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RESEARCH ARTICLE
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CONTRIBUTION OF CHRONIC LIVER DISEASE BURDEN AS COMPARED TO AVERAGE LIFE EXPECTANCY OF THE WORLD

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ABSTRACT

INTRODUCTION: Disability adjusted life years (DALY) represent a comprehensive health metric that captures both the years of life lost due to premature death (YLL) and years lived with disability (YLD). This indicator offers a holistic perspective on disease burden, reflecting both the increasing health challenges and the diminished quality of life caused by a particular disease. In this study, we aimed to calculate DALY's among patients of chronic Liver disease (CLD) to highlight both the fatal and the non-fatal consequences of the disease. This approach is intended to assist in development of policies and the effective allocation of healthcare resources. Chronic liver disease significantly contributes to the overall disease burden in Pakistan.

MATERIALS AND METHODS: This was a descriptive case series study carried out over an 8-month period, from April 2022 to November 2022, at Gulab Devi hospital (semi-private tertiary care chest hospital) affiliated with Al-Aleem medical college Lahore, Pakistan. A total of 45 patients who were suffering from chronic liver disease for more than 6 months were interviewed. Participants were selected using purposive sampling technique. YPLL was calculated by using Child Pugh's score to generate the estimated years of life left. For YLD, duration of disability obtained from the questionnaire as duration of the specific symptoms were quantified and multiplied with disability weight for Chronic liver disease. All the statistical analysis was done through SPSS software.

RESULTS: 45 patients who presented with chronic liver disease had mean DALY of 13.9948 in accordance with global average life expectancy. YLL contributed a major part in the calculation of DALY. The mean DALYs was 9.6231 for the females and 5.2748 for the males on the basis of average global life expectancy which was contradicted by other studies. Most patients reported that they were suffering from the disease for the period of six months and the most common symptoms were bloating, restriction while performing work, diet limitation and body pain.

CONCLUSION: According to the findings of our study, 45 patients who suffered from chronic liver disease have lost a total of 615.81 DALYs based on the life expectancy of Pakistan, while

629.77 DALYs lost when based on average global life expectancy. Appropriate steps must be taken to decrease the health burden associated with CLD.

KEYWORDS: Disability-Adjusted Life Years; Chronic Liver Disease; Years of Life Lost Due to Premature Mortality; Years Lost to Disability; Years Of Potential Life Lost; Disease Burden

INTRODUCTION

Disability adjusted life year is a composite indicator of disease burden that combines two key components: years of life lost (YLL) due to premature mortality and the years lost to disability (YLD). It is used to estimate the overall loss of healthy life caused by a prevalent condition. It aids in shaping the global health policies and guiding the resource allocation by comparing the burden of different diseases. It emphasizes on the health impacts caused by disease itself and the economic challenges posed by healthcare costs. (8)

CLD have been causing significant morbidity and mortality worldwide. Health related quality of life is significantly decreased due to chronic liver disease. CLD patients have the highest rate of unemployment, as they were unable to work due to disability caused by the disease. (10). Patients with chronic liver disease also had the highest rates of hospitalization, greater number of readmission and longer hospital stays.

The Global burden of disease study (2010) reported that 1.75 million deaths were attributable to chronic liver disease. In the United States, nearly 2 million deaths occur each year due to CLD. The two major complications of chronic liver disease are cirrhosis and liver cancer. Cirrhosis and liver cancer are causing growing health problems as evidenced by the rising disease specific DALY rates. Majority of the DALYs globally is represented by Asian region. Developed countries such as America, Australia and Asia-Pacific region are relatively less effected. From the etiological standpoint, DALYs secondary to HBV and HBC have been improving while NAFLD/NASH is contributing significantly to the rising global burden of CLD. This highlights the urgent need for more effective management techniques (6). Cirrhosis remains a leading cause of mortality and morbidity worldwide, ranking 11^{th} in the causes of death and 15^{th} in the causes of disability. In 2016, CLD was responsible for 2.2% of global deaths and 1.5% of global morbidity. (15)

The burden of cirrhosis varies by region and the demographic groups. In 2017, cirrhosis caused over 1.32 million deaths globally, compared to fewer than 899,000 deaths in 1990. Furthermore, the number of deaths, DALYs, and the proportion of all global deaths due to cirrhosis increased from 1990 to 2017. Despite being a global health challenge, comprehensive data on CLD-related morbidity and mortality remains limited. Therefore, there is a clear need for further research in this area to address the growing burden of the disease. (11)

Chronic liver disease significantly affects the quality of life. Patients with CLD experience a much lower health-related quality of life than healthy individuals, with levels comparable to those seen in patients with chronic obstructive pulmonary disease and congestive heart failure. (14)

Pakistan has one of the highest burdens of decompensated liver disease in the world. With this said, cirrhosis is the leading cause of mortality and recurrent visits in hospital. Hepatitis C was found to be the major cause of chronic liver disease. (13) In Pakistan, high prevalence of hepatitis B surface antigen positivity was also observed in chronic liver disease and hepatocellular carcinoma patients. Additionally, chronic hepatitis C follows a progressive course that can lead to cirrhosis. (12).

The demand for liver transplants (LTX) is rising in Pakistan due to the high incidence of end stage liver disease cases, and mortality primarily caused by liver failure and hepatocellular carcinoma (HCC. Approximately 10 million people in the country are estimated to be infected with HCV1 and according to WHO Pakistan ranks second in the world for the prevalence of Hepatitis C, following Egypt. In Sindh, there are around 1 million chronic carriers of hepatitis B and 1.7 million chronic carriers of hepatitis C. In regions with a high prevalence of Hepatitis B, Delta Hepatitis (HDV) is also common. Study findings showed that 28.3% of individuals in Karachi and 60.7% individuals in other areas were co-infected with Hepatitis B and Delta Hepatitis.(5)

This indicates that suitable measures must be taken to deal with this problem. The public should be informed about the risks of sharing needles or razors and the importance of avoiding unnecessary injections. Frequent exposure to the hepatitis virus could contribute to the rising incidence of chronic liver disease.

3-METHODOLOGY:

3.1-Study Design:

This was a descriptive (Clinical case series) study.

3.2-Study Setting:

This study was conducted at Gulab Devi Hospital, a 1,500 bedded semi-private tertiary care chest hospital situated on Ferozepur Road in Lahore, Pakistan, which also houses Al-Aleem medical college for medical education.

3.3-Study Duration:

It was conducted over a period of 3 months.

3.4-Sample size:

Sample size was based on anticipated monthly patients of chronic liver disease patients in Gulab devi hospital that is about 45 patients. This sample fulfills the requirement of central limit theorem that needs a minimum sample of greater than 30.

3.5-Sampling Technique:

This study took on Purposive sampling technique.

3.6-Inclusion Criteria:

The study included 45 Patients with a history of chronic liver disease lasting more than 6 months. Progression of Liver disease was assessed using Child-Turcotte-Pugh Score (child criteria). Patients with scores ranging from 6-15 were deemed eligible as this indicated a moderate to severe stage of liver disease. Individuals with or without other co-morbidities such as diabetes mellitus, acquired immunodeficiency syndrome (AIDS), Cognitive impairment, Stroke or COPD, were included.

3.7-Exclusion Criteria:

Patients who had not undergone full investigation for child's score, including assessments of total bilirubin, albumin, ascites, hepatic encephalopathy and international normalized ratio (INR) were excluded.

3.8-Data Collection Procedure:

Chronic Liver Disease patients admitted in Medicine ward of Gulab devi Hospital were assessed irrespective of sex.

A closed ended questionnaire was developed using chronic liver disease Questionnaire to determine YLD (Years of life lived with disability). Duration of the symptoms like Ascites, Encephalopathy, Abdominal bloating, Abdominal pain, Fatigue, Trouble concentrating, Shortness of breath, Anxiety, decreased energy levels, Depression, Diet Limitation, Sleeping Difficulty and muscle cramps indirectly measured YLD. While YPLL (Years of Potential life lost) were calculated as the difference between the age at death and age from a selected cut- off (Pakistan's and global average life expectancy considered). While Child Pugh Score table estimated the years of life left. Hepatic encephalopathy was considered through psychometric testing as none mild ore severe and Ascites was confirmed by senior medical officer and through patients file on ultrasound reports. While Bilirubin levels, Albumin levels and International normalized ratio was confirmed through Lab reports that were no older than 2 weeks.

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3.9-Data Analysis:

The data analysis for YPLL was conducted using the child Pugh's Calculator to estimate the remaining years of life, with additional calculations carried out in an excel spreadsheet. Statistical analysis for YLD was performed using SPSS software.

For YPLL calculation expected years of life remaining calculated through child Pugh score were subtracted from Global average life expectancy that is 73.2 years, Pakistan's average life expectancy that is 67.4, Globally gender specific (Male: 70.8, Female: 75.6), Pakistan gender specific (Male: 64.8, Female: 67.9) according to 2022 census for obtaining consistent Results for comparison.

YPLL = Percentage of child's Pugh score in terms of selected cut off was calculated to generate Years of Life left/survival

Then YPLL = Difference of Global average life expectancy/Pakistan's average life expectancy and the years of Life Left

YLD = disability weight x duration of disability (in years)

CHILD-PUGH SCORE

Factor	1 point	2 points	3 points
Total bilirubin (μmol/L)	<34	34-50	>50
Serum albumin (g/L)	>35	28-35	<28
PT INR	<1.7	1.71-2.30	>2.30
Ascites	None	Mild	Moderate to Severe
Hepatic encephalopathy	None	Grade I-II (or suppressed with medication)	Grade III-IV (or refractory)

	Class A	Class B	Class C
Total points	5-6	7-9	10-15
1-year survival	100%	80%	45%

For YLD calculation duration of disability obtained from the questionnaire as duration of the specific symptoms were quantified and multiplied with disability weight for Chronic liver disease.

Disability Weight quantifies the degree of health loss caused by specific health conditions and was used to calculate years of life lived with disability (YLD) for those conditions within a given population. The weights are scaled from 0-1, with 0 representing full health and 1 indicating death. For decompensated liver cirrhosis, the disability weight from the GBD 13 study was applied which is **0.178 (0.123-0.250).**

DALY's = Sum of YPLL and YDL

The more DALYs attributable to a disease, the greater its burden on public health.

3.10-Data dissemination:

Reporting, Publishing and research seminar presentation.

RESULTS

Table1: DALYS AMONG PATIENTS OF CLD ON BASIS OF GLOBAL AVERAGE LIFE EXPECTANCY

MEASURE	STATISTICS	STANDARD ERROR
Mean	13.9	1.3
95% confidence interval for mean (Lower)	11.3	
(Upper)	16.6	
Variance	80.4	
Standard deviation	8.9	
Range	40.5	
Interquartile range	0.45	
Median	13.8	

Table 1 presents the descriptive statistics of DALYs based on Global life expectancy. The mean DALYs of 45 patients were calculated using the global life expectancy of 73.2 years as the end point for YLL calculation. The mean DALY, based on Global average life expectancy was 13.9948 with the standard deviation of 8.96722.

Table2: THE RELATIVE SHARE OF YLL AND YLD IN TOTAL DALYs ON THE BASIS OF GLOBAL AVERAGE LIFE EXPECTANCY

	SUM	PERCENTAGE OF DALY
YLD	31.5	5
YLL	598.1	95
DALYS	629.7	100

Composition of DALYs

The calculated DALYs constitutes of YLL and YLD. The relative contribution of each component was determined from the total of 615.81 DALYs as shown in shown in table 2. YLL contributes 95% on the basis of global average life expectancy. The sum of YLL from 45 patients was calculated as 598.18 on the basis of average global life expectancy. The total YLD for these 45 patients was 31.5, accounting for approximately 5% of the DALYs, indicating a relatively mild nature of disability as compared to other diseases.

Table3: COMPARISION OF DALY BETWEEN MALE AND FEMALE PATIENTS OF CLD 0N BASIS OF AVERAGE LIFE EXPECTANCY

	DALY FOR MALES	DALY FOR FEMALE
MEAN	5.2748	9.6231
STANDARD ERROR OF MEAN	1.29562	1.57409
95% CONFIDENCE INTERVAL FOR MEAN (LOWER)	2.6637	6.4507
(UPPER)	7.886	12.7955
VARIENCE	75.539	111.5
STANDARD DEVIATION	8.6913	10.55934
RANGE	39.32	41.83
INTERQUARTILE RANGE	14.24	15.52
MEDIAN	0	15.16

Relationship between gender and DALYs

Out of 45 patients 19 were male and 26 were female, there was a significant correlation of DALYs with the gender of the patients. The mean DALYs for the female patient was 9.6231 and 5.2748 for the males (on the basis of average global life expectancy). This indicates that the disease affected females more than the males. Gender specific descriptive analysis for DALYs is given in table 3. Gender specific life expectancies were taken for calculating DALYs which are (M =70.8, F=75.6) globally.

Discussion

Quantitative analysis of DALYs is used to estimate the overall disease burden among the patients presented with the chronic liver disease. YPLL and YLD were taken into account for the calculation of mortality and morbidity respectively, caused by Chronic Liver Disease.

In our study, mean DALY lost was 13.99 in accordance with the global average life expectancy. This means that every person affected with chronic liver disease will lose around 13.9 years on the basis of global average life expectancy of his life to this disease. The sum of DALYs of 45 patients was estimated to be 615.81. This implies that out of 45 patients 8.41 lifetimes have been lost which is 18.6% (on the basis of global average life expectancy which is 73.2 years).

The relative differences seen in the mean DALYs of our study and that conducted by Aizaz Khalid and Umar Farooque is due to the difference in life expectancies used in our study that is Global average life expectancy to estimate DALYs instead of the life expectancy of Japan which is 84.62 that would yield an overambitious YPLL.

Our study shows that YLL constitutes a major portion of DALYs compared to YLD. This suggests that the disease burden on the individuals is primarily due to mortality caused by CLD, rather than morbidity. In other words, patients with CLD are unable to live their life to the fullest. This finding also prioritizes the need for the development of management strategies and policies for the CLD patients with particular focus on addressing mortality as a primary goal.

According to the analysis by National Centre for Health Sciences 2005, it is two times more likely for men to die with CLD and Cirrhosis (21), however according to our study the disease burden of CLD is increased in Females based on the fact that the bulk of data represents female patients

Out of 45 patients that were evaluated 24 were HCV positive while 2 were HBsAg positive. Hepatitis C virus (HCV) has been known to be a causative agent of chronic liver disease maybe a precipitating factor for CLD induced mortality. (22)

DALYs acts as a transparent tool for the estimation of mortality and morbidity associated with a specific disease. With the rising burden of chronic diseases in developing countries, probable use of DALYs can help address the gaps in health data.

Management of CLD is conservative in most of the cases. Early diagnosis and treatment may help to improve the mortality rate associated with it and also to improve the quality of life which can be done by effectively managing the symptoms. YLD can be reduced if the medical interventions are aimed towards decreasing the debilitating symptoms along with slowing the progression of disease.

DALY is a valuable metric as it quantifies the health status of a population. The progression and disease burden of chronic liver disease can be mitigated through early diagnosis and prompt treatment.

CONCLUSION:

We conclude that chronic liver disease is a major global source of economic and health burden, and an urgent action is needed to reduce its impact. In Pakistan, CLD remains an increasing health issue contributing significantly to morbidity and mortality, as demonstrated by the estimated DALYs rates.

YPLL contributes majorly to DALY rates so there is a need of developing effective management plans and policies for dealing with the mortality factor. Prompt management of symptoms and appropriate medical treatment is useful for reducing the YLD.

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