fatty liver and different stages of hepatic steatosis and fibrosis. To evaluate hepatic fibrosis and disease activity, the fatty liver fibrosis score or fibroscan is advised. Ultrasound and fibroscan are non-invasive tests that may also identify later stages of hepatic steatosis, making them cost effective and patient-friendly even though liver biopsy is helpful in diagnosing severe fibrosis. Other non-invasive methods include fatty liver fibrosis score, BARD score, VCTE (Vibration-Controlled Transient Elastography), shear Wave Elastography, Fatty liver index (FLI), Hepatic Steatosis Index (HSI), and Steato Test. Treatment options for fatty liver disease include medication, lifestyle changes such as calorie restriction and exercise that results in weight loss, and management of the condition's underlying causes. To prevent fatty liver disease's long-term effects, early diagnosis and appropriate care are essential.

KEYWORDS: Fatty liver disease, obesity, hepatic fibrosis, Dyslipidemia.

INTRODUCTION

Globally, chronic liver disease is frequently brought on by fatty liver disease. Hepatic steatosis, a symptom of fatty liver disease, occurs when no other reasons of secondary hepatic buildup (such as high alcohol use) can be found. The progression of fatty liver disease can range from milder conditions like hepatic steatosis and cirrhosis to more severe conditions like liver failure. A fatty liver can develop into cirrhosis and fibrosis. Hepatic steatosis is present in fatty liver disease but there is no sign of inflammation, whereas in hepatic steatosis is linked to lobular inflammation and apoptosis that can result in fibrosis and cirrhosis.

Prior to the midpoint of the previous decade, hepatic steatosis was generally regarded as a grave ailment, primarily affecting women with excessive weight, frequently linked to type 2 diabetes mellitus, and relatively mild prognosis, which are foretelling risk factors of heart disease, stroke and diabetes. The frequency of liver disease has swiftly increased in developed nations in the west, especially in patients with abdominal obesity, type 2 diabetes mellitus, abnormal lipid levels, and metabolic syndrome.

The liver biopsy is the diagnostic test of choice for examining any type of liver inflammation, including damage. Liver biopsies can be very helpful in the diagnosis of fatty liver disease

and related disorders, and their results can range from more severe forms of steatohepatitis to triglyceride deposition as droplets in hepatocytes, along with concurrent inflammation and varying degrees of hepatic fibrosis, are the typical symptoms of steatohepatitis. Most patients with liver steatosis have non-progressive disease; however, a small percentage of these patients experience the steatohepatitis mentioned above, which can result in liver failure and even hepatocellular carcinoma.

The US guidelines for the management of fatty liver disease define fatty liver as the presence of steatosis with over 5% fat infiltration in imaging or histology, and without any alcohol, drug, or viral-induced steatosis. Patients with fatty liver disease may exhibit increased liver enzymes.

One or more metabolic syndrome symptoms such as systemic hypertension, dyslipidemia, insulin resistance, or overt diabetes, are present in patients with fatty liver disease. In addition to the fact that metabolic syndrome is a known risk factor for the development of cardiovascular disease, there is growing evidence that visceral obesity is a risk factor for people with fatty livers. Although the pathophysiological pathways linking cardiovascular disease and fatty liver disease are unclear, based on current data, cardiac and vascular disorders appeared to be the most significant cause of death in these individuals. The pathophysiology underlying these conditions is believed to be influenced by insulin resistance. Even an experienced practitioner may find it difficult to assess abnormal liver enzyme levels in otherwise healthy individuals. A prominent cause of abnormal liver test findings among blood donors is fatty liver disease. Once other causes of liver disease are ruled out, it can identify asymptomatic increases of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels in up to 95% cases. According to data from the world Health Organization's Global Health Observatory in 2014, 15% of men and 20% women worldwide who are 18 years old or above are obese. According to a research assessing the incidence of hepatic steatosis, between 5.5 and 20 percent of Americans are afflicted. Challenges arise from the variety of diseases caused by fatty liver, especially their intricate interactions with metabolic syndromes raises problems for medical professionals.

Diet may influence how fatty liver disease develops, and dietary changes have been proposed as the cornerstone of fatty liver disease therapy. However, there is a paucity of epidemiological evidence linking food or nutritional composition to the onset of fatty liver disease. Dietary pattern analysis is regarded as an alternative method to explore the

relationship between diet and disease risk in epidemiological research, as the evaluation of diet as a risk factor for fatty liver has historically concentrated on the influence of particular foods and nutrients. In comparison to individual foods or nutrients, this method examines the entire diet and takes the synergy of food and nutrient consumption into account, making it potentially more predictive of disease risk.

We are aware of very few observational studies that have looked at the relationship between food habits and adult fatty liver disease. In epidemiological studies or research organizations, the diet quality index score (DQI) is being used to measure diet quality in Indian people. It has been selected as the most efficient way to link dietary and lifestyle trends for a worldwide knowledge of diet quality. Patterns of daily activities and nutritional consumption are recorded using a locally validated food-frequency questionnaire (FFQ) and lifestyle questionnaire. The questionnaire asks about eating junk food, smoking, drinking, stress levels, how often you eat junk food, and if you consume meat, poultry, eggs, fish, or other non-vegetarian foods. It also asks how much sugar, salt, and other fatty foods you consume. Two models of questionnaire are created, and the diet quality index score is computed and evaluated.

MATERIALS AND METHODS

This hospital -based observational study have been conducted at Department of Gastroenterology, Adesh Institute of Medical Sciences and Research, Adesh Hospital, Bathinda. Data was collected from patients having evidence of fatty liver via data collection form containing information regarding the determinants related to fatty liver.

STUDY DESIGN

The patients presenting to Department of Gastroenterology were selected during a period of three months. The sample size is taken on the basis of.

Sample size (n)= $(z_{1-\alpha})^2$ (p) (q)/d

Where;

n = desired sample size

$(z_{1-\alpha})^2$ = critical value and a standard value for the corresponding level of confidence (at 95% confidence interval (type 1 error) is 1.96 and at 99% it is 2.58).

p = expected prevalence or based on previous research.

q = 1-p

d = margin of error or precision

Total sample size calculated =250

Time for data collection = 3 months

STUDY POPULATION

All patients visiting the Gastroenterology Department were selected after applying inclusion and exclusion criteria and obtaining their informed written consent, data collection form, and questionnaire related to their dietary intake and other relevant information were also filled after their willingness for the same.

SELECTION CRITERIA

Selection of the study participants was done based on inclusion and exclusion criteria.

INCLUSION CRITERIA

Patients (age 20 or above) who are newly diagnosed with fatty liver were included in the study.

EXCLUSION CRITERIA

The exclusion criteria included pregnancy, breastfeeding, having infectious diseases and renal diseases.

METHOD OF DATA COLLECTION

The data was collected using the pre-designed structured data collection form. This data collection tool used for study was an interview schedule that was held at the institute with assistance from faculty members and other experts. Before distributing the data collection form, the purpose of the study and the contents of the data collection form were clearly explained to the selected subjects and they were ensured confidentiality regarding their data. The selected subjects were the participants who visited the Department of Gastroenterology at Adesh Hospital. A written consent form was obtained from the participants who were willing to participate in the study.

ASSESSMENT OF DATA

The results will be computed using linear regression models.

- Estimation of hazard ratios and 95% confidence intervals were divided from regression models that compared mortality and rates of new onset clinical event rates according to

the histological features. These regression models were stratified according to three age groups (age 40 or less), age 41-60 and age 61 or above. Education status, sex, status of diabetes, metabolic syndromes and intake of other ayurvedic, homeopathic and other prescribed medications were imputed.

- The association between each diet quality score and fatty liver was analyzed using linear regression or correlation coefficients using sets of models respectively. The first model was adjusted for blood pressure, heart rate, and body mass index (BMI). The second model was adjusted for status of alcohol, smoking and drug intake, level of stress, physical activity, meal servings and intake of vitamins and other supplements whereas, the third model depicting the frequency of salt, sugar, dairy products, legumes, proteins, fruits, vegetables or other dietary products.

OUTCOME MEASURES

- A trustworthy non-invasive alternative to its diagnosis may be offered by new studies on the etiology of the disease development in fatty liver.
- Effects of dietary practices and complementary medicines on the remission of fatty liver were assured.

STATISTICAL ANALYSIS OF DATA

All the data was recorded and analysis was done using IBM SPSS version 22.0 where linear regression models was applied with p value < 0.05 and 95% confidence interval.

RESULTS

Total of 250 subjects attending the Department of Gastroenterology, Adesh Hospital, Bathinda were studied based on the inclusion and exclusion criteria. The results and observations are analyzed by linear regression and various frequency distribution tables and charts. The results and observations of these studied participants are as follows.

1. Demographic Details

1.1. Age

Ages are divided into three groups viz. group 1 (20-40 years old), group 2 (41-60 years old), and group 3 (61 or above). Three of these age groups, younger adults are most likely to experience significant consequences as a result of fatty liver disease. 131 (52.4%) are the young adults group 1, 78 (31.2%) are group 2, and 41 (16.4%) are group 3 i.e., geriatric population.

1.2. Gender of the patient

Group 1 (male patients and group 2 (female patients) are categories for the gender/sex of the patient. The majority of these 146 (58.4%) with fatty liver are discovered to be female.

1.3. Education status of the patient

In terms of the total number of patients, 50 (20.0%) had completed their secondary education, 173 (69.2%) were graduates, 21 (8.4%) had finished their elementary education, and 6 (2.4%) had no formal education. As a result, the majority of illness sufferers have earned their degrees.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.469[a]	.220	.188	.675

a. Predictors: (Constant), are you taking any ayurvedic,homeopathic or any other medicines, height (in cms), education status, is anyone in the family suffering from any of these diseases, body mass index, heart rate, mean artrial pressure, sex, comorbidities (if any), weight (in kgs). The variables are showing significant relationship with each other that means they are highly related to each other.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.734	10	3.073	6.747	.000[b]
	Residual	108.866	239	.456		
	Total	139.600	249			

a. Dependent Variable: Age

b. Predictors: (Constant), are you taking any ayurvedic,homeopathic or any other medicines, height (in cms), education status, is anyone in the family suffering from any of these diseases, body mass index, heart rate, mean artrial pressure, sex, comorbidities (if any), weight (in kgs). the relationship is highly significant and it is likely that the variables are highly related and associated with each other in the sample.

a. Dependent Variable: Age

Table 1: regression model analysis for model 1 (patient specific details).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
(Constant)	-4.448	2.152		-2.067	.040	-8.687	-.208			
sex	.100	.110	.066	.912	.363	-.116	.316	-.059	.059	.052
height (in cms)	.025	.012	.258	2.113	.036	.002	.048	.190	.135	.121
weight (in kgs)	-.008	.013	-.150	-.645	.520	-.033	.017	.200	-.042	-.037
body mass index	.035	.040	.167	.871	.385	-.044	.113	.170	.056	.050
mean artrial pressure	.012	.005	.159	2.540	.012	.003	.021	.266	.162	.145
heart rate	.007	.006	.069	1.128	.261	-.005	.018	.179	.073	.064
education status	-.088	.060	-.088	-1.459	.146	-.207	.031	-.191	-.094	-.083
Comorbidities(if any)	.479	.116	.401	4.120	.000	.250	.708	.365	.258	.235
is anyone in the family suffering from any of these diseases	-.014	.091	-.009	-.156	.876	-.193	.165	.028	-.010	-.009
are you taking any ayurvedic, homeopathic or any other medicines	-.106	.066	-.159	-1.610	.109	-.235	.024	.256	-.104	-.092

2. Laboratory investigations

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.334[a]	.111	.070	.722

Predictors: (Constant), VLDL cholesterol, total serum bilirubin, albumin, LDL cholesterol, HDL cholesterol, triglycerides, gamma glutamyl transpeptidase, alanine aminotransferase, total cholesterol level, aspartate aminotransferase, fasting blood sugar.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.561	11	1.415	2.714	.003[b]
	Residual	124.039	238	.521		
	Total	139.600	249			

a. Dependent Variable: Age

a. Predictors: (Constant), VLDL cholesterol, total serum bilirubin, albumin, LDL cholesterol, HDL cholesterol, triglycerides, gamma glutamyl transpeptidase, alanine aminotransferase, total cholesterol level, aspartate aminotransferase, fasting blood sugar.

b. Sig.003 indicates that there is a significant relationship and association between each variables.

Table 2: regression model for laboratory investigations.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.653	.653		-1.000	.318
	alanine aminotransferase	-.003	.004	-.053	-.786	.433
	aspartate aminotransferase	-.004	.004	-.065	-.953	.341
	gamma glutamyl transpeptidase	.000	.004	-.007	-.100	.920
	total serum bilirubin	.249	.119	.136	2.087	.038
	albumin	-.025	.074	-.023	-.340	.734
	fasting blood sugar	.015	.004	.239	3.395	.001
	total cholesterol level	.005	.003	.122	1.820	.070
	triglycerides	-.003	.002	-.125	-1.920	.056
	HDL cholesterol	-.002	.004	-.036	-.554	.580
	LDL cholesterol	.006	.003	.120	1.851	.065
	VLDL cholesterol	.003	.006	.038	.590	.556
a. Dependent Variable: Age						

2.1. Ultrasound and Fibroscan Findings

In a table, the frequency distribution illustrating the patient's ultrasound and fibroscan results is displayed. Ultrasound results are rated as 0, meaning that there is no sign of a fatty liver. Grade 1 and 2 of fatty liver refers to mild and significant fat accumulation in the liver, respectively. Fibroscan results are classified as 1; 2.0-5.3 kpa, which is normal, 2; 5.4-7.5 kpa, which is in the moderate range, and 3; higher than 7.5 kpa, which is severe or chronic.

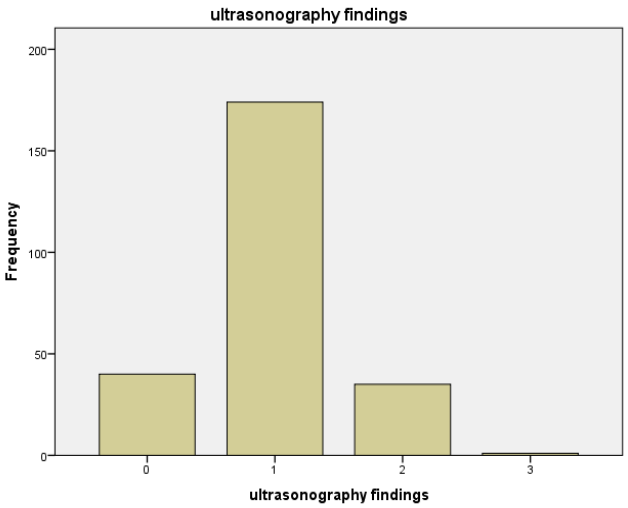

Fig 3.1: bar diagram showing ultrasound findings.

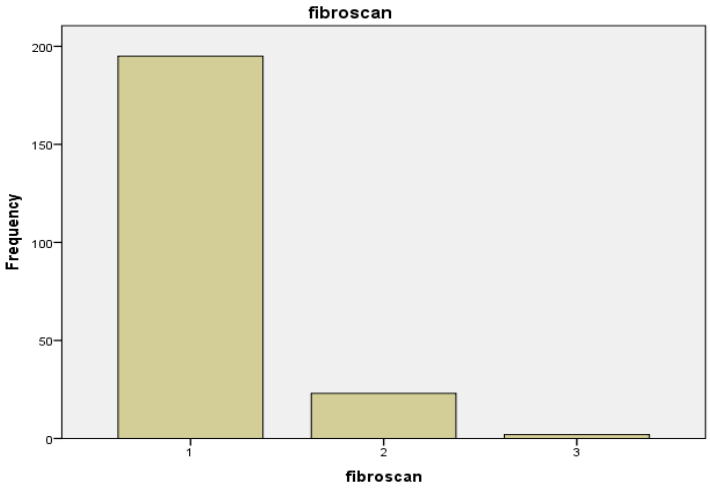

Fig 3.2: bar diagram showing fibroscan findings.

3. Diet quality score analysis

Diet quality score index is analyzed by using linear regression models or correlation coefficients by dividing models into model 1 and model 2 and the scores of both are analyzed and compared. Model 1 depicts lifestyle activities and type of foods consumed which is categorized on the basis of following scale: 0; never, 1; rarely, 2; often, 3; very often, 4; always and model 2 depicts the frequency of sugar, salt, spices, green vegetables, fruits etc., which is categorized on the basis of following scale, 0; no or very small amounts, 1; small amounts, 2; medium amounts, 3 large amounts.

Total Score Model1 * Total Score Model2 Crosstabulation

			total score model2				Total
			1	2	3	4	
total score model1	1	Count	8	59	107	36	210
		% of Total	3.2%	23.6%	42.8%	14.4%	84.0%
	2	Count	0	11	18	10	39
		% of Total	0.0%	4.4%	7.2%	4.0%	15.6%
	3	Count	0	0	0	1	1
		% of Total	0.0%	0.0%	0.0%	0.4%	0.4%
Total		Count	8	70	125	47	250
		% of Total	3.2%	28.0%	50.0%	18.8%	100.0%

Correlations

		comorbidities (if any)	total score model1	total score model2
Pearson Correlation	comorbidities (if any)	1.000	.080	-.089
	total score model1	.080	1.000	.103
	total score model2	-.089	.103	1.000
Sig. (1-tailed)	comorbidities (if any)	.	.104	.080
	total score model1	.104	.	.053
	total score model2	.080	.053	.
N	comorbidities (if any)	250	250	250
	total score model1	250	250	250
	total score model2	250	250	250

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.565	2	.783	2.009	.136[b]
	Residual	96.231	247	.390		
	Total	97.796	249			

a. Dependent Variable: comorbidities (if any)
b. Predictors: (Constant), total score model2, total score model1.
c. Variables are highly significant i.e., the scores are positively related to each other.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	.456	.187		2.441	.015			
	total score model1	.148	.104	.090	1.420	.157	.080	.090	.090
	total score model2	-.082	.052	-.099	-1.553	.122	-.089	-.098	-.098

Dependent Variable: comorbidities (if any)

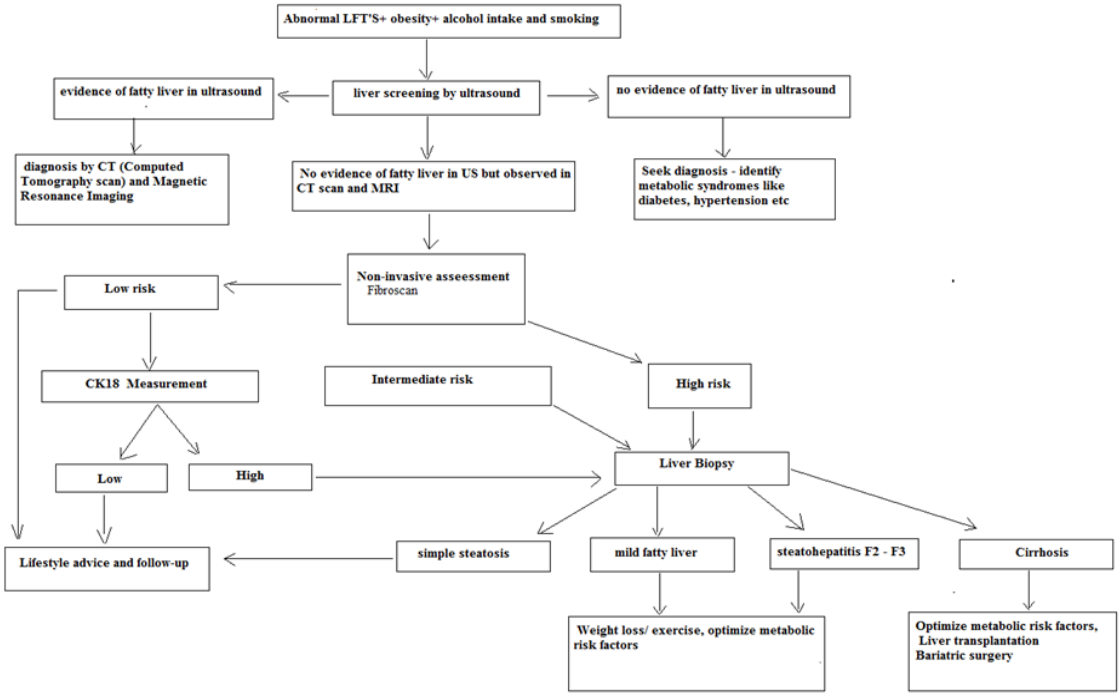

Fig 4: Schematic flowchart depicts diagnostic criteria for fatty liver disease.

CLINICAL OUTCOMES

A trustworthy non-invasive alternative to its diagnosis may be offered by new studies on the etiology of the disease development in fatty liver. Effects of dietary practices and complementary medicines on the remission of fatty liver might be assessed.

CONCLUSION

The study was conducted to study the diagnostic criteria or the early intervention for fatty liver disease and to observe significant clinical outcomes by association of diet quality score and fatty liver that was analyzed using linear regression models or correlation coefficients using sets of models respectively. Steatohepatitis or steatosis encourages the development of cirrhosis or even liver failure, and fatty liver sickness has a widespread correlation with the regularly occurring metabolic syndrome. Fatty liver sickness occurrence will stay a widespread societal fitness difficulty for many years to come. Therefore, it is crucial to unfold understanding approximately early screening for fatty liver sickness in an effort to pick out the situation and enforce a success therapies. Effective remedy strategies could postpone the onset of metabolic illnesses and forestall the improvement from fatty liver to liver failure. However, due to the fact liver biopsy is an intrusive operation, its application for great screening and early detection of fatty liver disorder stays normally constrained. Though correct and touchy in grading slight to extreme fatty liver disorder, non-invasive strategies for

early diagnosis (inclusive of serum biomarkers, scoring systems, and imaging) have evolved recently, they are nonetheless a long way from acceptable. Large facts evaluation could be useful resource with inside the introduction of those interesting new serum markers and imaging strategies that would boom the diagnostic precision. Therefore, developing low-cost, practical, and correct non-invasive techniques with excessive sensitivity and accuracy for fatty liver disorder detection could now no longer most effective useful resource in monitoring the path of the disorder however, additionally inspire assessment of current and novel treatments.

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