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The effect of hepatitis b and c virus related diseases on labor productivity (labor market) in Pakistan

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Abstract: Health is the key and significant asset that a human being has that allow people to exclusively develop their abilities. If this asset corrodes or not fully developed, it will cause emotional and physical weakness that causes hindrances in people lives. Keeping in view the importance of health in human capital and human development index, it is important to conduct a study that highlight the consequence of Hepatitis in Pakistan. This study is designed to estimate the effect of viral hepatitis (B & C) on labor productivity,

family income, morbidity and mortality, estimate the direct and indirect cost hepatitis (B & C) and total cost imposed on each patient and their family in Pakistan. Primary data was collected from 8,388 Hepatitis B and C patients at district headquarter hospitals, private hospitals and doctors' clinic from 77 districts across Pakistan including Azad Jammu and Kashmir and Gilgit Baltistan through a well design questioner containing 36 questions based on demographic and economic indicators. Descriptive, probit logit and OLS econometric techniques were applied for data analysis. This study finds significant effect of viral hepatitis B and C on labor productivity, labor mobility, absenteeism and presentism at work place and family income, in Pakistan. This study also found significant impact of hepatitis on productivity in terms of absenteeism and presentism and estimated that an average per patient and their attendant's absenteeism and presentism 1.89 days per month and total working days. Furthermore hepatitis B and C had also found significant indirect impact on labor mobility employment and mortality and concluded that 2.07% visa rejection, 6.2% job rejection, 1.2% job termination and 5.2% morality caused by hepatitis B and C. similarly the effect of hepatitis B and C was found indirect and caused decline in income in term of loss of working days and sell of assents. The government should form such policies that encourage long term investment in human capital by both government and public sector. Recommendation: Health care expenditure must be increased up to 5% of GDP to meet the minimum requirements for the provision basic health facilities to population.

Keywords: Hepatitis, Labor productivity, Labor Mobility, Absenteeism, Job Rejection.

Introduction: Viral hepatitis also known as hepatitis A, B, C, D, and E affects millions of people around the world, leading to acute and chronic liver disease. Viral hepatitis is the 8th highest cause of death worldwide and is responsible for an estimated 1.41 million deaths every year from hepatitis related liver cancer and cirrhosis, acute infections, a toll comparable to that of tuberculosis and HIV. Approximately 55% the deaths are attributed to HBV, 35% to hepatitis C (HCV) and the remaining to hepatitis E virus (HEV) and hepatitis A virus (HAV). Hepatitis virus is also a rising cause of death among HIV infected people, whereas 5–20% with HBV and 5–15% is co-infected with HCV. Globally, about 130-150 million people are living with HCV and 2.40 billion people are chronically infected with HBV. Without an accelerated and expanded response, the number of persons living with HBV infection is estimated to stay at the existing high levels for the next 40 to 50 years, with an aggregate 20 million deaths happening between 2015 to 2030. A stepped-up worldwide response can no longer be delayed. Pakistan has the 2nd highest number of hepatitis C virus (HCV) infection after Egypt in the world. Both HCV and hepatitis B virus (HBV) are connected with increasing mortality and morbidity. It has been recently estimated that every 13th Pakistani is infected with either HBV or HCV infection (Government of Punjab, 2017).

National survey was conducted to estimate the prevalence of HCV and HBV in the Pakistan in 2008. The survey explored that 2.5% of population was positive for HBV whereas the prevalence of HCV was estimated at 5% in Pakistan. The frequency of anti HCV in Punjab was 6.7% which is higher than the national average whereas the prevalence of HBV was comparable (2.4%). At the general level the prevalence of HCV at 5% explains that an estimated 8 million people in Pakistan are exposed to this infection, while 4 million (2.5% prevalence for HBV) infected with hepatitis B. Recently, University of Bristol, UK has done a modelling study to estimate the epidemic of hepatitis C in Pakistan. The study revealed that to achieve the WHO target for eliminating hepatitis C from Pakistan by 2030, Pakistan has to overall treat 1.1 million hepatitis C cases annually.

Pakistan has the 2nd highest number of hepatitis C virus (HCV) infection after Egypt in the world. The risk factors responsible for relatively high prevalence of Hepatitis B and C are includes un safe blood transfusions (15%), history of hospitalization (14%), dental clinic (13%), use of contaminated injections (12%), and history of surgery (9%), sexual relationship, vertical transmission, lack of initial screening facility, old sewerage system and barber shop.

Pakistan launched its first ever plan on August 29, 2005 with the help of Center for Excellence in Molecular Biology (CEMB) at University of the Punjab, Lahore to significantly decrease the prevalence mortality and morbidity due to viral hepatitis in the general population by exploiting the prevailing health infrastructure. The total cost incurred by government of Pakistan of that program was Rs.2.59 billion for financial years 2005 to 2010 and (CEMB) University of the Punjab provide diagnostic services to patients that cost CEMB Rs. 113.6 million.

In 2005, Pakistan faced a loss of 1 billion dollar in national income due to premature deaths caused by chronic diseases which included heart disease, stroke and diabetes (WHO report (2005)- facing the facts).

By the inception of endogenous growth theory of Romer (1989) the importance of human capital was recognized.

It was also used in the production function by Makin et al. (1980). Human capital is consisted of many factors like education, health and professional trainings whereas the education and health found to be major determinations of human capital (Schlutz, 1961). Adequate investments in human capital, especially in improving health and literacy has broadly been recognized to be an essential element for, improving employment opportunities, reducing poverty, accelerating economic growth and improving human abilities in developing countries like Pakistan. Poverty alleviation and economic growth found to be positively associated with the investment in health and education (Chaudhry and Rehman, 2009).

Health is the most important assets for human being. It permits us to completely develop our abilities. The complete or partial absence of this asset causes physical and emotional flagging, initiating obstacles in people social and economic lives. The prior association can be assessed by correlation between health and income. Life cycle models explained the impact of health condition on the determination of people future income, consumption and wealth status (Smith 1999, Smith 1998 and Lilliard and Weiss 1997). Sorkin (1997) in an early empirical review of the impact of health on economic development, established the impact of health on economic development through reduction in mortality and concluded significant impact of health on economic development in the early 20th century. However, he also concluded that an increase in the health status of developed countries had little impact on economic growth whereas the impact in developing countries are different. He identified many ways in which health programs effect the economic growth in the developing countries.

Labor productivity and efficiency increase in the first way by increasing working hours of worker by good health. Jack (1999) explored that labor productivity depends on factors like mental and physical abilities, investment in human capital and productivity of labor organization and management he also emphasizes that changes in health facilities could affect labor productivity. On the other hand, developments in health conditions has significantly affected the experience of the labor force by enhancing life expectancy and health status.

The impact of health on labor productivity suggests a direct correlation between aggregate output and health. Healthy workforces are active and have less absenteeism from work due to good health conditions and produce more output during their working time. Health improvements had significant impact on widespread economic growth whereas ill and poor health traps in poverty (World Health Organization, 1999). World health indicators 1993 on health explained an increasing interest in the association among health condition and economic growth (World Bank report 1993). Barro (1996) concluded health as a productive capital asset and a key instrument for economic growth and development. WHO 2005 report stated that 50% of differential in economic growth among developed and under developed countries are attributed to health condition and life expectancy that are both low in developing countries.

Developed nations invest a significant proportion of their budget on provision of health care as they are committed to their population's health and are convinced that these expenditures are key factor for economic growth and development. As health is wealth, any amount resources spent on health structure by a country is not considered too much. For economic growth and economic development an average 8% to 10 % of GDP must be allocated for health expenditure (The United Nation (UN) health expenditure report 2019 recommendation).

The investment in education leads to not only reduction in poverty but it also reduces the crimes and terrorism along with abridging the income inequalities (Faber and Augersaud, 2004). Moreover, the poverty status of households significantly decreases with the increase in educational and health attainment (Rodriguez et al, 2000). It is a matter of fact, that poverty is main hurdle in attaining education as parents do not send their children due to the adverse economic conditions.

Currently, firms throughout the world are facing many challenges including universal economic crisis, rising trend in demand for improved productivity, gradually fast paced businesses environment and more important an aging and apparently unhealthy labor force. As the burden of chronic diseases e.g., hepatitis, HIV, hypertension, heart disease, diabetes and cancer are rising workers are becoming unhealthy, sicker and less productive. A British health insurance company reported a bleak portrait of the future labor force. Workers will be older with long-term surroundings and lifestyle conditions, concerned for others, obese with hepatitis, diabetes and heart problems. The employees' health is becoming a significant factor of business in terms of both cost and in the form of an asset. Firms are not considering in the lowering of health care expenditures through containment policies due to daunting demographic characteristics and current diseases trends. Coupled with rising trend in demand for productivity in the international market place, firm's managers are considering the fact that current occupational health care settings are insufficient. They found sick leave a significant factor for the reduction of firms output. European Agency for Safety and Health at

Work (2000) found 600 million working days were lost due to work-related disease in Europe. Huisman et al. (2005) significant decrease in labor productivity due to hepatitis C and concluded that 70% decrease in their productivity. Younassi et al. (2016) also found loss of 23.7% and 13% in work related activities with chronic hepatitis C due to absenteeism. Yaseen et al. (2017) also found lower productivity of workers with chronic hepatitis as compared to healthy worker in district Faisalabad

At present hepatitis is an immense health problem and major cause of mortality and morbidity worldwide and in developing countries like Pakistan, Egypt and other south Asian countries this problem is severe (N Glass et al., 2012) Around 130-150 and 250 million people were infected with hepatitis C and B, respectively (Issur M et al., 2014). Globally, viral hepatitis B and C results in 1.4 million death every year compared to malaria 1.2 million, HIV 1.5 million and tuberculosis 1.2 million deaths respectively. The key factors of hepatitis B, C and D transmission are body fluids, contaminated syringes, barber shops and vertical transmission etc., whereas hepatitis A and E are transmitted by contaminated food items and water. In Pakistan estimated 325 people die per day due to viral hepatitis 4 mortality rate shows upward trend.

Globally, developed countries United States of America and European countries systematically recorded and studied mortality among patients with viral hepatitis, but the rest of the world, this vital public health and economic problem has not received its due attention. The analysis of World Health Organization (WHO) mortality data explored significant association of hepatitis B and C with mortality and stated substantial increase of mortality in people with HBV and HCV. Still, the long-term trend of mortality associated to viral hepatitis are rarely reported in East and Southeast Asian countries (Wu, J et al., 2020).

In developed countries like United States of America the total deaths and mortality associated with hepatitis B and C for the period 2003 to 2013 were estimated 11,051 in 2003 and 19,368 in 2013 with average increase rate of 865 deaths per year showed 6.2 % annual increase in mortality due to hepatitis B and C (Kathleen N et al., 2016).

In East and Southeast Asian countries mortality rate of hepatitis showed upward trend where highest mortality rate was recorded in China 64.4 % followed by Japan 36.9% during 1987 to 2015 but after 2015 Japan surpassed China and mortality associated to hepatitis declined in China, Philippines and Singapore (Wu, J et al., 2020). Similarly, Sarah M. Hatcher et al (2020) also found significant high mortality ratio associated with hepatitis C among American Indian 19.6% and 5.9 in American Asian. According to WHO report (2015) viral hepatitis B and C were responsible for about 1.34 million deaths in the world. The mortality rate of viral hepatitis was higher than mortality caused by tuberculosis (TB) and HIV. The untreated hepatitis B and C leads to 720,000 cirrhosis deaths and 470,000 deaths due to hepatocellular carcinoma. Mortality ratio of viral hepatitis increased by 22% since 2000.

These long-term complications are life-threatening and accounted for 96% of the deaths due to viral hepatitis. Mortality from viral hepatitis has increased by 22% since 2000. The mortality of viral hepatitis will remain increase till public with HCV and HBV infections are diagnosed and treated.

Grossman's (1972, 2000 and 2017) model of health demand explored the relationship among health status, human capital and their consumption at micro level and a framework modelling for human capital accumulation and its correlation with productivity at macro level. The key aspects of its model are human capital that are based on health and education of people and its relationship to labor supply, earnings and productivity. The Grossman's model concluded health as a capital asset and final consumption good. Human capital theory stated that better health condition and knowledge are the main determinant of labor productivity in both non-market and market activities. The Grossman model stated that health capital and education capital vary from other forms of capital both in its activity and productivity. Health capital defines the healthy time available for economic activity whereas knowledge capital affects the productivity of the time spent on them.

Bloom and Canning (2000) identified four ways that affect labor productivity first healthy workers are more productive as they are more physical and mentally active, second people with longer life expectancy invest in education and thus increase their productivity, third healthy people save more and accumulate their savings and last good health status results in high per capita income and enhanced their standard of life.

Ilias Gountas et al. (2019) projected 19.6% increase in hepatitis C related mortality, € 2.3 billion, € 1.1 billion increase indirect and indirect cost of viral hepatitis C in Greece by 2030. They also concluded an additional estimated € 3.2 to 3.4 billion need to treat 90,000 patients and eliminate hepatitis C from Greece by 2030 whereas per adjusted disability life cost was estimated from € 10,100 to 13,380.

DATA SOURCES AND METHODOLOGY

Sample size and sampling techniques

The aim of this study was the economic assessment of viral hepatitis B and C in Pakistan. The prevalence and severity of viral hepatitis B and C across the country would probably have varied, therefore it was imperative that any hepatitis B and C patient would be the representative of the whole hepatitis B and C in Pakistan. Simple random sampling techniques could be used included the patients for data collection. However, this technique would have formed representative data only if enough patients were recruited. Pakistan's population were geographically diverse. Hence, simple random sampling of hepatitis B and C patients across the country would be impractical and expensive. Therefore, multistage stratified cluster sampling techniques were used to ensure that the selected sample was the illustrative of Pakistan's population. The stratified cluster sampling techniques combined stratified and cluster sampling techniques. Initially the country was stratified by province and region, Pakistan consists of four province Punjab, Sindh, Khyber Pakhtunkhwa and Baluchistan, federal territory, capital territory, Azad Jammu and Kashmir and Gilgit Baltistan.

In order to get representative sample size, assuring quality of sample and ease of management, 77 districts among 154 districts from Pakistan including Azad Jammu and Kashmir and Gilgit Baltistan where the facilities of Government and private hospitals were available was selected randomly for sampling and sample was drawn from every third (3rd) hepatitis B and every fifth (5th) C patients visited to hepatitis clinic either public or private hospital and aged between 5 and 75 years completed hepatitis B or C treatment or in the course of treatment for the period March, 2021 to December 2021. Multi-stage stratified cluster sampling techniques were used for data collection. In the first stage the districts were selected while in the second stage the hospitals selected at random and categorized in private and public hospitals and at the third stage the respondents were interviewed at random for data collection. The selected hospitals were distributed by public and private hospitals and the patients were further classified by gender, occupation, demographic and economic characteristics. The sample was collected by the researcher and well-trained representatives of genome center for molecular based diagnostic and research laboratory (GCMBDR) in their chain of collection centers, hospitals, doctor's clinic and homeopathic clinics. The overall sample compromised of 8,388 respondents, entailing 6535 hepatitis C patients and 1853 hepatitis B patients. The 1395 respondents are from government THQ hospitals, 6819 patients responded from private hospitals and doctors' clinic, whereas 37 patients selected from homeopathic clinics and 48 patients attached to peer/ spiritual healers. The sample size was selected based sampling calculator provided by

$$n = \frac{2(Z\alpha + Z1 - \beta)2\ \sigma\ 2}{\Delta 2}$$

Where n is the required sample size, Z is a constant, σ is standard deviation and Δ is the difference in effect (estimated effect size). (bader et al. 2018), (Kadam, and Bhalerao, S. (2010), (Rahimzadeh, et al. 2013), Sajjad and Nosheen (2022).

Absenteeism

Absenteeism is measured as average sick leave days per month during course of illness (Miroslav et al., 2017), Sajjad and Nosheen (2022).

Productivity loss

Productivity loss due to hepatitis B or C are calculated in-patients by the period of hospitalization multiplied by his/her daily average income and for outpatients, it was assessed by the total of visit days multiplied by daily average income of the patient and caregivers (Khsoro et al., 2015, Dahye Baik et al., 2017 and Sajjad and Nosheen (2022). Salary conversion method, introspective method and firm's level method were applied for the measurement of productivity loss due to hepatitis B and C.

Salary conversion method: This method uses the survey response and salary information of the respondent to estimate productivity loss.

Introspective method: This method uses survey response as basis for assumed experiment to provide businesses an indication of magnitude to estimate their lost productivity.

Firm-level method: This method used to monetize output loss based on cost of counter measures to deal with absenteeism and presentism.

Measurement of the impact of hepatitis B and C foreign reserve in Pakistan:

This is estimated by the % age of hepatitis B patients out of total population of Pakistan that is 2.8% and also the estimated % age of hepatitis C patients out of total population that is 5 %. (As referenced in chapter 1) * Average per patient diagnostic cost (imports of detection kits and other tools used in hepatitis B and C). (Sajjad and Nosheen (2022)

(Estimated by average cost were calculated from data borrowed from five reputed labs and two firms importing these regents).

Thus, the formula developed for estimating foreign

reserve is as follow:

Estimation of the effect of hepatitis on foreign reserve

FR = HBP*YC + HCP*YC

Foreign reserves = Total number of hepatitis B patients * average per patient diagnostic cost + total number of hepatitis c patients * average per patient diagnostic cost

Limitation of the above model

This model developed to include only per patient diagnostics expenses incurred. It did not incorporate with medication and treatment instruments because of lack of available data.

Labor mobility

In order to observe the effect of the hepatitis on the labor mobility, we rely on the following question.

Q1: Has the patient ever experienced visa rejection because of hepatitis infection?

The objective of the analysis here is to compare the individuals whose visa has been rejected due to the exposure to hepatitis and their counterparts.

$$\textbf{Labor mobility} = \beta_0 + \beta_1\,(\text{gender}) + \beta_2\,(\text{age}) + \beta_3\,(\text{marital status}) + \beta_4\,(\text{sources of exposure}) + \beta_5\,(\text{employment status}) + \beta_6\,(\text{education}) + \varepsilon)$$

In the equation the dependent variable is a dummy variable. It indicates the visa rejection a proxy of labor mobility and coded as “1” if the respondent’s visa is rejected due to hepatitis and “0” if the visa is not rejected due to hepatitis. Given the dichotomous dependent variable we estimated the equation (1) by using logistic regression.

The coefficient (β_1) captures the differences between male and female respondents. Age represents how much old is the respondents and its impact is estimated by coefficient (β_2). The coefficient (β_3) estimates the difference between unmarried and married respondents. Sources of exposure to hepatitis represents the differences among potential sources of transmission of hepatitis, and its impact is estimated by coefficient (β_4). Coefficient (β_5) captures the effect of employment status, it is categorical variables comprise of different employment categories. Coefficient (β_6) captures the role of education.

we re-estimated equation by introducing other control variables in subsequent specification to check the robustness of results.

Second, the estimation strategy then relies on the flowing question to ascertain the impact of hepatitis on labor productivity. Absenteeism (work loss/day) during infection or treatment (Sajjad and Nosheen (2022)

$$\textbf{Absenteeism} = \beta_0 + \beta_1\,(\text{gender}) + \beta_2\,(\text{age}) + \beta_3\,(\text{marital status}) + \beta_4\,(\text{sources of exposure}) + \beta_5\,(\text{employment status}) + \beta_6\,(\text{education}) + \varepsilon$$

In the above equation, the dependent variable indicates the absenteeism during the treatment by the respondents exposed to the hepatitis. It is a continuous variable. the estimation was carried out by Ordinary Least Square (OLS) methodology. The rest of the variables are same discussed above.

The effect of hepatitis on the employment

The final model is developed to quantify the effect of hepatitis on the employment.

Has the patient ever experienced rejection during any job recruitment because of hepatitis?

$$\textbf{Employment} = \beta_0 + \beta_1\,(\text{gender}) + \beta_2\,(\text{age}) + \beta_3\,(\text{marital status}) + \beta_4\,(\text{sources of exposure}) + \beta_5\,(\text{employment status}) + \beta_6\,(\text{education}) + \varepsilon$$

The dependent variables in equation employment indicates that whether the respondent has been rejected from the job or not due to hepatitis. It is a dummy variable and coded as “1” if respondent has experienced rejection and “0” if there was no rejection.

Equation (3) is estimated by logistic regression given the dummy dependent variable. Other variables are same as defined above.

RESULTS AND THEIR INTERPRETATION

Table 1. Gender wise classification of data

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	3383	40.3	40.3	40.3
	Male	5005	59.7	59.7	100.0
	Total	8388	100.0	100.0	

Table 1 shows the frequency of male and female respondents of the current study. The prevalence of hepatitis exists more in male than female. Out of 8,388 hepatitis patients, the male respondents were 5,005 and female were 3,383 with their respective ratio of 59.7% and 40.3%.

Table 2. Age wise classification of viral hepatitis B and C patients in Pakistan

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5-18 Years	305	3.6	3.6	3.6
	19-32 Years	2898	34.5	34.5	38.2
	33-46 Years	2721	32.4	32.4	70.6
	47-60 Years	1511	18.0	18.0	88.6
	>60 Years	953	11.4	11.4	100.0
	Total	8388	100.0	100.0	

Table 2 indicate the number of patients/respondents fall in a particular age group with their respective mean, median age and standard deviation. These tables show that 3.6% of the patients lie in the age group 5-18 years and all of them are dependent as they are minor and not fall in working population, whereas 34.5%, 32.4%, 18.0% and 11.4 % patients fall in age group 19-32, 33-46, 47 -60 and above 60 years, respectively. The table also portrait that 84.9% of the patients belong to working population because retirement age in Pakistan is 60 years and that 84.9% of patients lie in age group of 19 to 60 years.

3. Marital status of the patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Married	6709	80.0	80.0	80.0
	Unmarried	1679	20.0	20.0	100.0
	Total	8388	100.0	100.0	

Table 3 determines the marital status of the patients/respondents. The statistics show that 6709 (80%) of the respondents were married and 1679 (20%) of the respondents were unmarried. The above results showed that viral hepatitis B and C are predominant among married people and found 80%

Table 4. Employment status of the patient

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time employee	708	8.4	8.4	8.4
	Part time employee <30 hr/week	127	1.5	1.5	10.0
	Self-employee	3380	40.3	40.3	50.3
	Dependent / Un-employed	4116	49.1	49.1	99.3
	Retired	57	.7	.7	100.0
	Total	8388	100.0	100.0	

The profession and employment status of the patients were elaborated in table 4 House wives, labors, students and farmers were the most infected people with their respective ratio of 33.8%, 13.5%, 16.1% and 12.9%, respectively. Data was collected from every field of professional and unprofessional peoples. In respect to employment status 49.1% of the respondents were unemployed and dependent on other family members income, 40.3% were self-employed and were involved in self-generated employment, 8.4% were full time employees in government sector, 1.5% were working part time and seeking for full time employment, 0.7% of the patients are government retired persons and 1.6% respondents were found to be unemployed.

Table 5: Baseline estimation labor mobility of hepatitis patients

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Male	0.033*** (0.008)	0.032*** (0.008)	0.032*** (0.008)	0.032*** (0.008)	0.030*** (0.008)	0.030*** (0.008)	0.030*** (0.008)	0.033*** (0.008)	0.033*** (0.008)	0.032*** (0.007)
Age of the Patient	-0.016*** (0.004)	-0.015*** (0.004)	-0.016*** (0.004)	-0.017*** (0.004)	-0.017*** (0.004)	-0.019*** (0.004)	-0.019*** (0.004)	-0.021*** (0.004)	-0.020*** (0.004)	-0.018*** (0.004)
Married	0.012 (0.010)	0.011 (0.010)	0.012 (0.010)	0.012 (0.010)	0.011 (0.010)	0.015 (0.009)	0.012 (0.009)	0.016* (0.009)	0.017* (0.009)	0.015 (0.009)
Dental clinic	-0.018 (0.013)	-0.022* (0.01	-0.022* (0.01	-0.026** (0.01	-0.030** (0.01	-0.030** (0.01	-0.028** (0.01	-0.021 (0.013)	-0.024* (0.01	-0.030** (0.01

		2)	2)	3)	3)	3)	3)		3)	3)
Sexual relation	0.013 (0.047)	0.005 (0.046)	-0.000 (0.045)	0.001 (0.043)	-0.006 (0.040)	-0.018 (0.041)	-0.019 (0.041)	-0.025 (0.041)	-0.018 (0.044)	-0.016 (0.047)
Barber shop	-0.055** (0.026)	-0.052* (0.027)	-0.053* (0.027)	-0.055** (0.025)	-0.059** (0.023)	-0.068*** (0.020)	-0.070*** (0.019)	-0.078*** (0.017)	-0.076*** (0.018)	-0.077*** (0.019)
Beauty parlour	0.019 (0.027)	0.015 (0.026)	0.011 (0.025)	0.006 (0.025)	0.006 (0.025)	0.003 (0.025)	0.003 (0.025)	0.023 (0.026)	0.022 (0.025)	0.020 (0.025)
Surgery	0.011 (0.015)	0.008 (0.015)	0.006 (0.015)	-0.003 (0.015)	-0.002 (0.014)	-0.005 (0.014)	-0.007 (0.014)	0.005 (0.015)	0.004 (0.015)	-0.008 (0.014)
Blood transfusion	-0.016 (0.021)	-0.016 (0.021)	-0.019 (0.020)	-0.023 (0.020)	-0.019 (0.020)	-0.015 (0.020)	-0.017 (0.020)	-0.017 (0.021)	-0.016 (0.020)	-0.027 (0.019)
Vertical transmission	0.013 (0.012)	0.015 (0.012)	-0.001 (0.012)	-0.010 (0.011)	-0.010 (0.011)	-0.018* (0.011)	-0.019* (0.011)	-0.024** (0.010)	-0.027*** (0.010)	-0.025** (0.010)
Part time employee <30 hr/week	0.279*** (0.049)	0.262*** (0.047)	0.253*** (0.052)	0.273*** (0.049)	0.265*** (0.051)	0.226*** (0.050)	0.213*** (0.050)	0.252*** (0.053)	0.269*** (0.056)	0.257*** (0.053)
Self-employee	0.151*** (0.012)	0.156*** (0.011)	0.160*** (0.011)	0.153*** (0.011)	0.165*** (0.011)	0.163*** (0.011)	0.165*** (0.010)	0.162*** (0.011)	0.140*** (0.012)	0.146*** (0.011)

Dependent	-0.016 (0.010)	-0.013 (0.010)	-0.011 (0.010)	-0.014 (0.010)	0.001 (0.009)	0.001 (0.009)	0.003 (0.009)	-0.001 (0.009)	-0.018* (0.011)	-0.013 (0.010)
un-employed	0.747*** (0.036)	0.741*** (0.036)	0.740*** (0.035)	0.686*** (0.043)	0.703*** (0.042)	0.765*** (0.042)	0.745*** (0.045)	0.755*** (0.052)	0.728*** (0.053)	0.674*** (0.059)
Education and Awareness	0.058*** (0.004)	0.058*** (0.004)	0.060*** (0.004)	0.059*** (0.004)	0.056*** (0.004)	0.058*** (0.004)	0.058*** (0.004)	0.054*** (0.004)	0.057*** (0.004)	0.062*** (0.004)
Total number of Family Members		-0.023*** (0.006)	-0.028*** (0.006)	-0.021*** (0.005)	-0.020*** (0.005)	-0.016*** (0.005)	-0.019*** (0.005)	-0.024*** (0.005)	-0.025*** (0.005)	-0.014*** (0.005)
Number of Infected Family Members			0.038*** (0.005)	0.025*** (0.005)	0.029*** (0.005)	0.030*** (0.005)	0.032*** (0.005)	0.034*** (0.005)	0.035*** (0.005)	0.037*** (0.005)
Death of a Family member				0.084*** (0.007)	0.071*** (0.008)	0.071*** (0.007)	0.067*** (0.007)	0.059*** (0.007)	0.055*** (0.007)	0.050*** (0.007)
Complete health insurance					0.116*** (0.026)	0.107*** (0.025)	0.094*** (0.024)	0.091*** (0.024)	0.114*** (0.025)	0.101*** (0.023)
Estimated Direct Medical Cost per						-0.089*** (0.01	-0.113*** (0.01	-0.094*** (0.01	-0.084*** (0.01	-0.074*** (0.01

Month						0)	3)	4)	4)	3)
Estimate Indirect Medical Cost per Month							0.061*** (0.013)	0.065*** (0.012)	0.075*** (0.011)	0.075*** (0.010)
Total Cost Spent on Treatment								-0.054*** (0.007)	-0.051*** (0.007)	-0.062*** (0.007)
Monthly Income									-0.037*** (0.004)	-0.036*** (0.004)
Total Cost of Visit Per Month										-0.025*** (0.003)
Observations	8331	8331	8331	8331	8331	8331	8331	8331	8331	8331

Notes: This table presents the marginal effects of Logit regressions examining the effects of hepatitis on labor mobility. Standard errors (in brackets) are robust to arbitrary heteroskedasticity. *, **, and * indicate statistical significance at the 10%, 5% and 1% level, respectively.**

The aim of this estimation strategy is to capture the impact of hepatitis B and C on labor mobility. We have empirically estimated equation (1) by using logistics regression econometric approach. Table 6 contains outcome for equation (1) and presents average marginal effect from logistics regression for the probability of labor mobility (visa rejection) conditional to wide range of independent variables. The average marginal effects are estimated by taking labor mobility as dichotomous variable i.e., 1 (if an individual's visa is rejected) and "0" (if an individual not rejected).

The "average marginal effects" derived from logistic regression provide more holistic picture of regression phenomenon to compare outcomes. On average, for males there are 3.2 percent significantly more chances of visa rejection, as compared with female respondent. Column/specification (10) indicates 1.8 percentage significantly lower probability (less likely) with an additional year of age that visa would be rejected.

The result indicates that individuals who exposed to hepatitis from dental clinic, barber shop and vertical transmission found to be 3, 7.7 and 2.5 percent less likely to be rejected for visa, respectively. Moreover, table 4.39 shows that individuals working as part time employee, self-employee and unemployed have 2.57, 1.46 and 6.74 percent significantly higher probability

(more likely) for visa rejection.

The household size and estimated direct medical cost per month found to be negatively associated with visa rejection the magnitude of household size and direct medical cost -0.014 with P-value of 0.005 and -0.074 with P-value of 0.013 indicated that probability of visa rejection for large family size and estimated direct medical had 14% and 7.4% less than others while the probability of Education, number of infected family members, death of a family member, complete health insurance and estimate indirect medical cost per month has positive and significant effect on visa rejection. In addition, total amount spent on treatment, monthly income and total cost of visit per month have significantly high probability of visa rejection.

Table 6: Baseline estimation absenteeism of hepatitis B and C patients during treatment (labor productivity)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Male	0.015** (0.008)	0.016** (0.008)	0.016** (0.008)	0.016** (0.008)	0.017** (0.008)	0.017** (0.008)	0.017** (0.008)	0.020** (0.008)	0.020** (0.008)	0.025*** (0.007)
Age of the Patient	0.011** (0.004)	0.009** (0.004)	0.008* (0.004)	0.008* (0.004)	0.008* (0.004)	0.007* (0.004)	0.007 (0.004)	0.005 (0.004)	0.004 (0.004)	-0.002 (0.004)
Married	-0.044*** (0.010)	-0.041*** (0.010)	-0.039*** (0.010)	-0.039*** (0.010)	-0.038*** (0.010)	-0.037*** (0.010)	-0.038*** (0.010)	-0.034*** (0.010)	-0.034*** (0.010)	-0.025** (0.010)
Dental clinic	-0.053*** (0.014)	-0.048*** (0.014)	-0.050*** (0.014)	-0.049*** (0.014)	-0.048*** (0.014)	-0.047*** (0.014)	-0.047*** (0.014)	-0.034** (0.015)	-0.034** (0.015)	-0.013 (0.014)
Sexual relation	0.055** (0.028)	0.060** (0.029)	0.054* (0.028)	0.053* (0.028)	0.060** (0.029)	0.057** (0.029)	0.059** (0.029)	0.052* (0.028)	0.051* (0.028)	0.059** (0.029)
Barber shop	0.070*** (0.025	0.065** (0.025	0.066*** (0.025	0.067*** (0.025	0.070*** (0.024	0.068*** (0.025	0.064*** (0.025	0.050** (0.025	0.047* (0.025)	0.035 (0.025)

	)	)	)	)	)	)	)	)		
Beauty parlour	-0.025 (0.029)	-0.023 (0.029)	-0.028 (0.029)	-0.025 (0.029)	-0.027 (0.029)	-0.027 (0.028)	-0.025 (0.028)	-0.007 (0.029)	-0.006 (0.028)	0.001 (0.029)
Surgery	-0.034** (0.016)	-0.030** (0.016)	-0.033** (0.016)	-0.031** (0.016)	-0.031** (0.016)	-0.032** (0.016)	-0.033** (0.016)	-0.020 (0.016)	-0.019 (0.016)	0.025** (0.015)
Blood transfusion	-0.047** (0.023)	-0.049** (0.023)	-0.052** (0.023)	-0.050** (0.023)	-0.054** (0.023)	-0.052** (0.022)	-0.052** (0.022)	-0.049** (0.022)	-0.049** (0.022)	-0.019 (0.021)
Vertical transmission	0.033*** (0.010)	0.030*** (0.010)	0.017 (0.011)	0.019* (0.011)	0.019* (0.011)	0.016 (0.011)	0.015 (0.011)	0.007 (0.011)	0.008 (0.011)	-0.006 (0.010)
Part time employee <30 hr/week	0.204*** (0.028)	0.212*** (0.029)	0.210*** (0.025)	0.207*** (0.024)	0.201*** (0.025)	0.184*** (0.024)	0.180*** (0.025)	0.201*** (0.027)	0.205*** (0.027)	0.200*** (0.029)
Self-employee	0.098*** (0.014)	0.089*** (0.014)	0.091*** (0.014)	0.093*** (0.014)	0.077*** (0.015)	0.072*** (0.015)	0.074*** (0.015)	0.068*** (0.015)	0.081*** (0.015)	0.047*** (0.015)
Dependent	0.017 (0.013)	0.010 (0.014)	0.010 (0.014)	0.010 (0.014)	-0.007 (0.014)	-0.012 (0.014)	-0.009 (0.014)	-0.018 (0.014)	-0.006 (0.014)	-0.035** (0.015)
Retired	0.097*** (0.014)	0.082*** (0.015)	0.074*** (0.017)	0.096*** (0.017)	0.071*** (0.018)	0.064*** (0.018)	0.065*** (0.018)	0.086*** (0.020)	0.082*** (0.021)	0.104*** (0.021)

Un-employed	-0.103** (0.050)	-0.099** (0.051)	-0.106** (0.048)	-0.084* (0.049)	-0.103** (0.049)	-0.097* (0.050)	-0.106** (0.050)	-0.127** (0.052)	-0.114** (0.052)	0.017 (0.048)
Education and Awareness	0.045*** (0.004)	0.046*** (0.004)	0.046*** (0.004)	0.046*** (0.004)	0.048*** (0.004)	0.048*** (0.004)	0.047*** (0.004)	0.042*** (0.004)	0.040*** (0.004)	0.023*** (0.003)
Total number of Family Members		0.031*** (0.007)	0.026*** (0.007)	0.025*** (0.007)	0.024*** (0.007)	0.024*** (0.007)	0.020*** (0.007)	0.014* (0.007)	0.013* (0.007)	-0.023*** (0.007)
Number of Infected Family Members			0.037*** (0.007)	0.042*** (0.007)	0.039*** (0.007)	0.040*** (0.007)	0.041*** (0.007)	0.037*** (0.007)	0.037*** (0.007)	0.027*** (0.007)
Death of a Family member				-0.033*** (0.009)	-0.024** (0.009)	-0.024** (0.009)	-0.022** (0.009)	-0.025*** (0.009)	-0.024** (0.009)	0.005 (0.009)
Complete health insurance					-0.092*** (0.021)	-0.093*** (0.021)	-0.100*** (0.021)	-0.112*** (0.020)	-0.117*** (0.020)	-0.071*** (0.020)
Estimated Direct Medical Cost per Month						-0.051*** (0.012)	-0.070*** (0.015)	-0.043*** (0.015)	-0.047*** (0.015)	-0.049*** (0.014)

Estimate Indirect Medical Cost per Month							0.056*** (0.019)	0.055*** (0.019)	0.054*** (0.019)	0.016 (0.017)
Total Cost Spent on Treatment								-0.059*** (0.008)	-0.061*** (0.009)	-0.002 (0.009)
Monthly Income									0.016*** (0.006)	0.009 (0.006)
Total Cost of Visit Per Month										0.100*** (0.005)
Constant	1.753*** (0.024)	1.674*** (0.030)	1.633*** (0.030)	1.632*** (0.030)	1.651*** (0.030)	1.758*** (0.040)	1.697*** (0.044)	1.825*** (0.045)	1.796*** (0.046)	1.624*** (0.045)
Observations	8388	8388	8388	8388	8388	8388	8388	8388	8388	8388

Notes: This table presents the results of OLS regressions examining the effects of hepatitis on labor productivity. Standard errors (in brackets) are robust to arbitrary heteroscedasticity. *, **, and * indicate statistical significance at the 10%, 5% and 1% level, respectively.**

Table 6 explored the results of OLS regression models estimated for the effect of hepatitis B and C on absenteeism from job based on gender of the patient, age of the patients, material status, source of exposure, employment status, family size, direct and indirect cost and monthly income of the infect person's family. The above table 4.40 model 10 showed significant effect of gender on absenteeism/productivity and found that male patient significantly high probability of absenteeism than female. The magnitude of male patients indicated 25% greater probability of absenteeism than female whereas on average age of the patient has also direct impact on absenteeism (productivity). Material status of the patient and source of exposure of Hepatitis B and C were found indirectly related to absenteeism from job of employees with hepatitis B or C virus, the probability of married Patients of Hepatitis B or C were found 44% less than unmarried while patients exposed for hepatitis from dental clinic, beauty parlor, surgery and blood

transfusion had on average had significant indirect impact on absenteeism while the effect sexual relation and vertical transmission with absenteeism were found directly. The results of OLS model also indicated the significate direct effect of employment status of Viral Hepatitis patients on absenteeism, the probability of absenteeism among part time employee, self-employed and retired employees were estimated 29%, 47% and 10.4% respectively while the effect of unemployed and dependent patients were estimated significantly indirect to absenteeism. The results also revealed that family size and number of infect family members were also significant direct impact of absenteeism and found on average 22% and 37% respectively whereas the effect of complete health insurance was estimated indirect with absenteeism due to hepatitis infection. The estimated results of direct medical cost, Indirect medical cost and monthly income of the patients also explored the direct impact of viral hepatitis infection on absenteeism from job among hepatitis patients.

Table 7: Baseline estimation job rejection of hepatitis B and C patients

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Male	0.015*** (0.005)	0.015*** (0.005)	0.015*** (0.005)	0.013** (0.005)	0.011** (0.005)	0.012** (0.005)	0.012** (0.005)	0.014*** (0.005)	0.014*** (0.005)	0.013*** (0.005)
Age of the Patient	-0.001 (0.003)	-0.000 (0.003)	-0.000 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.001 (0.003)
Married	-0.007 (0.008)	-0.008 (0.008)	-0.008 (0.008)	-0.009 (0.008)	-0.010 (0.008)	-0.007 (0.007)	-0.007 (0.007)	-0.005 (0.007)	-0.004 (0.007)	-0.007 (0.007)
Dental clinic	-0.011 (0.009)	-0.015* (0.008)	-0.015* (0.008)	-0.016* (0.008)	-0.021** (0.008)	-0.020** (0.008)	-0.021** (0.008)	-0.019** (0.008)	-0.021** (0.008)	-0.022*** (0.008)
Sexual relation	0.108*** (0.040)	0.099** (0.039)	0.099** (0.039)	0.102*** (0.037)	0.081*** (0.029)	0.073** (0.030)	0.072** (0.028)	0.064** (0.026)	0.065** (0.026)	0.062** (0.025)
Barber shop	0.023 (0.029)	0.025 (0.032)	0.025 (0.032)	0.020 (0.028)	0.011 (0.026)	0.005 (0.025)	0.006 (0.026)	0.000 (0.024)	0.000 (0.025)	0.002 (0.028)
Beauty	-0.012	-0.013	-0.013	-0.020	-0.018	-	-	-0.008	-0.009	-0.012

parlour	(0.016)	(0.015)	(0.015)	(0.014)	(0.014)	0.022** (0.013)	0.023* (0.013)	(0.017)	(0.016)	(0.015)
Surgery	0.008 (0.012)	0.006 (0.012)	0.006 (0.012)	0.000 (0.011)	0.002 (0.011)	0.004 (0.011)	0.004 (0.011)	0.009 (0.012)	0.008 (0.012)	-0.005 (0.010)
Blood transfusion	-0.014 (0.012)	-0.013 (0.013)	-0.013 (0.013)	-0.014 (0.012)	-0.008 (0.013)	-0.008 (0.013)	-0.008 (0.013)	-0.011 (0.013)	-0.010 (0.013)	-0.017 (0.012)
Vertical transmission	0.005 (0.008)	0.007 (0.009)	0.008 (0.009)	0.001 (0.008)	0.001 (0.008)	-0.003 (0.008)	-0.003 (0.008)	-0.007 (0.007)	-0.008 (0.007)	-0.006 (0.007)
Part time employee <30 hr/week	0.095*** (0.030)	0.079*** (0.028)	0.079*** (0.028)	0.095*** (0.029)	0.087*** (0.029)	0.072*** (0.023)	0.076*** (0.025)	0.121*** (0.030)	0.123*** (0.031)	0.110*** (0.027)
Self-employee	0.000 (0.013)	0.007 (0.012)	0.007 (0.012)	-0.002 (0.012)	0.020** (0.009)	0.018** (0.009)	0.017* (0.009)	0.016* (0.009)	0.005 (0.010)	0.015* (0.008)
Dependent	-0.053*** (0.011)	-0.048*** (0.010)	-0.048*** (0.010)	-0.053*** (0.011)	-0.028*** (0.009)	-0.027*** (0.009)	-0.027*** (0.009)	-0.028*** (0.008)	-0.036*** (0.010)	-0.029*** (0.008)
Un-employed	0.512*** (0.040)	0.494*** (0.045)	0.495*** (0.045)	0.374*** (0.053)	0.421*** (0.049)	0.466*** (0.055)	0.481*** (0.054)	0.442*** (0.068)	0.424*** (0.062)	0.310*** (0.053)
Education and Awareness	0.030*** (0.003)	0.030*** (0.003)	0.030*** (0.003)	0.030*** (0.003)	0.025*** (0.003)	0.026*** (0.003)	0.026*** (0.003)	0.025*** (0.003)	0.026*** (0.003)	0.032*** (0.003)

Total number of Family Members		-0.021*** (0.005)	-0.020*** (0.005)	-0.013*** (0.004)	-0.010*** (0.004)	-0.008** (0.004)	-0.007** (0.004)	-0.009** (0.004)	-0.010*** (0.004)	-0.002 (0.003)
Number of Infected Family Members			-0.001 (0.004)	-0.010** (0.004)	-0.003 (0.004)	-0.001 (0.003)	-0.001 (0.003)	0.002 (0.004)	0.003 (0.004)	0.005 (0.003)
Death of a Family member				0.053*** (0.004)	0.036*** (0.004)	0.034*** (0.004)	0.035*** (0.004)	0.029*** (0.004)	0.028*** (0.004)	0.023*** (0.004)
Complete health insurance					0.134*** (0.020)	0.131*** (0.019)	0.136*** (0.020)	0.135*** (0.020)	0.148*** (0.021)	0.127*** (0.018)
Estimated Direct Medical Cost per Month						-0.038*** (0.007)	-0.032*** (0.009)	-0.018 (0.011)	-0.013 (0.010)	-0.009 (0.008)
Estimate Indirect Medical Cost per Month							-0.013 (0.010)	-0.014 (0.010)	-0.012 (0.010)	-0.009 (0.008)
Total Cost Spent on Treatment								-0.034*** (0.006)	-0.032*** (0.006)	-0.035*** (0.005)
Monthly income									-0.013*	-0.010*

									** (0.003)	** (0.003)
Total Cost of Visit Per Month										-0.020*** (0.002)
Observations	8331	8331	8331	8331	8331	8331	8331	8331	8331	8331

Notes: This table presents the marginal effects of Logit regressions examining the effects of hepatitis on employment. Standard errors (in brackets) are robust to arbitrary heteroskedasticity. *, **, and * indicate statistical significance at the 10%, 5% and 1% level, respectively.**

The objective of this estimation approach is to estimate the impact of hepatitis B and C on job rejection. We have empirically estimated equation (3) by using logistics regression econometric techniques. Table 8 contains outcome for equation (3) and presented the average marginal effects estimated from logistics regression for the probability of job rejection restricted to wide range of independent variables included in the current study. The average marginal effects were estimated by taking job rejection because of hepatitis infection as dichotomous variable i.e., 1 (if an individual experienced job rejection caused by hepatitis B or C) and "0" (if an individual not experienced job rejection caused by hepatitis B or C).

The results of "average marginal effects" derived from logistic regression provide more complete picture of regression phenomenon to compare outcomes. On average, male has 1.5 percent significantly more chances of experienced job rejection caused by hepatitis B or C, as compared with female respondent. Column (10) of table 4.41 indicates 1% significantly lower probability (less likely) with an additional year of age that job be rejected due hepatitis B or C.

The result indicates that respondents who exposed to hepatitis B or C from dental clinic, barber shop and blood transfusion found to be 3, 7.7 and 2.7 percent less likely to be rejected for job respectively. Furthermore, table 4.41 showed that respondents working as part time employee, self-employee and unemployed have 9.5, 1.5 and 5.12 percent significantly higher probability (more likely) for experienced job rejection caused by hepatitis B or C.

The household size and estimated direct medical cost and indirect medical costs per month were estimated to be significant negative effect on experienced job rejection caused by hepatitis B or C and significantly lower probability (less likely) with an additional year. The estimated average probability of household size and direct medical cost and indirect medical costs -0.008 with P-value of 0.004 and -0.018 with P-value of 0.011 and -0.012 with P-value of 0.008 indicated that probability of significantly lower probability (less likely) with job rejection caused by hepatitis B or C. Monthly income of the patients and their family was also found indirect effect and significantly lower probability (less likely) with job rejection caused by hepatitis B or C.

CONCLUSION AND RECOMMENDATIONS

Keeping in view the importance of health in human capital and human development index, it is important to conduct a study that highlight the consequence of hepatitis in Pakistan. This study is designed to estimate the effect of viral hepatitis (B & C) on labor productivity, family income, morbidity and mortality, estimate the direct and indirect cost of hepatitis (B & C) and total cost imposed on each patient and their family in Pakistan. Primary data was collected from 8,388 hepatitis B and C patients at district headquarter hospitals, private hospitals and doctors' clinic from 77 districts across Pakistan including Azad Jammu and Kashmir and Gilgit Baltistan through a well design questionaire containing 36 questions based on demographic and economic indicators. Descriptive, inferential statistical tools, logit and OLS econometric techniques were applied for data analysis.

This study found significant effect of viral hepatitis B

and C on labor productivity, labor mobility, absenteeism and presentism at work place, family income, mortality and life style in Pakistan. This study also found significant impact of hepatitis on productivity in terms of absenteeism and presentism and estimated that an average per patient and their attendant's absenteeism and presentism 1.89 days per month and total working days lost in Pakistan were estimated 32,432,400. Furthermore, hepatitis B and C had also found significant indirect impact on labor mobility employment and mortality and concluded that 2.07% visa rejection, 12% job rejection and 5.2% morality caused by hepatitis B and C. The "average marginal effects" derived from logistic regression provide more holistic picture of regression phenomenon to compare outcomes. On average, for male are 3.2 percent significantly more chances of visa rejection, as compared with female respondent. Column (10) of table 8 indicates 1.8 percentage significantly lower probability (less likely) with an additional year of age that visa would be rejected.

Similarly, the effect of hepatitis B and C was found indirect and caused decline in income in term of loss of working days and selling of assets. This study also found adverse effect of viral hepatitis B and C on foreign reserves and concluded high 0.18% reduction in foreign reserves.

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