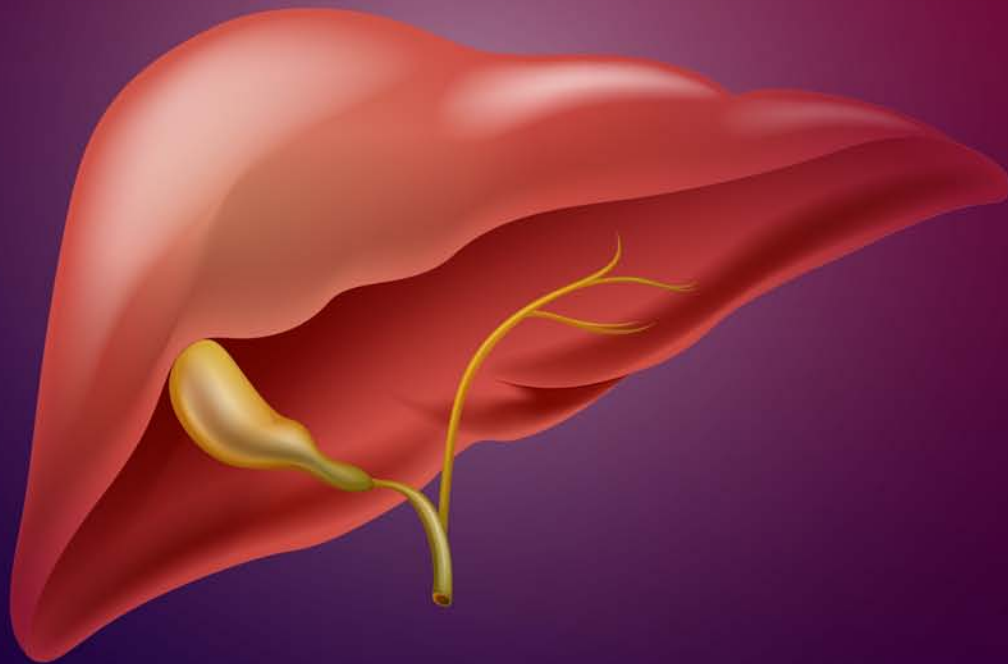


PROTECTING PUBLIC HEALTH

ADDRESSING LIVER DISEASE IN WELFARE PROGRAMS



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Bentham Books

Protecting Public Health: Addressing Liver Disease in Welfare Programs

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FOREWORD

Liver disease has long been an under-recognized yet escalating public health concern, silently affecting millions across the globe. Despite its profound impact on individual well-being, productivity, and socioeconomic stability, it often remains overshadowed by more visible health challenges. The editors of this book, Dr. Ravindra Mishra, Dr. Vinay Jain, Dr. Harsha Rathore, and Dr. Salahuddin Mohammed, have commendably undertaken the task of illuminating this critical issue through a multifaceted, forward-thinking lens.

The book “Protecting Public Health: Addressing Liver Disease in Welfare Programs” captures the intricate relationships among healthcare systems, social policies, and the biological realities of liver disease. It provides not only scientific insights but also policy-oriented strategies that can empower welfare frameworks to prevent, manage, and mitigate the burden of hepatic diseases. The editors have brought together a diverse array of chapters that blend epidemiological evidence, socio-economic analysis, community engagement, and healthcare innovation—making this work a vital contribution to both scientific and public health literature.

By weaving together themes of equity, prevention, and community-centered care, this book moves beyond traditional medical narratives. It emphasizes the importance of early detection, nutritional support, behavioral interventions, and the integration of welfare programs in improving liver health outcomes. Such a holistic approach reflects the growing global consensus that sustainable health progress must arise from inclusive and collaborative systems rather than isolated medical solutions.

For policymakers, public health professionals, and academicians, this book serves as a roadmap for actionable change. It encourages readers to rethink the boundaries between medicine, social welfare, and governance—ultimately envisioning a future in which every individual has the opportunity to live free from preventable liver disease. The editors deserve great appreciation for curating a resource that not only informs but also inspires, guiding us toward a more equitable and health-conscious society.

This volume stands as a timely and impactful contribution to public health scholarship, one that bridges scientific understanding with pragmatic welfare initiatives—an essential step toward protecting the liver health of our communities and, ultimately, safeguarding public health at large.

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PREFACE

Liver disease is a silent public health crisis that disproportionately affects vulnerable populations, including those living in poverty and dependent on welfare systems. Despite its severe impact, liver health often receives insufficient attention in public health and welfare frameworks.

"Protecting Public Health: Addressing Liver Disease in Welfare Programs" addresses this gap by exploring the intersection of liver disease and public welfare. The book provides a comprehensive roadmap, combining analysis, case studies, and actionable recommendations to integrate liver health into welfare systems, ensuring equitable care and support for at-risk communities. Aimed at policymakers, healthcare providers, and public health professionals, this book advocates for inclusive and proactive public health approaches. Prioritizing liver health in welfare programs seeks to reduce health disparities, alleviate the burden of disease, and foster healthier, more resilient societies.

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DEDICATION

This book is especially dedicated to my parents, my colleague, and the institute principal, Dr. Vinay Jain. They have always inspired me to move forward without thinking about failure.

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CHAPTER 1

Silent Epidemic: Uncovering the Hidden Burden of Liver Diseases

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Abstract: Worldwide, liver illnesses represent a serious and rapidly growing issue for national health care systems. Chronic liver disease and its consequences, like cirrhosis and liver cancer, result in high death rates, morbidity, and financial burden. Liver disease is responsible for around 2 million fatalities worldwide each year, with ten lakhs due to cirrhosis complications and ten lakhs due to viral hepatitis or liver cancer; about 75% of all liver-related deaths occur in males. The most common causes of cirrhosis around the world are alcohol, non-alcoholic fatty liver disease, and viral hepatitis. Hepatotropic viruses are the main causative agents of acute hepatitis; however, drug-induced liver injury is becoming a more common cause. For these developing liver health priorities, which disproportionately affect developing countries in Africa, Asia, and South America, a worldwide integrated approach, including social, behavioural, and biological targets, must be implemented at the health system level in a planned manner.

Keywords: Acute hepatitis, Cirrhosis, Gastrointestinal bleeding, Liver cancer, Liver diseases.

INTRODUCTION

Approximately two million people worldwide die from liver disease each year. Liver diseases are the eleventh leading cause of death in the world. It has been found that about two-thirds of deaths caused by liver-related disease affect men. Complications from cirrhosis and hepatocellular cancer are the reasons for the majority of the deaths. Viral hepatitis, alcohol, and non-alcoholic fatty liver disease are the most common causes of cirrhosis worldwide.

The majority of acute hepatitis results from hepatotropic viruses, but growing cases of drug-induced liver injury may become a more common cause in the future [1].

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The liver is the most vital and highly vascular organ of the human body, accounting for 2–3% of the average body weight. It is located on the upper right side of the belly. The liver is an important site for numerous metabolic events in the body.

The liver manages about 500 key activities, including converting food components into needed blood components, storing vitamins and minerals, and generating various significant proteins. The liver helps in maintaining hormonal balance by metabolising and removing excess hormones from the bloodstream. The liver plays an important role in detoxifying the body's harmful wastes. It creates bile, which helps with digestion. The liver also plays an important part in carbohydrate, protein, and lipid metabolism [2].

Because an undamaged liver is required for a wide range of processes, illnesses that cause hepatic dysfunction have far-reaching consequences. We find a variety of problems, including abnormal blood clotting, variceal haemorrhage, renal dysfunction, muscle atrophy, extrapyramidal movements, cognitive impairment, and coma.

Although there may not be obvious early indicators of hepatic failure, early diagnosis and management of liver illness may prevent the emergence of major consequences. One Nonspecific symptoms, including weariness, pruritus, personality changes, mood swings, and memory loss, may precede jaundice, palmar erythema, ascites, and spider angiomas [3].

Liver disorders are becoming more common around the world, affecting people's quality of life and potentially leading to fatal complications. The burden of complex liver disease caused by hepatitis B has been reduced by antiviral agents, but complete eradication is not yet available. Usage of relatively new and expensive interventions like Direct-Acting Antivirals (DAAs), *e.g.*, Sofosbuvir, in IV form has reduced the incidence of hepatitis C.

The pandemic of Non-Alcoholic Fatty Liver Disease (NAFLD) is unending, while incidences of Alcohol-related Liver Disease (ALD) are rising very high; besides risk factor management, there is no other therapeutic solution. It has been found that genetic factors have shown a major role in the development of all types of chronic liver diseases. Advancements in the care of CLD problems have improved the patients' life expectancy. The increase in the prevalence of hepatocellular carcinoma (HCC) has augmented the requirement for liver transplantation around the globe.

LIVER DISEASES

Liver disease refers to any condition that causes the liver to malfunction. Liver illnesses can be grouped into two categories: chronic and acute liver diseases. Chronic diseases are persistent or typically last for more than a year. Acute illness is severe and sudden in onset. In the clinical perspective, chronic liver disease is an illness of the liver in which hepatic parenchyma gradually undergoes the process of destruction and regeneration, which finally leads to cirrhosis and fibrosis [4, 5].

The incidence of liver disorders is rising globally. The increased IV drug usage of DAAs has benefited the treatment of hepatitis C, but it is very difficult to eradicate hepatitis B [6].

With the advancement of better problem management, chronic liver disease patients are living longer lives, but it has enhanced the prevalence of hepatocellular carcinoma (HCC) and Liver Transplantation (LT) cases. Development of more accurate diagnostics and effective therapies for fibrosis, HCC, portal hypertension, and post-LT has become much easier now [7].

Liver disease can lead to several complications, including hepatitis, autoimmune hepatitis, cirrhosis, portal hypertension, variceal haemorrhage, hepatorenal syndrome, spontaneous bacterial peritonitis and ascites, hepatic encephalopathy, hepatocellular carcinoma, *etc.*

The assessment of liver function and the results of diagnostic studies are crucial for understanding liver disease.

The primary sign of liver disease is unusual liver biochemical test levels. The hepatic dysfunction can be judged by the pattern of abnormalities, like increased levels of serum aminotransferase, which are characteristic of viral hepatitis, whereas raised alkaline phosphatase levels indicate cholestasis disorders such as primary sclerosing cholangitis and primary biliary cholangitis [7].

Additional testing, such as serologic and imaging examinations, plays a crucial role in the accurate diagnosis of dysfunctions in the liver. No specific testing is available for identifying drug-induced liver disease and nonalcoholic fatty liver disease, so identification is done by ruling out alternative causes [8]. Liver biopsy is the best choice for the diagnosis of hepatic disease of unidentified origin [9].

Liver Function Tests (LFTs), a combination of blood tests, measure different enzymes, proteins, and metabolites produced by the liver, such as albumin, bilirubin, alanine transaminase (ALT), aspartate aminotransferase (AST), alkaline

CHAPTER 2

From Risk to Resilience: How Welfare Programs Can Transform Liver Health

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Abstract: Liver illnesses are an increasing problem around the world, impacting millions of individuals every year. Hepatitis, fatty liver disease, and cirrhosis are often made worse by differences in income and education, poor lifestyle choices, and limited access to healthcare. When done right, welfare programs can be a big help in stopping and dealing with liver-related health problems. This chapter examines the potential of social and health policies to alleviate the burden of liver diseases through the provision of free or subsidised healthcare, health awareness initiatives, nutritional support, and community-based interventions. Case studies and effective welfare interventions are analysed to underscore the significance of a unified approach in addressing liver illnesses. The roles of government, non-profit groups, and community involvement are also talked about, showing how welfare programs can improve liver health and public health.

Keywords: Cirrhosis, Hepatitis, Liver diseases, NAFLD, Public welfare, Rehabilitation programmes, Socioeconomic.

INTRODUCTION

Liver illnesses are a major public health issue worldwide, affecting millions of people each year. Individuals from lower socioeconomic backgrounds are more vulnerable to these diseases because they lack easy access to healthcare, have poor diets, and are more exposed to risk factors such as alcohol misuse and infectious diseases. Addressing these disparities requires a variety of strategies. Welfare programs are crucial because they provide at-risk groups with access to healthcare, nutritious food, and education.

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The Worldwide Impact of Liver Disease

Liver illnesses are among the top causes of death and illness around the world. The World Health Organisation (WHO) says that about 1.5 million people die from liver-related diseases every year. A large number of these deaths happen in low- and middle-income countries. Hepatitis, Non-Alcoholic Fatty Liver Disease (NAFLD), cirrhosis, and liver cancer are the main causes of this expanding problem.

Hepatitis B and C infections continue to be the principal etiological factors of chronic liver disease, especially in areas with insufficient healthcare infrastructure. NAFLD, which is connected to obesity and metabolic syndrome, is becoming a “silent epidemic” that affects about 25% of the world's population. Alcohol-related liver disease is still a prominent cause, especially in rich countries Fig. (1) [1].

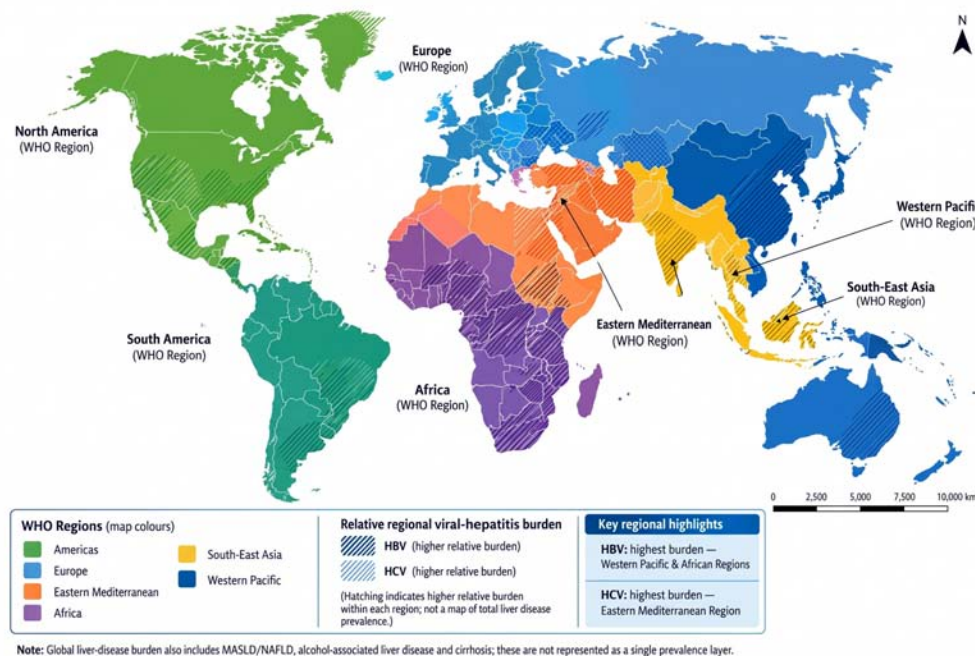


Fig. (1). Global prevalence of liver diseases (Map showing affected regions) [2].

Socioeconomic Factors Affecting Liver Health

Socioeconomic factors, such as income, education, access to healthcare, and living conditions, have a big effect on how common liver illnesses are. Socioeconomic differences make it harder for people in marginalised groups to

get early diagnosis, treatment, and preventative care, which makes the illness burden worse.

Some important socioeconomic factors that affect liver health are:

- **Limited Healthcare Access:** There aren't enough places to get tests and treatment, especially in rural or less developed areas.
- **Poor Nutrition:** Eating a lot of processed and fatty meals raises the risk of NAFLD.
- **Substance Abuse:** Alcohol and drug dependence are major causes of liver cirrhosis and liver failure.
- **Environmental Hazards:** Being among industrial chemicals, dirty water, and viruses because of bad hygiene (Table 1) [2].

Table 1. Socioeconomic risk factors for liver disease.

Factor	Impact on Liver Health
Low Income	Limited access to healthcare and nutritious food
Poor Education	Lack of awareness about liver diseases and prevention
Urban Pollution	Exposure to toxins affecting liver function

THE ROLE OF WELFARE PROGRAMS IN PUBLIC HEALTH

Welfare programs are important ways to lower the risk of liver disease by making it easier for people to get health care, eat well, and learn about public health. These programs work by:

- **Universal Healthcare Coverage:** Making sure that everyone can get free or low-cost check-ups, early diagnosis, and treatment for liver-related problems.
- **Nutritional Assistance Programs:** Helping people who are at risk of getting liver disorders by making sure they have enough food and giving them advice on what to eat.
- **Substance Abuse Rehabilitation:** Setting up support mechanisms to help people with liver problems caused by drugs and alcohol.
- **Public Health Campaigns:** Teaching people about being vaccinated against hepatitis, drinking less alcohol, and making changes to their lifestyles to lower the number of liver diseases.

India's National Viral Hepatitis Control Program and the European Union's Alcohol Reduction Initiatives have both been very successful at stopping the spread of hepatitis and liver problems caused by alcohol. They did this by using good policies and funding plans [3].

Bridging the Gap: Connecting Public Welfare and Hepatic Care

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Abstract: Nowadays, liver dysfunction is rising at an alarming rate, and complications from chronic hepatitis, liver cirrhosis, and hepatic carcinoma cause more than 2.2 million human casualties. The public lacks sufficient knowledge of liver diseases, their risk factors, and potential complications. Different efforts must be aligned to address public misperceptions about liver disorders, and knowledge about liver diseases should be well planned and implemented at the ground level. To bridge the gap between hepatic care and public welfare, it is necessary to address the complex relationship between hepatic and social determinants of health. Socioeconomic status, as well as various environmental factors, significantly impact the risk of developing liver disorders. Public welfare programs can play a vital role in mitigating their adverse effects on liver health. Through these programs, people can receive various support, such as financial assistance, food security, housing support, and appropriate healthcare for vulnerable populations. Focusing on people's basic needs can reduce the burden of liver disease and improve health outcomes. There are some gaps in coordination and communication between public welfare systems and liver care professionals, which lead to inappropriate care, delayed identification of disease, and poorer health outcomes for individuals. Integrating medical care services into public welfare programs can improve access to health care and facilitate the pre-detection and management of liver disease. The establishment of care coordination mechanisms between public welfare organizations and hepatic care providers can ensure uniform transitions and prevent gaps in hepatic care. Public welfare initiatives can empower people to take proactive measures to protect their liver health by increasing awareness of liver health and by providing information about available resources in their areas. Supporting laws that address and advance fair access to liver care can create a more supportive atmosphere for people with liver illness.

Keywords: Integrating approach, Liver disorders, Policy advocacy, Public awareness, Socio-economic factors.

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INTRODUCTION

Hepatic diseases are a global health concern, accounting for over 2 million deaths annually. Complications of chronic viral hepatitis, cirrhosis (severe liver scarring), and hepatocellular carcinoma (liver cancer) primarily cause these deaths. Liver disease is a broad category encompassing infectious, cancerous, and chronic conditions with diverse causes. Cirrhosis is a significant consequence of many forms of liver disease. Despite their varied origins, many liver diseases share common symptoms, including jaundice and abdominal swelling [1].

Chronic liver illness is a leading cause of illness and death globally. Key factors contributing to this burden include hepatitis infections, liver disease itself, and non-alcoholic fatty liver disease. Viral hepatitis remains a significant cause of death among pregnant women. Limited access to resources, low awareness of liver disease, and shortages of healthcare facilities and professionals often lead individuals to rely on unproven traditional remedies and herbal supplements for relief, rather than seeking professional medical care. Because liver damage often progresses without noticeable early symptoms like nausea or vomiting until the liver is severely compromised, raising awareness about liver disorders is crucial. This lack of awareness significantly contributes to the higher prevalence of certain liver diseases in some regions. The ineffective communication of information about liver disease within communities suggests that there must be improved awareness campaigns using diverse media channels. This includes encouraging doctors to dedicate more time to patient education during consultations and expanding the use of online platforms to distribute educational materials to the public. While research indicates a substantial portion of the population has some awareness of various liver diseases, their understanding is often shallow [2].

A study has been done on bridging the gap in metabolic and endocrine care of patients during transition to discuss and share how transitional care is being managed within different institutions. The disparities exist based on gender and geography, exclusively in alcohol-related liver disease, and social determinants play a role in the disparate health outcomes. The current disparities in chronic hepatic disease and strategies have the potential to bridge gaps, improve quality, and promote equity in liver care [3]. Several barriers, including poor health literacy, the stigma associated with liver disease, a lack of practical and emotional support, and communication issues during patient consultations, can contribute to inequitable access to liver care [4].

In hepatology (the study of the liver), social factors are strongly associated with both the prevalence of liver disease and patient outcomes. Specifically, chronic liver disease, irrespective of its cause, excessively affects racial and traditional

minorities and individuals living in low-income communities [5]. Knowledge gaps among public health and primary care providers, coupled with restrictive prescribing policies that limit treatment access to specialists in urban centers, create health discrimination, particularly for native communities. Requiring individuals from distant areas to travel to cities for diagnosis and treatment further exacerbates this inequity. Addressing this issue necessitates supporting local primary healthcare providers in developing and maintaining integrated services for HCV (Hepatitis C Virus) prevention, diagnosis, handling, and support [6].

The illness and death from chronic liver disease are increasing day by day; in these cases, they are preventable and remediable if they are detected early, and appropriate lifestyle changes should be made. One of the most common causes of chronic liver damage is excessive alcohol consumption (leading to alcohol-related liver disease), obesity, and related metabolic risk factors (resulting in non-alcoholic fatty liver disease), which contribute to the rising morbidity and mortality [7].

Health disparities are preventable and systematic differences in health outcomes that negatively impact socially disadvantaged groups. These groups are often defined by factors like race, ethnicity, income, gender, religion, sexual orientation, disability, geography, or other characteristics associated with discrimination or marginalization [8].

Scientific work is being carried out to place greater stress on research effectiveness as a strategy for bridging the gap between research and practice. Telemedicine extends a new technology to reach previously inaccessible patients, yet there are problems with implementation, the potential to exacerbate disparities, and the requirement for research to confirm its effectiveness [9].

Integrating hepatic care services into public welfare programs can improve the approach to care and facilitate early detection and management of liver disease. An integrated care model for hepatic burden focuses on providing comprehensive and coordinated care for individuals with liver disease, addressing both their medical and social needs. This approach recognizes that liver situations are often chronic and complex, requiring a multidisciplinary team and a patient-centered approach. A team of healthcare professionals from various disciplines, such as hepatologists, gastroenterologists, pharmacists, social workers, nutritionists, and rational health providers, work together to provide holistic care. The team works to develop and implement comprehensive care and addresses the individual's specific needs, ensuring continuous transitions between different services and providers. The individual is actively involved in their care, with their preferences and goals considered when making decisions about treatment and management of

CHAPTER 4

Socioeconomic Impact on Liver Diseases: Breaking the Cycle

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Abstract: Chronic liver diseases cause a widespread socioeconomic burden on sufferers and the healthcare system, but for certain reasons, they remain underexplored. The primary reason for this burden is the high treatment costs and fitness-related issues faced by patients with chronic liver diseases, which vary across different stages of the disorders and have uncertain causes. Cirrhosis and other chronic liver disorders are among the most common liver diseases. As a result, these disorders lead to significant economic and social burdens on society. Cancers significantly increase the risk of high mortality and morbidity rates. According to recent data from the World Health Organization, chronic liver disorders are becoming increasingly prevalent and burdensome. As a result, this trend is increasing the socioeconomic burden of treating other chronic liver disorders, such as nonalcoholic fatty liver disease and alcohol-associated liver disorder. Nowadays, some countries are suffering from chronic diseases like hepatitis B and hepatitis C, such as the Middle East, Northern Africa, and Southern Asia. According to some reports, patients in central Japan and North Africa are suffering from nonalcoholic fatty liver disorder. In some reports, it was observed that patients in Eastern Europe and West Africa are suffering from alcohol-associated disorders, which are ultimately creating an economic burden on society.

Some reports indicate that Middle East countries have the highest treatment costs for liver cirrhosis. In some reports, it was found that all types of socio-demographic groups, including those in the USA, are experiencing the burden of treating another liver disease known as hepatocellular carcinoma. In some case studies, it was reported that currently, based on certain etiopathologies, several Asian countries, including China, Korea, India, Japan, and Thailand, have a high number of patients suffering from hepatitis B and C viruses, which results in a significant socioeconomic burden due to high treatment rates.

Keywords: Anatomy, Impact factors, Liver diseases, Physiology, Socio-economic factors.

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INTRODUCTION

Liver

The liver, located above the stomach and below the rib cage, is one of the body's most important glands. It performs very important functions in our human body, having a high ability to regenerate successfully without any issue. The liver serves several important functions, including the provision of enzymes that aid in the proper digestion of food. It also plays a crucial role in the removal of toxic substances from the body, thereby helping to maintain overall health. Additionally, the liver regulates blood glucose levels, which supports energy production at both cellular and tissue levels. Furthermore, it produces blood-clotting factors, which are essential for patients to recover more swiftly from both minor and major injuries and surgeries [1 - 3].

Structure of Liver

The color of the liver was found to be reddish brown in nature. The shape of the liver is like a cone in nature, which is placed very nicely above the spleen and stomach, as well as below the rib cage of the lungs. The weight of the liver is about 1500 grams.

The liver is divided into four distinct lobes: the prominent right lobe, the smaller left lobe, the caudate lobe, and the quadrate lobe. The falciform ligament, which looks like a sickle, separates the left and right lobes. It connects the liver to the abdominal wall. Additionally, the liver can be segmented into eight segments, each comprising smaller units called lobules. The primary role of these lobules is to produce bile within the liver and transport it to the hepatic duct for further processing [4 - 6].

Parts of Liver

The following are some of the most important parts of the liver:

- **Hepatic Duct:** It is a type of tube that transports bile outside the liver. It is developed from the division of the right and left hepatic lobes, which are regarded as ducts.
- **Ligament:** It is a thin and fibrous ligament, known as the falciform ligament, which separates the two distinct portions of the liver and connects them to the abdominal wall.
- **Glisson's Capsule:** It is regarded as a layer of loose connective tissue that is present in the outer layer of the liver, and it is also present in associated arteries and ducts.

- **Hepatic Artery:** This is one of the important blood vessels that transport oxygenated blood to the liver regularly.
- **Portal Vein:** It is one of the most essential sections of the liver. It is a type of blood vessel that carries blood from different organs, like the gastrointestinal tract, gallbladder, pancreas, and spleen, to the liver.
- **Lobes:** They are regarded as histopathological parts of the liver that segregate the full liver into right and left lobes.
- **Lobules:** These are considered the minute microscopic building blocks of the liver.
- **Peritoneum:** It is a type of membrane that forms the outer layer of the liver and is regarded as the external part of the liver (Fig. 1) [7 - 9].

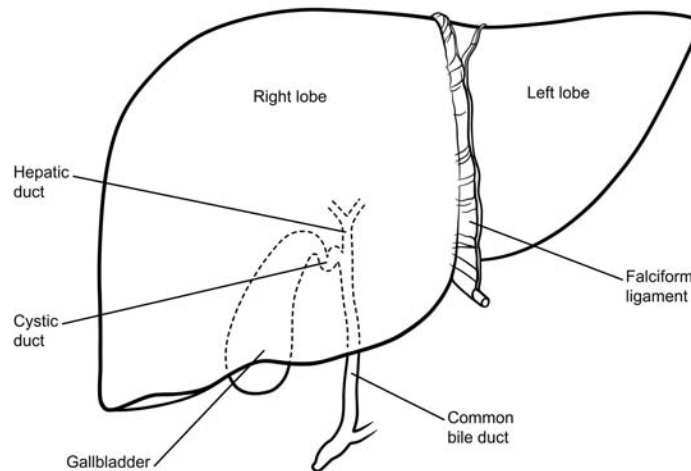


Fig. (1). Anatomy of Liver [7 - 9].

Functions of the liver

Some of the functions of the liver are as follows:

- **Formation of Bile**

The main function of the liver is to produce bile, which is one of the important enzymes that help digest and absorb fats. Another important function of bile is to help in producing some of the essential vitamins and cholesterol [10].

- **Absorption of Bilirubin**

Another important function of the liver is to absorb bilirubin, which is produced from the breakdown of hemoglobin. During this whole procedure, free iron is released, which is stored in the liver in order to produce blood cells like RBC, WBC, *etc* [11, 12].

CHAPTER 5

Early Interventions: Catching Liver Disease Before It's Too Late

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Abstract: Liver diseases are frequently referred to as “silent killers” due to their insidious progression over years before the manifestation of conspicuous clinical symptoms. Because there are no early warning signs, diagnosis often happens at later stages, like cirrhosis or hepatocellular carcinoma (HCC), when there aren't many treatment options. The title of this chapter, “Early Interventions: Catching Liver Disease Before It's Too Late,” tells you what it's about: the biological mechanisms, molecular pathways, and public health frameworks that make it possible to find and stop liver diseases early.

We investigate how comprehending the molecular pathogenesis—including oxidative stress, mitochondrial dysfunction, lipotoxicity, inflammatory signalling (TNF- α , IL-6, TGF- β), and the fibrogenic activation of hepatic stellate cells—can facilitate early diagnosis and intervention. The chapter emphasises the potential of non-invasive biomarkers, including serum enzymes (ALT, AST, GGT), cytokeratin-18 fragments, microRNAs (miR-122, miR-192), and epigenetic signatures, as well as advanced imaging techniques such as Magnetic Resonance Elastography (MRE), transient elastography (FibroScan), and AI-driven imaging analytics. When it comes to interventions, the focus is on changing one's lifestyle, improving one's diet, and taking medications (such as antioxidants, PPAR agonists, anti-fibrotic agents, and immunomodulatory agents). The conversation also includes new gene- and RNA-based treatments, such as small interfering RNA (siRNA) and antisense oligonucleotides (ASOs), which are the cutting edge of precision hepatology.

The chapter emphasises the importance of incorporating early diagnostic tools and preventive care into welfare and public health programs, linking laboratory discoveries with community health practices. Early intervention can change the course of liver disease around the world, going from late-stage management to proactive prevention, thanks to collaboration between clinicians, scientists, data experts, and policymakers.

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Ravindra Mishra, Vinay Jain, Harsha Rathore & Salahuddin Mohammed (Eds.)
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Keywords: Artificial intelligence, Biomarkers, Early intervention, Fibrosis, Hepatocellular carcinoma (HCC), Liver disease, Mitochondrial dysfunction, Non-alcoholic fatty liver disease (NAFLD), Oxidative stress, Precision medicine, Public health, RNA-based therapy, Translational hepatology.

INTRODUCTION

The liver is one of the most metabolically active organs in the body. It does more than 500 important things that keep the body in balance, such as getting rid of xenobiotics, making plasma proteins, making bile, storing glycogen, and controlling the metabolism of carbohydrates, lipids, and amino acids [1]. It is also very important for keeping the immune and endocrine systems in balance. Because the liver has so many important jobs in the body, even small problems with it can have big effects on the whole body, causing metabolic problems, oxidative stress, and problems with multiple organs.

The liver can heal itself, but it is still very vulnerable to damage from viral infections, too much alcohol, metabolic syndrome, and drugs that hurt the liver. Long-term exposure to these risk factors can cause fibrosis, cirrhosis, and hepatocellular carcinoma (HCC), which together make up a large part of the world's disease burden [2]. The Global Burden of Disease Study (GBD 2023) says that liver diseases kill about 2 million people each year, which is almost 4% of all deaths worldwide. Most of these deaths are caused by complications of cirrhosis and HCC [3].

The Change in the Causes of Liver Disease

In the 20th century, viral hepatitis (HBV and HCV) and Alcoholic Liver Disease (ALD) were the principal aetiologies of chronic liver injury. Nonetheless, the 21st century has experienced a significant epidemiological shift with the emergence of metabolic dysfunction–associated steatotic liver disease (MASLD), previously referred to as Non-Alcoholic Fatty Liver Disease (NAFLD) [4, 5]. MASLD now affects about 30% of people around the world, making it the most common liver disease in the world [6]. Its pathophysiology is intricately associated with obesity, insulin resistance, and dyslipidaemia, constituting the hepatic manifestation of metabolic syndrome. This change in the way diseases spread shows how important it is to include metabolic screening and lifestyle changes in liver health management, especially in health programs that are based on welfare.

The Problem of Silent Progression

One of the biggest problems in hepatology is that liver diseases often get worse over time without any noticeable symptoms. Patients remain asymptomatic until significant parenchymal damage has transpired. By the time symptoms like jaundice, ascites, or hepatic encephalopathy show up, cirrhosis or carcinoma may have already become permanent [7]. This “silent epidemic” underscores the urgent necessity for early biomarkers and screening instruments capable of identifying molecular and structural alterations prior to the onset of overt liver failure [8].

Reasons for Early Interventions

The justification for early intervention is based on the liver's distinctive capacity for regeneration and the reversibility of fibrosis, provided that the underlying cause is promptly addressed [9]. Lifestyle changes, antiviral treatment, or medications can help with early-stage steatosis and inflammation. This stops the disease from getting worse and turning into cirrhosis and HCC. For example, starting antiviral treatment for hepatitis B or C early can lower the risk of cirrhosis by up to 80%. Also, people with MASLD who lose 7–10% of their body weight and keep it off see big improvements in their histology [10, 11].

Transient elastography (FibroScan) and Magnetic Resonance Elastography (MRE) are two examples of non-invasive imaging techniques that can be used to check for fibrosis progression in real time. This makes screening easier and cheaper for population-level interventions [12]. When used with serum biomarker panels and AI-based predictive models, these technologies make it possible to find diseases early on a large enough scale that they can be included in national health and welfare programs [13].

Combining Biomedical and Public Health Points of View

Molecular biology elucidates the mechanisms of hepatic injury, yet public health strategies are crucial for converting this knowledge into effective community-based interventions. The World Health Organisation (WHO) supports a multi-tiered strategy that includes primary prevention (vaccination, alcohol regulation, and metabolic risk control), secondary prevention (early screening and biomarker surveillance), and tertiary prevention (management of established disease and complications) [14].

In welfare-driven health systems, especially in low- and middle-income countries, connecting primary care networks, digital health technologies, and AI-assisted diagnostics can help fill in the gaps in how liver disease is treated. This kind of

CHAPTER 6

The Role of Nutrition: Fighting Liver Disease through Food Security

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Abstract: A regulated and well-balanced diet with abundant fruits, vegetables, whole grains, and lean proteins, and containing limited saturated fats, sugars, and excessive sodium, is imperative for the prevention and treatment of liver disorders, a significant health issue worldwide. The other topics that relate to nutrition, food security, and liver health are interconnected in this chapter, where the significance of accessible nutrient-rich meals in liver disease management is outlined. This chapter explains the detrimental impact of malnutrition and overnutrition and the nutritional aspects affecting liver functions, including the lack of macronutrient and micronutrient balance. It highlights the fact that food security plays a vital role in ensuring that adequate nutritional intake is maintained to prevent and cure liver problems, particularly in poor communities. This chapter continues by discussing how nutritional changes, fortified food, and functional foods are rich in antioxidants and anti-inflammatory properties and can be used to improve the health of the liver by improving the liver enzymes and preventing the accumulation of fats. The primary objective, however, is to discuss approaches that enhance the population's health and eliminate food insecurity by facilitating sustainable food systems. The chapter integrates scientific details with practice to highlight the importance of diet in the worldwide action to fight liver diseases.

Keywords: Food security, Functional foods, Health, Liver disease, Micronutrients, Nutrition.

INTRODUCTION

Liver disease is the leading cause of death globally, as it causes approximately 2 million deaths annually, which is 4 percent of all deaths. This illness poses much difficulty to the health systems of the populace in the world. The majority of the deaths occur as a result of cirrhosis and hepatocellular carcinoma complications, yet fewer people die as a result of acute hepatitis. Viral hepatitis, alcohol consu-

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mption, and Non-Alcoholic Fatty Liver Disease (NAFLD) are the major causes of cirrhosis in the world. Most cases of acute hepatitis are caused by hepatotropic viruses, whereas the proportion of cases caused by drugs has increased and strains the available healthcare resources. The causes of liver diseases are numerous; however, these causes are frequently affected by the factors of lifestyle and, in particular, by the effects of nutrition and diet. Liver health is determined by a healthy diet because the liver is the metabolic center of the body that helps in the production of proteins, detoxification, and the regulation of nutrients. The food intake of an individual may be disturbed by malnutrition, overnutrition, or deficiency of any micronutrient, which results in impaired liver functioning, a deteriorated state of health, and chronic liver disease. Therefore, it is crucial to take into account dietary factors for the prevention and treatment of liver issues [1, 2].

Liver health is closely associated with food security, the regular supply of sufficient, safe, and nutritious food. Malnutrition is aggravated by food insecurity in most of the regions, and liver disorders are also attributed to food insecurity. Poor food and poor access to medical services expose persons in low-income or food-insecure settings to the risk of liver disease. This chapter discusses the relationship between liver disease, food security, and nutrition, highlighting the significance of sustainable food systems and nutritional therapies in promoting liver health. It studies the underlying causes of food poverty and nutritional deficiencies, and how these factors affect the development of liver diseases, and the specific therapy to mitigate the effects. The most important issues are the impact of nutrition on the state of the liver, the impact of food poverty, and the possibility of welfare programs to decrease the inequalities in liver disease treatment and food security [3, 4]. To reverse liver disease and enhance the health of people, this chapter integrates knowledge based on evidence and practical advice on the strategic policy of nutritional and food security.

KNOWING LIVER DISEASES

A diverse range of diseases, including viral infections, metabolic disorders, high alcohol consumption, and genetic or environmental factors, have a devastating impact on global health by significantly promoting morbidity and mortality worldwide. The section describes the most common liver diseases, causes, and risk factors.

Significant Forms of Liver Diseases

Viral Hepatitis

Asymptomatic to severe liver failure may occur due to a range of disorders, including viral hepatitis. It can be caused by hepatitis B (HBV) and by hepatitis C (HCV). The prevalence of Hepatitis B among the global population is estimated to be 296 million people; East Asia and Sub-Saharan Africa have some of the highest rates of the disease. It could have a range of causes, one of which is viral hepatitis C (HCVP). The prevalence of hepatitis B is approximately 296 million individuals across the globe; East Asia and Sub-Saharan Africa record the highest incidence. Asymptomatic chronic infections with HBV may result in hepatocellular carcinoma (HCC) and cirrhosis, which is characterized by a gradual accumulation of inflammation and liver damage. Hepatitis C is a virus that is generally transmitted by means of blood, and it is known to affect about 58 million people all over the world. Although there is no vaccine that prevents HCV, there are high-cure-rate antiviral drugs. HBV and HCV are also reasons to consider liver-related mortality and morbidity, although they have been treated, indicating the relevance of prevention strategies such as screening and vaccination [5].

Non-Alcoholic Fatty Liver Disease (NAFLD)

It is a metabolic condition characterized by increasing liver fat levels, abdominal pain, and swelling of the liver. Among patients with NAFLD, 30–100% are obese. Steatosis in obese people is 4.6 times as likely as in normal people. Type 2 diabetes mellitus is common in NAFLD patients, with a range of 10 to 75 percent prevalence. It was discovered that one out of three respondents who had NAFLD had been diagnosed with type 2 diabetes mellitus. NAFLD refers to a range of hepatic diseases, ranging from moderate lipid accumulation to more serious disease that is characterized by inflammation and hepatocellular necrosis, known as non-alcoholic steatohepatitis (NASH). When untreated, NASH may develop into cirrhosis, major fibrosis, and hepatocellular carcinoma (HCC). Insulin resistance is directly connected with the development of NAFLD since it assists hepatocytes in accumulating additional free fatty acids, which, in turn, initiates the process of oxidative stress and the inflammatory process [6]. Such lifestyle habits as improper food consumption and lack of physical activity have a major impact on the prevalence of NAFLD, therefore justifying the need for national health change campaigns targeting these modifiable risk factors.

CHAPTER 7

Alcohol and the Liver: Public Welfare's Role in Harm Reduction

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Abstract: Alcohol use is a major public health issue, with heavy consumption causing serious liver conditions like fatty liver, hepatitis, cirrhosis, and hepatocellular carcinoma. The economic and social cost of Alcohol-associated Liver Disease (ALD) warrants active public welfare measures to reduce harm and create healthier populations. Public welfare programmes play a significant role in harm reduction strategies, including public awareness campaigns, policy control, access to medical care, and rehabilitation services. Harm reduction strategies like taxation of alcoholic drinks, limiting the sale and advertisement of alcohol, and encouraging low-risk drinking recommendations are discussed. Community-based activities such as alcohol screening, counselling, and reduced-cost treatment programmes also contribute to the prevention of ALD development. Including harm reduction in healthcare systems, especially through early detection and intervention, is key to decreasing morbidity and mortality rates. The efficacy of current policies and possible enhancements, such as an increased focus on education and behaviour interventions, are also addressed. Prioritising harm reduction will allow public welfare programmes to play a role in reducing the prevalence of alcohol-induced liver diseases and enhancing overall public health outcomes.

Keywords: Alcohol, Control policies, Health, Liver disease, Public welfare.

INTRODUCTION

Public health is protected through welfare programmes, as they make ways to mitigate the adverse effects of alcohol use. Alcohol metabolism involves the liver; however, continuous drinking will impair its functionality and result in conditions such as fatty liver, cirrhosis, and liver cancer. Such diseases have a broad impact, from affecting an individual's life to impacting a community and even a health system. Welfare programmes can become very important components in the stra-

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tegy of harm reduction by focusing more on prevention and education, and increased access to care. Public health campaigns can enhance awareness about heavy drinking dangers, as well as how it will affect the liver. For example, warning labels on alcohol bottles and community education programmes can teach people about such risks.

Policies such as increasing the tax on alcohol, restricting its sales, and limiting advertisements can be implemented by governments. Free liver health screenings, counselling services, and rehabilitation programmes for alcohol dependence should also be provided by the welfare programme to at-risk individuals. The provision of support groups and affordable healthcare ensures that there is care for vulnerable populations.

These combined efforts enable welfare programmes to safeguard public health, lighten the burden of liver disease, and make communities healthier. Prevention and care can then work together for their clients struggling with alcohol [1].

Drinking alcohol is a significant public health issue worldwide, causing a lot of illness and death. Despite its dangers, an estimated 2.4 billion individuals globally drink alcohol, with about 950 million drinking heavily episodically—more than 60 grams of pure alcohol at least monthly. Although previous research indicated that moderate drinking may have some health advantages, more recent studies show that even low levels of drinking can have severe health effects.

Alcohol consumption has serious adverse impacts, as reported by the World Health Organization in 2018 on alcohol and health. Harmful alcohol use alone in 2016 caused 132.6 million disability-adjusted life years and caused more than 3 million deaths every year, which was responsible for more than 5% of total global deaths. Alcohol consumption exceeds the death rate caused by diseases like HIV/AIDS, diabetes, and tuberculosis.

One of the organs most impacted is the liver, which is vital for digestion, detoxification, and general metabolic processes. Alcohol-related Liver Disease (ALD) is a significant result of heavy drinking, resulting in about 372,000 deaths worldwide annually. The liver, which is found in the upper right part of the abdomen below the ribcage, performs more than 500 vital functions of the body. Without it, survival would be impossible.

The most frequent cause of liver disease is too much alcohol drinking. When drinking alcohol, this substance is filtered through the liver into acetaldehyde, a known toxin. Over time, massive intake can bring about inflammation in the liver, resulting in scarring and permanent injury. Alcohol-induced liver disease goes through stages, leading to potentially dangerous conditions [2].

Impact and Prevalence

Chronic liver disease impacts nearly 4.5 million Americans, or 1.8% of the nation's adult population. With 54,803 deaths in 2020, liver disease was the tenth most common cause of death. In 2016, cirrhosis alone caused 1.2 million deaths, clearly showing the huge mortality burden of the disease.

Liver Disease Prevalence Worldwide

Liver disease is heavily burdened. Chronic liver diseases caused by various conditions include Hepatitis B Virus (HBV) 29%, Hepatitis C Virus (HCV) 9%, Alcohol-related Liver Disease (ALD) 2%, and Non-Alcoholic Fatty Liver Disease (NAFLD) 60%. Affecting a population of nearly 1.5 billion individuals in 2017, liver disease constitutes a leading cause of mortality and causes nearly 2 million deaths per year, or 4% of deaths globally.

An estimated 1.8% of adults in the United States, or 4.5 million adults aged 18 and over, have been diagnosed with liver disease. Liver disease was the 10th largest cause of death in the United States in 2020, killing 54,803 people. These numbers underscore the prevalence of liver disease and how it impacts general health (Fig. 1) [3].

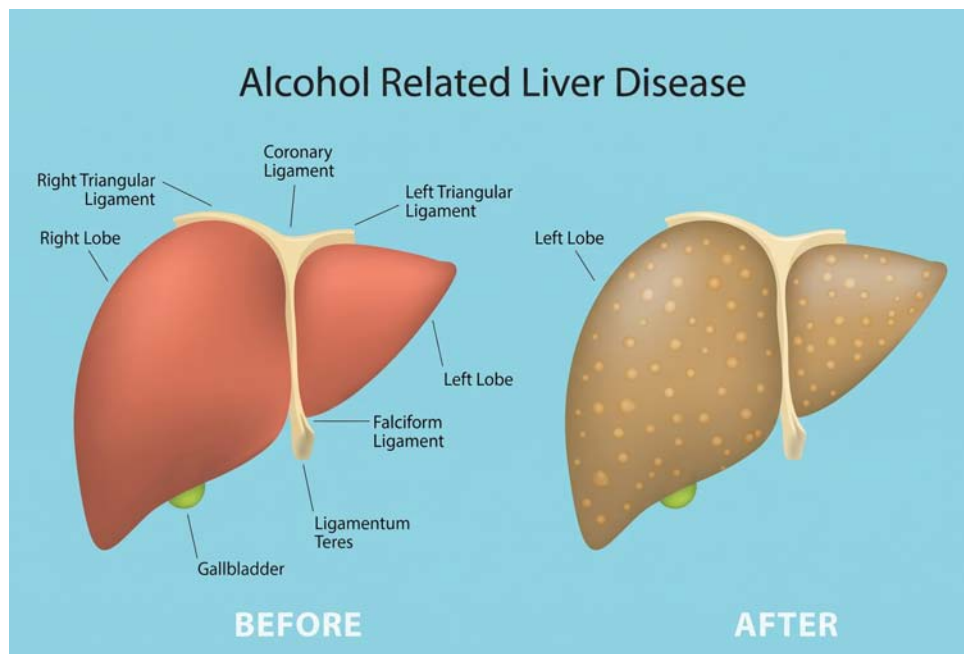


Fig. (1). Alcohol-related liver disease affects the liver [4].

CHAPTER 8

Best Practices: Innovative Approaches to Liver Health in Welfare Programs**Ravindra Mishra¹, Vinay Jain^{2*}, Nitin Dasputre³ and Dharmendra Dayal⁴**¹ *Department of Pharmacology, ShriRam College of Pharmacy, Banmore, Morena Madhya Pradesh, India*² *Department of Pharmacognosy, ShriRam College of Pharmacy, Banmore, Morena, Madhya Pradesh, India*³ *European Business & Regulatory Affairs, Tillomed Laboratories Limited, Luton, England*⁴ *Department of Pharmaceutical Chemistry, ShriRam College of Pharmacy, Banmore, Morena, Madhya Pradesh, India*

Abstract: The liver is a critical organ that performs crucial physiological activities, including metabolism, detoxification, synthesis, and storage. It is the key component in homeostasis, but liver-associated illnesses are an international health crisis. The cases of hepatitis, cirrhosis, and Non-Alcoholic Fatty Liver Disease (NAFLD) have risen, thus the need to adopt effective prevention and management measures. The welfare programs that include the government, institutional, and community-based programs are the integrated programs that are aimed at enhancing the awareness, early detection, and access to treatment of liver disorders. The chapter deals with evidence-based and innovative initiatives to improve liver health using welfare programs. It defines preventive, nutritional, diagnostic, and technological interventions that will help to decrease the burden of the disease. The talk focuses on how liver health can be incorporated into wider public health programs and welfare to make it accessible, affordable, and sustainable.

Keywords: Early screening, Hepatitis, Liver health, Nutrition, Policy integration, Prevention, Public health, Welfare programs.

INTRODUCTION

The liver is considered to be one of the most complex and useful organs in the body. It has significant roles in metabolism, detoxification, and biochemical control [1]. It maintains the correct levels of nutrients, hormones, and waste

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products in the body and is the primary location of the breakdown of carbs, lipids, and proteins. Hepatocytes are the cells that comprise the liver and participate in the control of enzymatic and metabolic functions, and provide stability of the body systemically and locally.

The liver is involved in over 500 biochemical roles, which are required to support life [2]. The most valuable jobs at it are:

- Macronutrient metabolism (carbohydrates, lipids, and proteins).
- Decontamination of xenobiotics, such as drugs, alcohol, and environmental toxins.
- Digestion and fat absorption through the secretion of bile.
- Production of essential plasma proteins like albumin, fibrinogen, and transferrin.
- Storing of vitamins and minerals such as A, D, B12, and iron.

Although the liver is susceptible to various diseases, including acute viral as well as degenerative diseases that destroy its structure and functioning, it has the capability to efficiently heal itself [3]. Globally, liver-related diseases result in more than 2 million deaths annually, which is approximately 4 percent of total deaths [4].

Modern lifestyles characterized by a lack of activity, a diet rich in fats, and drinking have increased cases of NAFLD and related metabolic ailments. One of the most significant health problems in the world is considered to be viral hepatitis, as well as exposure to hepatotoxins. Diseases often prove difficult to detect and prevent at early stages due to asymptomatic development and the general public being unaware of them [5].

Welfare programs are relevant to address these problems since they enhance liver health through organized preventive, diagnostic, and treatment services. These types of programs offer healthcare to not only the hospitals, but also include liver disease management in community-based programs, awareness programs, and nutrition programs [6]. The welfare-based health interventions correspond to the international goals, including the United Nations Sustainable Development Goal (SDG) 3.3, which is to eradicate the epidemics of hepatitis and other significant illnesses by 2030 [7].

By including liver health in welfare programs, it is possible to:

- Provide vulnerable populations with equal access to health care;
- Preventative vaccination and nutrition;
- Make frequent screening and health education;

Strengthen disease surveillance and care delivery systems at the community level, and more.

THE IMPORTANCE OF WELFARE PROGRAMS TO LIVER HEALTH

Public welfare programs provide a just and structured method of enhancing the health of the people, particularly those who are poor or less prosperous. Preventive, diagnostic, and rehabilitative components are included in the larger healthcare policies in these programs to ensure that the most in need individuals receive the services they require when it comes to healthcare [8]. The welfare programs provide a crucial framework that can be used to address communicable and non-communicable liver diseases with coordinated strategies that would focus on prevention, awareness, and availability.

Preventive Health Frameworks

Welfare-based liver health management is largely based on preventive care; hence, vaccination, nutrition, and early diagnosis programs have been found to contribute to the reduction of individuals contracting liver disease. Indicatively, the hepatitis B vaccine is even today one of the best public health interventions, as millions of potential diseases and deaths worldwide have been saved [9]. Education campaigns that are aimed at excessive consumption of alcohol, unsafe injecting practices, and lack of sanitation also reduce the risk of viral and toxic liver diseases.

In India, preventive efforts have been initiated through welfare programs such as the National Viral Hepatitis Control Program (NVHCP) to ensure that individuals receive free screening, immunisation, and cure against hepatitis B and C at any of the levels of care. The program is consistent with the international target of eliminating viral hepatitis as a community health challenge by 2030 [10]. These types of prevention programs added to the current welfare programs ensure that they become long-lasting, are cost-effective, and involve a large number of people.

Lifestyle and Nutritional Interventions

Nutritional management is essential for completing welfare initiatives focused on liver health. The extraordinary diets have the proper proportion of antioxidants, vitamins, and lean proteins that aid the hepatic regeneration and detoxification [11]. The nutrition patterns that will lead to the reduction of the risk of fatty liver disease and metabolic syndrome could also be achieved through the welfare-based nutrition programs, such as mid-day meal programs, women and child health programs, and the public food distribution systems.

CHAPTER 9

Policy Blueprints: Designing Welfare Programs for Liver Diseases Prevention

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Abstract: Globally, liver disorders such as cirrhosis, hepatitis, and non-alcoholic fatty liver disease (NAFLD) present serious public health issues. To prevent these illnesses and reduce the burden on healthcare, effective social programmes are essential. With a focus on early identification, public awareness, and lifestyle treatments, this study offers policy guidelines for creating comprehensive liver disease prevention programmes. Targeted health education efforts, subsidised tests, nutritional assistance, and laws limiting the use of processed foods and alcohol are important elements. We also look at how government-private sector partnerships, community involvement, and digital health solutions might improve programme efficacy. These policy designs seek to promote equal access to preventative care and proactive liver health management by incorporating evidence-based practices.

Keywords: Early detection of liver disease, Early diagnosis, Health education, Nutrition support, Public health policies, Welfare programmes.

INTRODUCTION TO LIVER DISEASES AND PREVENTION

The largest organ in the body, the liver, accounts for around 2% of the average person's total body weight. The majority of physiological functions, such as growth, immunity, nutrition, energy metabolism, and reproduction, are linked to it. The liver is primarily responsible for the synthesis and excretion of bile, albumin, prothrombin, and complement, which are the principal effectors of the humoral branch of the immune system. The WHO information sheets on hepatitis state that about 170 million people suffer from chronic liver diseases caused by the hepatitis C virus, and 60,000 people die from acute and chronic hepatitis B each year.

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Major Liver Diseases

Hepatitis caused by drugs. One of the main causes of liver damage is known to be drugs. Twenty to forty per cent of all cases of fulminant hepatic failure are caused by medications, and over 900 drugs, poisons, and plants have been shown to induce liver damage. Inflammation brought on by some prescription medications, including herbal remedies, is known as drug-induced hepatitis. Two categories can be used to classify drug toxicity: A) medications that directly impact the liver and are dose-dependent, and B) medications that trigger an immunological response. Hepatocyte disruption from drug binding to intracellular proteins, disruption of transport proteins, catalytic T-cell activation from covalent drug binding to the immunogen P-450, hepatocyte apoptosis, mitochondrial disruption, and bile duct injury from toxic metabolites expelled in the bile duct are some of the pathophysiologic mechanisms of hepatotoxicity that are still being investigated.

Alcohol-induced hepatitis

This is an inflammation of the liver brought on by long-term, excessive alcohol use. More than 2 million people, or around 1% of the population, in the United States alone suffer from alcoholic liver disease, which is still one of the leading causes of liver disease worldwide. Several factors contribute significantly to alcohol-induced hepatitis, including metabolic, immunologic, family and genetic, dietary, and environmental factors. Acetaldehyde, the byproduct of alcohol metabolism, is a strong toxic metabolite that can harm hepatocytes directly. According to certain research, acetaldehyde-modified cytoskeletal proteins may trigger an immune response that results in the production of IgA antibodies and several pro-apoptotic cytokines.

Non-alcoholic steatohepatitis (NASH)

This illness, which affects non-alcoholics, is comparable to alcohol-induced hepatitis. Due to the ongoing rise in type 2 diabetes and obesity, the prevalence of NASH is increasing quickly. Despite the complexity and lack of understanding of the mechanism, a 2-hit hypothesis has been put forth:

- 1) Entails a fatty acid metabolic imbalance that causes hepatic triglyceride buildup, or steatosis.
- 2) It could be metabolic or oxidative stress, and attempts to correct for the disrupted lipid homeostasis may result in dysregulated cytokine production, which in turn causes inflammation and fibrosis.

Viral hepatitis

A significant cause of morbidity and mortality in the human population, viral hepatitis has become a global public health concern that affects hundreds of millions of people. Hepatitis viruses A, B, D, and E are known to cause viral hepatitis. In addition to these, additional viruses like Epstein-Barr virus, herpes simplex, cytomegalovirus, or yellow fever can also cause inflammation of the liver. In patients with persistent infection, cirrhosis and hepatocellular carcinoma (HCC) may occur. The inflammatory process is brought on by immune cells attacking the liver due to a virus present in the hepatocytes.

Despite the fact that proper history taking, physical examinations, and laboratory tests can be used to diagnose the aforementioned main liver illnesses, treatment options have proven ineffective, especially in this day and age of advanced technology. The scientific community, physicians, and patients are turning to Chinese herbal medicine, Ayurvedic medicine, and other well-liked alternative medical therapies due to the dearth of contemporary medical treatments and the growing number of patients suffering from liver illnesses [1].

We need liver disease prevention programmes for several critical reasons, all tied to the growing impact liver diseases have on individuals and society. These programmes not only save lives but also reduce the economic burden on healthcare systems and improve overall public health.

Here's why these programmes are essential:

Increasing Rates of Liver Disease

Liver illnesses, including cirrhosis, viral hepatitis, Non-Alcoholic Fatty Liver Disease (NAFLD), and liver cancer, are on the rise worldwide, primarily as a result of lifestyle choices such as poor eating habits, obesity, alcohol consumption, and ignorance. By targeting these risk factors at an early stage, prevention initiatives can help slow this tendency.

Silent Nature of Liver Diseases

People sometimes don't realise they're in danger until it's too late because many liver illnesses don't exhibit symptoms until they've advanced to an advanced stage. By identifying these disorders in their early, more treatable phases, prevention programmes—particularly those that emphasise early identification through screening can help avert serious repercussions like cancer or liver failure [2, 3].

CHAPTER 10

Community and Care: Mobilizing Local Resources for Liver Health**Meena Devi¹, Jyoti Malik¹, Nisham Rani² and Ritu Kataria^{2,*}**¹ *Department of Pharmaceutics, G.V. M College of Pharmacy, Sonapat, Haryana, India*² *Department of Pharmaceutical Chemistry, G.V. M College of Pharmacy, Sonapat, Haryana, India*

Abstract: The liver is an essential organ that performs more than 500 bodily activities and is crucial for metabolism, cleansing, and general health. However, hepatitis, non-alcoholic fatty liver disease, and liver cirrhosis are among the liver disorders that are on the rise worldwide. These conditions are frequently brought on by sedentary lifestyles, bad eating habits, alcohol abuse, and restricted access to healthcare. An integrated approach that incorporates community-based prevention activities, medical care, and emotional assistance is needed to manage liver health. Effectively dealing with these issues requires mobilising local health resources. In order to successfully manage liver disorders and improve liver wellness, local authorities, healthcare providers, educational organisations, and community assets must be engaged for liver health. Important information on the health of the liver, associated risks, and preventative treatments can be shared through campaigns for public health, educational programmes, and collaborations with businesses and religious organisations. People with liver illnesses can benefit from emotional and social assistance when patient support groups and counselling services are established. Encouraging local governments, corporations, and volunteers to contribute money improves these programmes' viability. Systemic change can be sparked by appealing to and interacting with legislators to support liver health regulations and healthcare infrastructure. For long-lasting effects, customised strategies that take into account regional settings and resources are crucial. By working together, we can create a future in which everyone has access to the support and care they require and liver health is given first priority.

Keywords: Community assets, Counselling services, Liver cirrhosis, Local resources, Sedentary lifestyles.

INTRODUCTION

The liver is essential to maintaining general health and well-being, yet it is usually underestimated because of its complexity in the human body. The liver is the

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largest internal organ in the body and a true powerhouse, silently carrying out more than five hundred vital processes, from vital protein and enzyme production to detoxification and metabolism. Therefore, the liver might weaken just like any other overactive and extremely effective organ. The health and well-being of an individual can be impacted by liver illnesses such as cirrhosis, fatty liver disease, and hepatitis. Despite the fact that liver health is essential, it frequently falls behind other healthcare concerns. In India, liver disease has become a major public health concern over the past ten years [1]. Non-alcoholic steatohepatitis (NASH) and Non-Alcoholic Fatty Liver Disease (NAFLD) have been added to the National Program for the Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS) by the Ministry of Health and Family Welfare of the Government of India as a result of this health crisis. The inclusion of liver illnesses in the NPCDCS emphasises increasing awareness and encouraging early detection and screening, prompt and precise diagnosis, and access to treatment that is both inexpensive and long-lasting. Globally, chronic liver disease is becoming a bigger issue. Even with efforts to manage and treat liver illnesses, serious health problems still exist. Millions of individuals worldwide suffer from liver illnesses, and complications from liver cancer, cirrhosis, and chronic viral hepatitis have been responsible for over 2 million deaths. Living with liver disease may seriously impact a patient's life and lead to physical complications and symptoms like ascites, tiredness, hepatic encephalitis, reduced mobility, difficulty sleeping, jaundice, and pain in the muscles, as well as serious mental health issues like stress, depression, anxiety, isolation from society, and fluctuations in body image. Individuals' daily lives are impacted, and their understanding and control of the illness are put under a lot of strain [2]. Thus, it is necessary to empower and encourage people with liver ailments to take care of themselves [3]. Still, research indicates that individuals with liver illness typically possess a limited understanding of the condition, and numerous individuals struggle to cope with liver disease because it is challenging and demands lifestyle changes, treatment adherence, and dietary recommendations [4–7]. This is made worse by the fact that liver disease is a condition whose management gets more complicated as it progresses [8]. Knowledge is a vital part of healthcare and is necessary for individuals' disease management plans. Social requirements that cannot be entirely satisfied by purely medical means are known as health concerns. Significant improvements in health can result from mobilisation and improved use of the economic, social interactions, and human assets already available. People lacking fundamental healthcare-related knowledge and access to healthcare that would enable them to manage their surroundings and/or behaviour for the benefit of their health [9]. Therefore, avoidable and treatable illnesses often result in death or incapacity and, even in cases where they do not, are a major cause of impoverished families becoming

poorer and more hopeless. When it comes to accessing healthcare, women and children face many more obstacles than men do. They are also often only given limited involvement in decisions pertaining to their own or their families' health. Their health and the way they seek medical attention are significantly harmed by this. The issue is not a lack of ideas but rather getting these solutions to the people and communities that need them. People with liver health issues can benefit greatly from the prevention, treatment, and support of their community. Cirrhosis, hepatitis, fatty liver disease, liver cancer, and other liver illnesses may necessitate long-term care, lifestyle modifications, and support networks [10]. When it comes to enhancing the mental and physical health of people with liver health issues, community involvement can have a big impact. For this reason, local resources are being mobilised for liver health maintenance, which entails making use of the networks, facilities, and community resources to support prevention, early detection, treatment, and assistance for those afflicted by liver illnesses. In order to solve a specific need or accomplish a shared objective, “mobilising local resources” refers to the act of leveraging and utilising the resources, skills, and qualities that are accessible within a given local community or location. Communities can develop long-lasting solutions to enhance liver health outcomes and alleviate the rising prevalence of liver-related illnesses by utilising the combined strength of local resources [11]. The efforts of national governments and outside funders to sustain and expand liver health programmes can be greatly aided by local resources. Health programmes can develop and expand healthcare services, engage both people and organisations in the community, and foster collaborations between the public, private, and government sectors by finding and utilising the entire spectrum of local resources, both financial and nonfinancial. Even while nonfinancial assets like workers, materials, and area are frequently undervalued, they are nonetheless valuable sources of assistance. Furthermore, they are present in all communities. Finding and utilising these resources to address community health needs is a problem for health initiatives. In order to accomplish this, programmes might have to collaborate with local people and organisations to better understand the needs of the community and to encourage deeper engagement with health care services. As communities grow more engaged and take on more accountability for their health care, people and organisations may actively push governments at every level to play a bigger part in assisting with health care delivery. Using available resources such as local people, organisations, companies, healthcare providers, and governments might be able to contribute the resources listed below Table 1 to the organisation [12].

IMPORTANCE OF MOBILIZING LOCAL RESOURCES

Community resource mobilisation has become more crucial due to a number of significant global healthcare challenges [13]. Each of these has ramifications for

CHAPTER 11

Overcoming Stigma: Changing Perceptions of Liver Disease in Public Health**Ankita Thakur¹, Sonalika Bhalla¹ and Rajnish Srivastava^{1,*}**¹ *Chitkara University School of Pharmacy, Chitkara University, Baddi, Himachal Pradesh, India*

Abstract: Liver diseases are major health issues throughout the globe. Although medical treatment of these diseases has improved, social stigma is still a significant problem in response to liver diseases. This chapter is based on the impact of stigma in liver disease concerning social, cultural, and psychological factors that define how society, and specifically patients, view patients with liver diseases. Liver disease perception might be linked to alcohol consumption and other hazardous habits, therefore leading to more discrimination, isolation, and delays in seeking health care amenities. Such stigmatizing attitudes should be eliminated to enhance patient outcomes and encourage early diagnosis. This chapter also highlights some of the strategies that promote positive behavioral change toward liver diseases, such as educating the general population, media engagement, and specialized training for healthcare providers. Dispelling myths and increasing awareness through educational campaigns will help society to better understand and accept individuals affected by liver diseases. Therefore, the goal is to show how important it is to include social and environmental factors, like culture, organizations, and policies, to change how the community views liver diseases and to encourage a healthier culture in healthcare settings. Global cooperation between governments, physicians, and other NGOs improves the perception of liver diseases in society and provides more attention to them. Challenging cultural beliefs is crucial to changing disease prevalence and increasing opportunities for proper treatment for patients with liver diseases.

Keywords: Awareness, Healthcare barriers, Liver disease, Public health, Public perception, Stigma.

INTRODUCTION**Overview of Liver Diseases**

Chronic liver disease has now become a global health issue that affects millions of people every year, leading to increased morbidity and mortality. The liver is the

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most vital organ of the human body that is responsible for performing various typical functions, such as metabolizing nutrients, detoxifying the blood, and producing bile, promoting overall well-being [1].

There are severe conditions arising from compromised liver function. Liver diseases are typically divided into two types: acute and chronic. Acute hepatic conditions include Acute Liver Failure (ALF), which is characterized by sudden and severe liver injury due to infections, toxins, or drug-induced liver damage. Chronic liver conditions include hepatitis, cirrhosis, fatty liver disease, and liver cancer, which are long-lasting illnesses that develop slowly and can be caused by things like drinking too much alcohol, metabolic issues, or viruses.

Although extensive statistical data on liver disease are available, there is still a lack of awareness among the population, with stigma and misunderstandings about these diseases. The World Health Organization (WHO) has stated that about 257 million people were living with chronic Hepatitis B Virus (HBV) infection in 2016, and 58 million people were living with chronic Hepatitis C Virus (HCV) infection in 2019, which added to the rising annual mortality rate due to cirrhosis and liver cancer [1 - 8].

The etiology of liver diseases is complicated and characterized by infections, lifestyle factors, genetic factors, and toxins. Viral hepatitis (types A, B, C, D, and E) is one of the most significant infectious etiological factors, and especially hepatitis B and C often lead to the development of chronic liver diseases such as liver cancer and cirrhosis [9]. The contributing lifestyle approach categories involve persistent alcohol intake, which results in Alcohol-related Liver Disease (ALD) [10]. Conversely, Non-Alcoholic Fatty Liver Disease (NAFLD) is induced by metabolic diseases such as obesity, diabetes, and metabolic syndrome and ultimately causes non-alcoholic steatohepatitis (NASH) [11]. Genetic diseases such as hemochromatosis, Wilson's disease, and alpha-1 antitrypsin deficiency damage liver functions by interfering with iron, copper, and protein metabolism [12]. Moreover, autoimmune liver diseases, including autoimmune hepatitis (AIH), Primary Biliary Cholangitis (PBC), and Primary Sclerosing Cholangitis (PSC), arise when the immune system targets liver cells and bile ducts, causing chronic inflammation and fibrosis [13]. Drug-Induced Liver Injury (DILI) is the damage caused by medications such as acetaminophen and certain herbal products or toxic exposures, including aflatoxins or industrial chemicals, that affects the hepatic system [14].

Hepatic circulation disorders, including Budd-Chiari syndrome, also known as hepatic vein thrombosis, and portal hypertension, negatively affect blood circulation in the liver, leading to its dysfunction [15]. Other diseases are also

leading causes of liver disease in neonates and children, such as neonatal hepatitis and biliary atresia [16]. In adults, hepatocellular carcinoma (HCC) and cholangiocarcinoma (CC) usually occur in participants with chronic liver disease or cirrhosis [17]. Furthermore, occupational exposure to hepatotoxic agents, as well as infections, including hepatitis A and E associated with poor hygiene, further leads to liver damage and functional impairment [18, 19]. The variability of these etiologies emphasizes the significance of multifaceted methods of approaching liver disease prevention, early diagnosis, and subsequent management.

Importance of Addressing Stigma in Public Health

The stigma attributed to liver ailments often elicits a link with lifestyle habits, especially consumption of alcohol. This limited perspective not only distorts the causes of liver disease into different approaches but also encourages prejudice that restricts a person from receiving the right and timely therapeutic treatment for liver disease. The stigma of these types of diseases worsens social isolation, restrains the means and opportunities for treatment, and hinders the application of efficacious health measures in fighting against diseases [20]. Eradication of stigma is also an important strategy of public health focused on fighting several types of liver diseases. Moreover, stigma prevents the target population from accessing medical care, holding onto their treatment regimens, and engaging in disease prevention practices [21].

Moreover, it influences the communication of public health information, policymaking, and resource allocation, thus fostering inequality in health care service delivery. Public health agencies can raise awareness of liver illness by altering societal attitudes and perceptions, which will create a significant positive effect and lead to better outcomes in terms of the quality of life for individuals. This social understanding emphasizes that individuals must change their perception of liver diseases and replace blame with empathy for patients, as these diseases can result from various causes, including genetic, environmental, and social factors [22]. This chapter focuses on the concept of the interconnection of stigma and liver disease, especially in patients, populations, and the overall delivery of healthcare solutions. It evaluates the preventive measures to combat stigma, which include teaching, policymaking, and changing the laws that would ensure equal treatment for patients. The stigma presents an opportunity to create a foundational framework that enables solutions aimed at empowering individuals from diverse cultural and marginalized backgrounds, contributing to the development of a healthier society.

The Road Ahead: Future-Proofing Public Welfare Against Liver Disease

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Abstract: Liver disease is a major global health problem that causes 4% of all fatalities. Modifiable lifestyle factors such as excessive fast food and alcohol consumption, physical inactivity, and an aging population considerably contribute to this burden. Non-alcoholic fatty liver disease (NAFLD) and its more advanced variant, metabolic dysfunction-associated fatty liver disease (MAFLD), are swiftly becoming significant risks to worldwide healthcare systems. This chapter will examine new approaches to detecting and treating liver disease early. We will discuss how ID-LIVER (Integrated Diagnostics for Early Detection of Liver Disease) could address clinical problems, socioeconomic issues, and early disease detection. Digital health platforms can give patients tools to help them take care of themselves, and AI-based diagnostics could help find liver abnormalities earlier and more accurately. Personalized medicine is another promising way to make healthcare more effective and help patients get better. India has acknowledged the necessity for cohesive national efforts to address NAFLD. These kinds of plans stress how important it is to do better research and come up with new ideas for treating liver disease. Strong public education programs are also crucial for stopping problems before they start and getting help early. Policymakers may greatly lower the chance of getting liver disorders by running campaigns to raise awareness and making it easier for people to get information about liver health. This chapter will argue for various ways that mix new technologies with public health programs. To deal with the growing problem of liver disease around the world, we will need integrated solutions like these.

Keywords: Digital health, Integrated solutions, Liver disease, Public health, Public welfare.

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INTRODUCTION: THE GROWING CHALLENGE OF LIVER DISEASE

Overview of Liver Disease

Annually, about 2 million deaths are caused by liver disease worldwide, with chronic liver disease, like hepatitis, and liver cancer being responsible for about 1 million deaths annually [1]. The global burden is increasing drastically with time. The cause of liver disease mortality has been portrayed in Fig. (1).

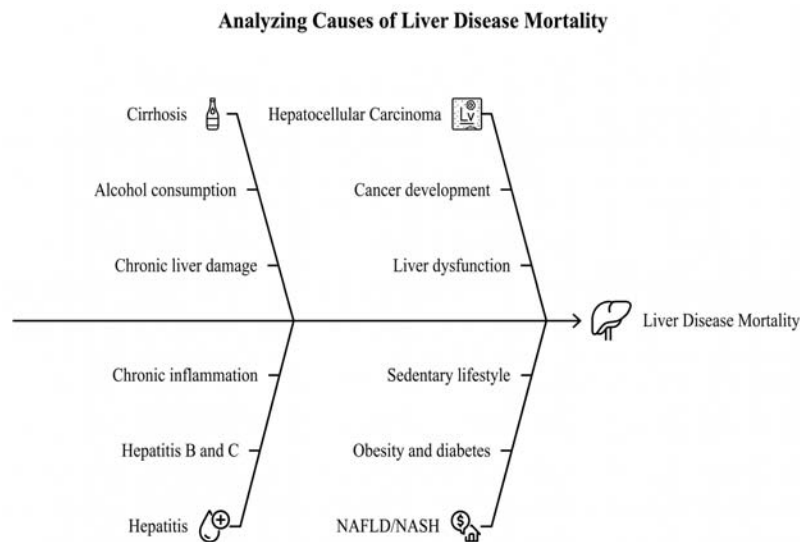


Fig. (1). Factors influencing mortality from liver disease [1].

Reports say that liver disease alone kills 2 million people per year. Complications of cirrhosis, viral hepatitis, and hepatocellular cancer are key contributors to the epidemiology. The actual figures may be higher due to underreporting and differences in how cases are identified. Several problems make it hard to accurately measure the burden of liver disease. In Africa and other regions where the disease is common, there is either insufficient data on cause-specific mortality or none at all. About one-third of the world's countries don't have a reliable way to track deaths. This situation makes it very hard to know what's really going on with the disease. Even in countries with advanced healthcare systems, the characteristics of liver disease render it challenging to categorize cases according to both etiology and disease stage. Epidemiological investigations encounter many methodological obstacles, including:

- Referral bias when data is predominantly sourced from specialized tertiary care centers.

- Problems in sampling populations in hospital and outpatient settings.
- Various healthcare systems define diseases differently (for example, some regions use alcoholic hepatitis as cirrhosis).

Bias in late-stage diagnosis occurs because many people are first identified after they have developed cirrhosis, despite using various methods to determine liver disease, such as lab tests, liver biopsies, non-invasive markers, imaging studies, death certificates, and self-reported data.

Geographic, demographic, and socioeconomic factors also contribute to the distribution and prevalence of liver disease. There are big differences based on:

- Gender-specific risk factors and treatment responses.
- Socioeconomic position and accessibility of healthcare facilities.

There are instances where liver disorders and cirrhosis are inadequately reported as the major cause of death, which is essential for obtaining an accurate calculation of mortality attributed to liver disease. There are many reasons why this can happen, such as:

- Competing causes of death.
- Complex disease interactions and involvement of numerous organs.
- Different coding practices in different places.
- Some areas do not know much about medicine.

Furthermore, chronic liver diseases like NAFLD and alcoholic liver diseases (ALD) are gradually increasing due to present lifestyle habits and the huge presence of obesity in the current population; there are increasing cases of alcohol consumption in many areas, too. By 2030, the cases of NAFLD and NASH are estimated to increase by 100.9 and 27, respectively, as shown in Fig. (2) .

We can take important steps to address the rise in liver disease cases, such as establishing standardized diagnostic criteria, improving surveillance systems, and working together on a global scale. These actions will help reduce strain on healthcare systems and enhance patient outcomes worldwide [3].

Trends and Risks Around the World

Liver illnesses, especially chronic liver diseases (CLD), are growing rapidly every day. The main reasons are metabolic problems and drinking alcohol, both of which are on the rise. With a beneficial public healthcare plan for working together at the federal and state levels to treat steatotic liver disease (SLD), direct individual efforts and implementation will help make things better.

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