

Research Article

Analysis of Trends in Awareness Regarding Hepatitis Using Bayesian Multiple Logistic Regression Model

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Diseases like hepatitis remained a major health concern, especially in developing countries. The awareness and knowledge about such diseases are of prime importance. The analysis of socioeconomic factors associated with the tendency of awareness and knowledge about the said diseases is fundamental. However, in developing countries like Pakistan, very few studies have considered such investigations using nationally representative data. In addition, a careful review of the literature suggests that no studies have analyzed the trends in awareness and knowledge about said disease with respect to time using nationally representative datasets. Furthermore, the existing literature regarding these studies has utilized the classical methods for the analysis. We have considered a detailed study for analyzing the trends in awareness and knowledge about the said disease in the general population of Pakistan from 2012 to 2018, using nationally representative data collected through Pakistan Demographic and Health Surveys. In addition, we have considered the Bayesian methods for the analysis and performance of the proposed Bayes methods that have been compared with the frequently used classical methods. The results indicated that the proposed Bayesian multiple logistic regression models performed better as compared to classical multiple logistic regression models (CMLRMs). This is due to fact that widths of 95% CIs were smaller for Bayesian multiple logistic regression models (BMLRM), as compared to classical multiple logistic regression models. The findings of the study suggest that there are severe disparities (with respect to different socioeconomic groups) in the knowledge and awareness of respondents for hepatitis. The levels of knowledge and awareness about the said disease are drastically low for respondents living in rural areas, having lower levels of education and wealth. These disparities seem to persist, as the corresponding odds have not changed much during the period 2012 to 2018. The policy-maker should plan and implement the strategies to reduce the observed disparities for different sectors of society.

1. Introduction

Diseases like hepatitis remained a major health concern, especially in developing countries. Hepatitis C is one of the liver diseases that occur due to HCV (hepatitis C virus); this virus can lead to chronic and acute hepatitis, ranging in acuteness from mild infection lasting some weeks to a serious, lifetime illness. According to estimation, 71 million individuals worldwide are infected with chronic hepatitis C [1]. Pakistan has the second-highest prevalence rate of hepatitis C. Although the total

prevalence of HIV in the adult population is still less than 1%, the most recent estimate of people living with HIV (PLHIV) was 150,0002 in 2017. In 2018, there were 21,000 new PLHIV cases reported. Between 2016 and 2030, the World Health Organization hopes to cut new hepatitis infections by 90% and fatalities by 65%. [1]. Kumar et al. [2] conducted a cross-sectional study to assess the knowledge and practices about the dietary habits of patients with HCV treated in two hospitals located in the capital city Islamabad, Pakistan. The study concluded that the respondents have sufficient

knowledge about HCV, though there is a misunderstanding among the patients that spicy foods cause HCV. Rafiq et al. [3] explored the lack of awareness about HBV and HCV among the nonmedical students in the universities of Karachi. Iqbal et al. [4] conducted a study to investigate the tendency of knowledge and awareness about HCV among the MBBS students from the Faisalabad Medical University. It was encouraging to observe that majority of the practicing students were having adequate knowledge about the transmission and prevention of HCV. According to Junaid et al. [5], although there is less prevalence of HCV among university students in Lahore, the rate of prevalence was high among minorities and general populations. The need for awareness campaigns was proposed.

Ali et al. [6] conducted a study during 2016 to investigate the awareness of the health hazards of HCV in the paramedical staff at Nishtar Hospital, Multan, Pakistan. The study concluded that although the paramedical staff was having sufficient knowledge about the spread of HCV, the information on treatment plans was not adequate. Akhtar et al. [7] studied the prevalence of HCV in men to women in Rawalpindi, Pakistan. It was assessed that the HCV infection was predominant in the respondents. Khan et al. [8] considered a cross-sectional study to analyze the knowledge, attitude, and practices regarding HBV among staff nurses in a public hospital in Peshawar, Pakistan. Although the knowledge and attitude of the nurses regarding HBV were good, the practices were quite poor. Haq et al. [9] conducted a cross-sectional study to assess the awareness regarding HCV in Pakistan. Balch et al. [10] investigated the genotype distribution of HCV. Falade-Nwulia et al. [11] considered the systematic review of oral direct-acting agent therapy for HCV. Other similar studies include Shakeel et al. [12]; Ali et al. [13]; Ali et al. [14]; Waheed et al. [15]; Ashraf and Ahmad [16]; Ayoub et al. [17]; and Haq et al. [9].

The awareness and knowledge about the diseases such as HCV/HBV are of prime importance. The analysis of socioeconomic factors associated with the tendency of awareness and knowledge about the said diseases is fundamental. However, in Pakistan, very few studies have considered such investigations using nationally representative data. In addition, a careful review of the literature suggests that no studies have analyzed the trends in awareness and knowledge about said disease with respect to time using nationally representative datasets. Furthermore, the existing literature regarding these studies has utilized the classical methods for the analysis. We have considered a detailed study for analyzing the trends in awareness and knowledge about the said disease in the general population of Pakistan from 2006 to 2018 using nationally representative data collected through Pakistan Demographic and Health Surveys. In addition, we have considered the Bayesian methods for the analysis and performance of the proposed Bayes methods that have been compared with the frequently used classical methods. The results from the study suggested the superior performance of proposed Bayesian methods as compared to classical methods. In addition,

2. Material and Methods

The datasets regarding awareness and knowledge about hepatitis have been used for the analysis. These datasets have been extracted from the reports of PDHS carried out during 2012–13 and 2017–18. These datasets were collected using two-stage stratified random sampling. The probability proportional to size was used in the first stage to determine the enumeration blocks. The second stage utilized the systematic sampling plans to select the required number of eligible respondents. The efficiency of the data collection methods was evaluated using pre-testing. The Bayesian multiple logistic regression has been used to identify the important determinants regarding awareness and knowledge about hepatitis in Pakistan. The results under the proposed models have been compared with their classical counterparts. The said comparison has been carried out using widths of 95% confidence intervals (CI) for the ORs. The goodness-of-fit criteria such as Akaike information criteria (AIC) and Bayesian information criteria (BIC) have also been used for the comparison among the models. The changes in levels of awareness and knowledge about hepatitis have been investigated using the data from PDHSs conducted from 2012 to 2018.

2.1. Logistic Regression Model. Logistic regression is a statistical model for determining whether an independent variable affects a binary dependent variable. It can be derived using the simple linear regression model of the form

$$g(x) = \beta_0 + \beta_1 x, \quad (1)$$

where $g(x)$ is a response variable, and X represents an explanatory variable. The terms β_0 and β_1 are the intercept and slope parameters of the model, respectively.

$$\begin{aligned} \log(P_i) &= \log\left(\frac{P_i}{1 - P_i}\right) \\ &= \beta_0 + \beta_1 x. \end{aligned} \quad (2)$$

If p is the proportion of observations with an outcome of “1,” then $1 - p$ is the probability of an outcome of “0.” The ratio $p/(1 - p)$ is called the odds, and the logit is the logarithm of the odds.

2.2. Bayesian Multiple Logistic Regression Model. Under the assumption that the i th observation from the multiple logistic regression model follows a binomial distribution, the corresponding likelihood function for all the observations is

$$\text{likelihood}_i = \pi(x_i)^{y_i} \{1 - \pi(x_i)\}^{1 - y_i}, \quad (3)$$

where $\pi(x_i)$ represents the probability of the event for the subject i who has covariate vectors x_i and y_i that indicate the presence, $y_i = 1$, or absence, $y_i = 0$, of the event of that subject.

$$\pi(x) = \frac{e^{\beta_0 + \beta_1 X_1 + \dots + \beta_p X_p}}{1 + e^{\beta_0 + \beta_1 X_1 + \dots + \beta_p X_p}}. \quad (4)$$

The prior distribution is

$$\beta_j \sim N(\mu_j, \sigma_j^2), \quad j = 0, 1, 2, \dots, p. \quad (5)$$

The corresponding posterior distribution is

$$\text{Posterior} = \prod_{i=1}^n \left[\left(\frac{e^{\beta_0 + \beta_1 X_{i1} + \dots + \beta_p X_{ip}}}{1 + e^{\beta_0 + \beta_1 X_{i1} + \dots + \beta_p X_{ip}}} \right)^{y_i} \left(1 - \frac{e^{\beta_0 + \beta_1 X_{i1} + \dots + \beta_p X_{ip}}}{1 + e^{\beta_0 + \beta_1 X_{i1} + \dots + \beta_p X_{ip}}} \right)^{(1-y_i)} \right] \prod_{j=0}^p \frac{1}{\sqrt{2\pi\sigma_j}} \exp \left\{ -\frac{1}{2} \left(\frac{\beta_j - \mu_j}{\sigma_j} \right)^2 \right\}. \quad (6)$$

3. Results and Discussions

This section deals with numerical computations regarding knowledge and awareness about hepatitis. The analysis has been carried out based on BMLRM and CMLRM. The ORs and corresponding widths for 95% confidence intervals (CI) have been reported. The amounts of AICs and BICs have also been reported. The national representative datasets from PDHS conducted during 2012–18 have been used for the analysis. The response variables used in the study were as follows:

- (i) Heard about hepatitis
- (ii) Know the preventive measures for hepatitis

The explanatory variables used in the study were as follows: age, residence, gender, region, education, and wealth.

The analysis regarding awareness about hepatitis using multiple logistic regression models is given in Tables 1, and –4. A similar analysis using BMLRM has been given in Tables 5, and –8. Table 1 discusses the analysis regarding the respondents who have heard about hepatitis during 2012–13. Similarly, Table 2 contains the result for respondents who have knowledge about the prevention measure of hepatitis during 2012–13. The results presented in Tables 1–8 also advocate a better estimation under BMLRM as compared to CMLRM. This is owing to the reason that the widths of 95% CIs for ORs are smaller in the case of BMLRM as compared to CMLRM. This comparison can also be seen, based on the amounts of AICs and BICs, from Tables 9 and 10, respectively. In particular, Table 9 reports the AICs and BICs for the models using data from PDHS 2012-13. On the other hand, Table 10 presents the AICs and BICs based on the data from PDHS 2017-18. Since the amounts of AICs and BICs are smaller for BMLRM, and compared to CMLRM, the performance of the BMLRM was found to be superior to CMLRM.

From Table 5, it can be assessed that the odds for respondents who have heard about hepatitis are higher at higher age. For example, the said OR is 0.389{0.198,0.836}^d for age-group 15–19 years as compared to age-group 45–49 years. The odds for respondents from rural areas are significantly lower with OR 0.545{0.749,1.193}^d as compared to urban areas. The odds for Punjab are greater than Sindh, KPK, and other provinces of Pakistan. The results display that the odds for respondents having no education levels are

smaller than 0.049{0.020,0.100}^d. Similarly, the odds for lower wealth quintiles are the minimum 0.252{0.169,0.369}^d.

Table 6 suggests that the ORs for the person who knows that hepatitis can be prevented are not greatly different for different age-groups. For example, the said OR for age-group 15–19 years is 1.471{0.593,4.762}^b, while it is 0.843 {0.626,1.118}^a for age-group 40–44 years. The said ORs were substantially high in the urban areas as compared to the rural areas with ORs for rural areas, as 0.649{0.541, 0.778}^d. As far as the comparison of different regions is concerned, the said ORs were reasonably low in different provinces, as compared to Islamabad. On the other hand, the ORs for Punjab were higher as compared to Sindh, KPK, and Baluchistan. The said ORs were quite low in Baluchistan 0.583{0.154, 1.744}^b. Education was explored to be an important determinant in knowledge about hepatitis being a preventable disease. However, it was interesting to note that women from the same education levels as men have higher knowledge about hepatitis being a preventable disease. For example, in the case of illiterate, the said OR for women is 0.408{0.306, 0.536}^c and 0.413{0.349, 0.488}^c for men. Similarly, the said OR for respondents with matriculation education is 0.893 {0.645, 1.239}^d in women and 0.535{0.440, 0.645}^d in men. The knowledge about hepatitis being a preventable disease is relatively more dependent on wealth quintiles.

The analysis of awareness about hepatitis using multiple logistic regression models based on data from PDHS 2017–2018 has been discussed in Tables 7 and 8, respectively. In Table 7, we presented the analysis regarding the respondents who have heard of hepatitis. On the other hand, Table 8 contains the ORs for respondents who know about the prevention of hepatitis. The said ORs are mostly greater in urban areas as compared to rural areas 0.609{0.457, 0.809}^d. Knowledge about hepatitis is very low in uneducated people with corresponding ORs 0.143{0.079, 0.238}^d in case of men, 0.141{0.108, 0.181}^d in case of women, and 0.142 {0.103, 0.167}^d for the whole population. From Table 8, we can assess that odds for respondents who know about the prevention of hepatitis are the lowest for the highest age-group 0.861{0.706, 1.054}^a. On the other hand, ORs are lower for no education level 0.497{0.349, 0.712}^c. The ORs are also lower for lower-income levels. On the other hand, the ORs in favor of respondents who know about the preventive measures for hepatitis are seriously low in Punjab as compared to other regions.

The trends (over time) in awareness of hepatitis among the respondents have been presented in Figure 1. In

TABLE 1: Comparison of ORs for respondents who have heard of hepatitis using CMLRM based on data from PDHS 2012–13.

Age	Women	Men	Total
15–19	0.451 {0.340, 0.599} ^d	0.364 {0.159, 0.942} ^c	0.444 {0.343, 0.578} ^d
20–24	0.757 {0.601, 0.951} ^a	0.576 {0.355, 0.949} ^c	0.734 {0.598, 0.899} ^d
25–29	0.691 {0.554, 0.856} ^b	0.953 {0.622, 1.464} ^a	0.719 {0.593, 0.868} ^c
30–34	0.711 {0.569, 0.855} ^b	1.026 {0.679, 1.548} ^a	0.757 {0.623, 0.917} ^c
35–39	0.831 {0.659, 1.045} ^a	3.143 {1.803, 5.770} ^d	0.985 {0.801, 1.210} ^a
40–44	0.977 {0.761, 1.253} ^a	0.996 {0.648, 1.534} ^a	0.976 {0.787, 1.211} ^a
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	Reference	Reference
Rural	0.582 {0.510, 0.662} ^d	0.947 {0.714, 1.248} ^a	0.629 {0.559, 0.707} ^d
Region			
Punjab	0.913 {0.276, 2.227} ^a	0.860 {0.333, 1.846} ^b	0.707 {0.215, 1.705} ^b
Urban	1.291 {0.387, 3.199} ^b	1.169 {0.465, 2.481} ^a	0.908 {0.275, 2.217} ^a
Rural	0.787 {0.238, 1.923} ^b	0.755 {0.277, 1.604} ^b	0.631 {0.192, 1.524} ^b
Sindh	0.369 {0.112, 0.902} ^c	0.364 {0.147, 0.791} ^c	0.309 {0.094, 0.745} ^c
Urban	0.600 {0.180, 1.483} ^b	0.580 {0.208, 1.258} ^b	0.489 {0.148, 1.193} ^c
Rural	0.262 {0.079, 0.642} ^d	0.264 {0.097, 0.577} ^c	0.223 {0.068, 0.540} ^d
KPK	0.636 {0.191, 1.567} ^b	0.629 {0.254, 1.347} ^b	0.536 {0.162, 1.305} ^b
Urban	0.949 {0.270, 2.603} ^a	0.897 {0.329, 2.078} ^a	0.743 {0.214, 1.980} ^b
Rural	0.599 {0.180, 1.479} ^b	0.580 {0.227, 1.216} ^b	0.509 {0.154, 1.243} ^c
Baluchistan	0.252 {0.075, 0.626} ^d	0.253 {0.102, 0.540} ^d	0.224 {0.067, 0.550} ^d
Urban	0.252 {0.075, 0.626} ^d	0.403 {0.149, 0.992} ^c	0.305 {0.087, 0.838} ^c
Rural	0.224 {0.067, 0.561} ^d	0.232 {0.089, 0.502} ^d	0.206 {0.062, 0.510} ^c
Islamabad	Reference	Reference	Reference
Gilgit-Baltistan	0.067 {0.019, 0.178} ^d	0.071 {0.027, 0.163} ^d	0.051 {0.015, 0.134} ^d
Educational level			
Illiterate	0.143 {0.097, 0.204} ^d	0.046 {0.014, 0.110} ^d	0.116 {0.080, 0.162} ^d
Primary	0.304 {0.119, 0.448} ^d	0.098 {0.029, 0.241} ^d	0.243 {0.165, 0.348} ^d
Middle	0.508 {0.313, 0.814} ^c	0.158 {0.046, 0.408} ^d	0.397 {0.258, 0.599} ^d
Matriculation	0.788 {0.483, 1.271} ^a	0.233 {0.067, 0.624} ^d	0.611 {0.394, 0.933} ^b
Higher	Reference	Reference	Reference
Income level			
Least	0.174 {0.140, 0.214} ^d	0.240 {0.150, 0.372} ^d	0.184 {0.151, 0.222} ^d
Lower-middle	0.305 {0.244, 0.380} ^d	0.509 {0.305, 0.836} ^d	0.329 {0.268, 0.401} ^d
Middle	0.443 {0.350, 0.557} ^d	0.529 {0.316, 0.874} ^c	0.455 {0.368, 0.561} ^d
Upper-middle	0.536 {0.421, 0.678} ^d	0.642 {0.385, 1.052} ^b	0.554 {0.446, 0.686} ^d
Highest	Reference	Reference	Reference

* a: P value ≥ 0.05 ; b: P value < 0.05 ; c: P value < 0.01 ; and d: P value < 0.001 .

TABLE 2: Comparison of ORs for respondents who know ways to prevent hepatitis using CMLRM based on data from PDHS 2012–13.

Age	Women	Men	Total
15–19	0.876 {0.680, 1.136} ^a	1.398 {0.477, 5.965} ^a	0.852 {0.669, 1.093} ^a
20–24	0.860 {0.722, 1.024} ^b	0.505 {0.336, 0.765} ^d	0.782 {0.667, 0.195} ^c
25–29	0.929 {0.784, 1.098} ^a	0.683 {0.488, 0.952} ^c	0.861 {0.741, 0.999} ^a
30–34	1.012 {0.851, 1.202} ^a	0.930 {0.666, 1.294} ^a	0.980 {0.841, 1.141} ^a
35–39	0.922 {0.774, 1.097} ^a	1.005 {0.715, 1.411} ^a	0.922 {0.790, 1.076} ^a
40–44	0.959 {0.798, 1.152} ^a	0.833 {0.592, 1.173} ^a	0.922 {0.784, 1.083} ^a
45–49	Reference	Reference	Reference
Residence			
Urban			
Rural	0.778 {0.705, 0.858} ^d	0.649 {0.520, 0.806} ^d	0.754 {0.689, 0.825} ^d
Region			
Punjab	1.089 {0.537, 2.018} ^a	0.926 {0.145, 3.314} ^a	0.968 {0.497, 1.730} ^a
Urban	1.157 {0.567, 2.158} ^b	2.600 {0.398, 9.835} ^c	1.146 {0.585, 2.062} ^a
Rural	1.059 {0.521, 1.965} ^a	0.672 {0.105, 2.407} ^b	0.896 {0.459, 1.603} ^a
Sindh	0.763 {0.375, 1.418} ^b	0.428 {0.067, 1.538} ^b	0.628 {0.322, 1.126} ^b
Urban	1.132 {0.552, 2.127} ^a	0.406 {0.063, 1.478} ^b	0.842 {0.428, 1.521} ^a

TABLE 2: Continued.

Age	Women	Men	Total
Rural	0.543 {0.266, 1.016} ^b	0.444 {0.069, 1.615} ^b	0.487 {0.248, 0.877} ^b
KPK	0.891 {0.436, 1.665} ^a	0.699 {0.108, 2.576} ^b	0.777 {0.396, 1.400} ^b
Urban	1.180 {0.549, 2.361} ^a	0.800 {0.114, 3.538} ^b	1.009 {0.492, 1.931} ^a
Rural	0.841 {0.411, 1.576} ^b	0.682 {0.105, 2.532} ^b	0.737 {0.375, 1.330} ^a
Baluchistan	0.831 {0.397, 1.603} ^a	0.564 {0.086, 2.169} ^b	0.723 {0.362, 1.336} ^b
Urban	0.807 {0.348, 1.789} ^b	0.767 {0.097, 4.454} ^a	0.777 {0.353, 1.634} ^a
Rural	0.835 {0.395, 1.630} ^a	0.527 {0.079, 2.059} ^b	0.707 {0.351, 1.319} ^b
Islamabad			
Gilgit-Baltistan	0.929 {0.350, 2.519} ^a	0.533 {0.055, 5.133} ^b	0.772 {0.312, 1.924} ^a
Educational level			
Illiterate	0.443 {0.218, 0.998} ^c	1.000 {0.660, 1.514} ^a	0.418 {0.352, 0.494} ^d
Primary	0.420 {0.336, 0.522} ^d	0.552 {0.383, 0.789} ^d	0.449 {0.372, 0.540} ^d
Middle	0.458 {0.356, 0.588} ^d	0.599 {0.409, 0.871} ^d	0.499 {0.404, 0.614} ^d
Matriculation	0.532 {0.418, 0.674} ^d	0.879 {0.590, 1.302} ^d	0.606 {0.494, 0.741} ^d
Higher	Reference	Reference	Reference
Income level			
Least	0.624 {0.537, 0.725} ^d	0.433 {0.313, 0.596} ^d	0.584 {0.510, 0.669} ^d
Lower-middle	0.610 {0.527, 0.705} ^d	0.490 {0.353, 0.676} ^d	0.587 {0.513, 0.670} ^d
Middle	0.690 {0.595, 0.799} ^d	0.669 {0.475, 0.940} ^b	0.684 {0.597, 0.782} ^d
Upper-middle	0.776 {0.670, 0.900} ^b	0.786 {0.563, 1.093} ^a	0.779 {0.681, 0.892} ^d
Highest	Reference	Reference	Reference

*a: P value ≥ 0.05 ; b: P value < 0.05 ; c: P value < 0.01 ; and d: P value < 0.001 .

TABLE 3: Comparison of ORs for respondents who have heard of hepatitis using CMLRM based on data from PDHS 2017–18.

Age	Men	Women	Total
15–19	0.742 {0.248, 3.199} ^b	0.423 {0.328, 0.547} ^d	0.376 {0.295, 0.480} ^d
20–24	0.779 {0.431, 1.438} ^b	0.753 {0.607, 0.930} ^d	0.681 {0.558, 0.830} ^d
25–29	0.954 {0.573, 1.577} ^a	1.163 {0.937, 1.440} ^b	1.064 {0.873, 1.294} ^a
30–34	1.236 {0.724, 2.113} ^b	1.090 {0.878, 1.349} ^a	1.044 {0.856, 1.271} ^a
35–39	0.943 {0.568, 1.553} ^a	1.122 {0.899, 1.397} ^a	1.049 {0.857, 1.281} ^a
40–44	1.253 {0.716, 2.217} ^b	1.041 {0.820, 1.320} ^a	1.048 {0.843, 1.304} ^a
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	0.637 {0.564, 0.719} ^d	Reference
Rural	0.608 {0.433, 0.842} ^d	Reference	0.626 {0.558, 0.701} ^d
Educational level			
Illiterate	0.142 {0.069, 0.263} ^d	0.140 {0.101, 0.188} ^d	0.132 {0.099, 0.172} ^d
Primary	0.257 {0.120, 0.498} ^d	0.259 {0.183, 0.357} ^d	0.257 {0.188, 0.344} ^d
Middle	0.310 {0.141, 0.634} ^c	0.286 {0.197, 0.407} ^d	0.294 {0.211, 0.405} ^d
Matriculation	0.705 {0.305, 1.566} ^a	0.415 {0.285, 0.595} ^d	0.464 {0.330, 0.644} ^d
Higher	Reference	Reference	Reference
Income level			
Least	0.208 {0.118, 0.348} ^d	0.232 {0.189, 0.284} ^d	0.229 {0.189, 0.276} ^d
Lower-middle	0.335 {0.188, 0.574} ^d	0.337 {0.273, 0.414} ^d	0.337 {0.276, 0.408} ^d
Middle	0.499 {0.272, 0.888} ^c	0.414 {0.334, 0.510} ^d	0.421 {0.344, 0.513} ^d
Upper-middle	1.128 {0.570, 2.255} ^a	0.523 {0.420, 0.649} ^d	0.560 {0.455, 0.687} ^d
Highest	Reference	Reference	Reference
Region			
Punjab	1.558 {0.249, 5.305} ^b	0.988 {0.462, 1.858} ^a	1.043 {0.528, 1.852} ^a
Urban	1.767 {0.276, 6.343} ^c	1.746 {0.804, 3.360} ^c	1.729 {0.864, 3.132} ^b
Rural	1.479 {0.235, 5.123} ^b	0.783 {0.365, 1.475} ^b	0.836 {0.423, 1.488} ^a
Sindh	0.850 {0.135, 2.915} ^a	0.508 {0.237, 0.959} ^b	0.548 {0.277, 0.975} ^b
Urban	1.403 {0.218, 5.126} ^b	1.546 {0.253, 1.038} ^b	0.619 {0.311, 1.111} ^b
Rural	0.533 {0.084, 1.865} ^b	0.471 {0.218, 0.896} ^b	0.480 {0.241, 0.861} ^c
KPK	1.203 {0.187, 4.340} ^b	0.743 {0.345, 1.415} ^b	0.780 {0.392, 1.402} ^b

TABLE 3: Continued.

Age	Men	Women	Total
Urban	1.867 {0.237, 11.79} ^a	2.009 {0.828, 4.599} ^c	1.861 {0.841, 3.919} ^b
Rural	1.100 {0.171, 4.022} ^a	0.639 {0.296, 1.217} ^b	0.675 {0.339, 1.214} ^b
Baluchistan	0.521 {0.081, 1.905} ^b	0.184 {0.085, 0.351} ^d	0.216 {0.109, 0.390} ^d
Urban	1.178 {0.149, 7.490} ^a	0.292 {0.129, 0.598} ^d	0.360 {0.172, 0.696} ^c
Rural	0.386 {0.059, 1.433} ^c	0.155 {0.071, 0.299} ^d	0.182 {0.091, 0.330} ^d
Islamabad	Reference	Reference	Reference
Gilgit-Baltistan	0.244 {0.039, 0.853} ^d	0.098 {0.045, 0.185} ^d	0.111 {0.056, 0.198} ^d

*a: *P* value ≥0.05; b: *P* value <0.05; c: *P* value <0.01; and d: *P* value <0.001.

TABLE 4: Comparison of ORs for respondents who know about the preventive measures for hepatitis using CMLRM based on data from PDHS 2017–18.

Age	Men	Women	Total
15–19	1.802 {0.525, 3.323} ^c	0.887 {0.597, 1.340} ^a	1.025 {0.711, 1.512} ^a
20–24	0.802 {0.490, 1.333} ^b	0.805 {0.606, 1.063} ^b	0.844 {0.664, 1.071} ^b
25–29	0.671 {0.451, 0.987} ^b	0.957 {0.727, 1.251} ^a	0.896 {0.716, 1.116} ^a
30–34	1.243 {0.804, 1.922} ^b	1.102 {0.830, 1.454} ^a	1.156 {0.914, 1.458} ^a
35–39	1.224 {0.794, 1.888} ^b	0.835 {0.633, 1.095} ^a	0.934 {0.742, 1.173} ^a
40–44	0.884 {0.577, 1.350} ^a	0.834 {0.619, 1.120} ^b	0.855 {0.670, 1.089} ^a
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	Reference	Reference
Rural	0.907 {0.706, 1.160} ^a	0.827 {0.628, 1.079} ^a	0.734 {0.644, 0.834} ^d
Educational level			
Illiterate	0.496 {0.321, 0.751} ^c	0.446 {0.344, 0.570} ^d	0.463 {0.372, 0.571} ^d
Primary	0.374 {0.242, 0.564} ^d	0.632 {0.469, 0.845} ^d	0.533 {0.418, 0.677} ^d
Middle	0.573 {0.356, 0.916} ^b	0.694 {0.494, 0.974} ^b	0.644 {0.488, 0.847} ^c
Matriculation	0.591 {0.375, 0.915} ^b	0.761 {0.549, 1.052} ^d	0.679 {0.522, 0.880} ^c
Higher	Reference	Reference	Reference
Income level			
Lowest	0.936 {0.599, 1.471} ^a	0.441 {0.348, 0.555} ^d	0.517 {0.421, 0.633} ^d
Second	0.634 {0.424, 0.942} ^b	0.532 {0.421, 0.671} ^d	0.557 {0.455, 0.680} ^d
Middle	0.490 {0.334, 0.714} ^d	0.647 {0.509, 0.820} ^d	0.600 {0.490, 0.733} ^d
Fourth	0.670 {0.452, 0.985} ^b	0.718 {0.564, 0.911} ^d	0.699 {0.570, 0.856} ^c
Highest	Reference	Reference	Reference
Region			
Punjab	0.695 {0.165, 1.989} ^b	1.125 {0.471, 2.274} ^a	0.984 {0.481, 1.792} ^a
Urban	0.771 {0.181, 2.247} ^b	1.273 {0.527, 2.615} ^b	1.092 {0.530, 2.013} ^a
Rural	0.651 {0.154, 1.876} ^b	1.038 {0.433, 2.106} ^a	0.919 {0.448, 1.679} ^a
Sindh	2.333 {0.538, 7.053} ^c	0.816 {0.340, 1.662} ^b	1.024 {0.497, 1.883} ^a
Urban	2.116 {0.479, 6.645} ^c	1.213 {0.497, 2.532} ^b	1.395 {0.668, 2.621} ^b
Rural	2.713 {0.592, 9.188} ^c	0.584 {0.241, 1.201} ^b	0.765 {0.368, 1.422} ^b
KPK	1.806 {0.411, 5.600} ^b	0.642 {0.267, 1.311} ^b	0.786 {0.381, 1.449} ^b
Urban	0.926 {0.195, 3.372} ^a	0.849 {0.333, 1.899} ^a	0.907 {0.416, 1.813} ^a
Rural	2.181 {0.486, 7.070} ^b	0.602 {0.250, 1.234} ^b	0.764 {0.369, 1.415} ^b
Baluchistan	1.545 {0.334, 3.344} ^b	1.355 {0.524, 3.103} ^b	1.391 {0.636, 2.795} ^b
Urban	5.778 {0.702, 9.880} ^d	1.145 {0.396, 3.183} ^a	1.576 {0.629, 3.953} ^b
Rural	1.122 {0.239, 3.974} ^a	1.486 {0.550, 3.697} ^b	1.314 {0.585, 2.752} ^b
Islamabad	Reference	Reference	Reference
Gilgit-Baltistan	0.762 {0.172, 2.411} ^b	0.411 {0.168, 0.860} ^b	0.479 {0.229, 0.903} ^b

*a: *P* value ≥0.05; b: *P* value <0.05; c: *P* value <0.01; and d: *P* value <0.001.

particular, Figure 1(a) represents the said trends regarding the respondents who have heard about hepatitis. On the other hand, Figure 1(b) shows the trends for the respondents who know that hepatitis is a preventable disease. The results from the data collected through PDHS conducted in

2012–13 and 2017–18 have been used for drawing these comparisons. From Figure 1(a), it can be clearly seen that the ORs for the respondents having heard about hepatitis have not significantly changed over time. On the other hand, Figure 1(b) elucidates that the ORs for respondents who

TABLE 5: Comparison of ORs for respondents who have heard of hepatitis using BMLRM based on data from PDHS 2012–13.

Age	Men	Women	Total
15–19	0.389 {0.198, 0.836} ^d	0.460 {0.364, 0.586} ^c	0.445 {0.357, 0.555} ^d
20–24	0.584 {0.383, 0.889} ^a	0.761 {0.625, 0.920} ^c	0.736 {0.622, 0.881} ^d
25–29	0.946 {0.660, 1.372} ^b	0.690 {0.574, 0.825} ^a	0.719 {0.615, 0.842} ^c
30–34	1.028 {0.726, 1.430} ^b	0.713 {0.587, 0.860} ^a	0.755 {0.642, 0.889} ^c
35–39	3.139 {1.979, 5.156} ^a	0.832 {0.683, 1.005} ^d	0.989 {0.820, 1.182} ^a
40–44	1.022 {0.714, 1.486} ^a	0.972 {0.788, 1.195} ^a	0.977 {0.812, 1.167} ^a
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	Reference	Reference
Rural	0.545 {0.749, 1.193} ^d	0.582 {0.521, 0.650} ^d	0.631 {0.569, 0.695} ^d
Region			
Punjab	0.097 {0.000, 1.098} ^d	0.860 {0.333, 1.846} ^b	0.684 {0.255, 1.435} ^b
Urban	0.100 {0.000, 0.980} ^d	1.169 {0.465, 2.481} ^a	0.830 {0.303, 1.830} ^b
Rural	0.112 {0.000, 1.105} ^d	0.755 {0.277, 1.604} ^b	0.608 {0.239, 1.308} ^b
Sindh	0.496 {0.068, 1.870} ^b	0.364 {0.147, 0.791} ^c	0.312 {0.116, 0.657} ^c
Urban	0.113 {0.001, 0.992} ^d	0.580 {0.208, 1.258} ^b	0.474 {0.186, 1.009} ^c
Rural	0.384 {0.046, 1.491} ^b	0.264 {0.097, 0.577} ^c	0.232 {0.094, 0.480} ^d
KPK	0.142 {0.000, 1.519} ^d	0.629 {0.254, 1.347} ^b	0.513 {0.201, 1.122} ^b
Urban	0.126 {0.000, 1.437} ^d	0.897 {0.329, 2.078} ^a	0.713 {0.269, 1.626} ^b
Rural	0.158 {0.001, 1.697} ^d	0.580 {0.227, 1.216} ^b	0.500 {0.195, 1.024} ^b
Baluchistan	0.074 {0.000, 0.831} ^d	0.253 {0.102, 0.540} ^d	0.225 {0.093, 0.479} ^d
Urban	0.057 {0.000, 0.648} ^d	0.403 {0.149, 0.992} ^c	0.314 {0.116, 0.721} ^c
Rural	0.099 {0.000, 0.956} ^d	0.232 {0.089, 0.502} ^d	0.215 {0.084, 0.437} ^c
Islamabad	Reference	Reference	Reference
Gilgit-Baltistan	0.090 {0.011, 0.417} ^d	0.071 {0.027, 0.163} ^d	0.055 {0.021, 0.119} ^d
Educational level			
Illiterate	0.049 {0.020, 0.100} ^d	0.145 {0.104, 0.194} ^d	0.120 {0.088, 0.160} ^d
Primary	0.122 {0.054, 0.250} ^d	0.304 {0.214, 0.420} ^d	0.251 {0.183, 0.342} ^d
Middle	0.200 {0.079, 0.422} ^c	0.510 {0.340, 0.761} ^d	0.399 {0.276, 0.566} ^d
Matriculation	0.300 {0.124, 0.635} ^a	0.745 {0.495, 1.103} ^d	0.629 {0.439, 0.887} ^b
Higher	Reference	Reference	Reference
Income level			
Least	0.252 {0.169, 0.369} ^d	0.174 {0.144, 0.208} ^d	0.184 {0.157, 0.215} ^d
Lower-middle	0.507 {0.329, 0.779} ^d	0.304 {0.250, 0.366} ^d	0.330 {0.276, 0.390} ^d
Middle	0.552 {0.360, 0.846} ^d	0.441 {0.361, 0.534} ^c	0.458 {0.384, 0.546} ^d
Upper-middle	0.651 {0.424, 0.969} ^d	0.537 {0.442, 0.650} ^b	0.554 {0.462, 0.664} ^d
Highest	Reference	Reference	Reference

TABLE 6: Comparison of ORs for respondents who know about the prevention measure of hepatitis using BMLRM based on data from PDHS 2012–13.

Age	Men	Women	Total
15–19	1.471 {0.593, 4.762} ^b	0.879 {0.714, 1.080} ^a	0.860 {0.707, 1.054} ^b
20–24	0.508 {0.364, 0.714} ^b	0.867 {0.744, 1.004} ^b	0.782 {0.689, 0.886} ^c
25–29	0.688 {0.520, 0.910} ^b	0.932 {0.806, 1.069} ^c	0.864 {0.759, 0.986} ^a
30–34	0.929 {0.707, 1.223} ^a	1.011 {0.875, 1.169} ^a	0.984 {0.865, 1.113} ^a
35–39	1.004 {0.760, 1.331} ^a	0.924 {0.799, 1.068} ^a	0.921 {0.814, 1.049} ^a

TABLE 6: Continued.

Age	Men	Women	Total
40–44	0.843 {0.626, 1.118} ^a	0.961 {0.828, 1.116} ^a	0.922 {0.809, 1.057} ^a
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	Reference	Reference
Rural	0.649 {0.541, 0.778} ^d	0.777 {0.715, 0.842} ^d	0.922 {0.809, 1.057} ^d
Region			
Punjab	0.830 {0.220, 2.388} ^a	0.949 {0.515, 1.604} ^a	0.946 {0.543, 1.580} ^a
Urban	2.087 {0.476, 6.628} ^c	1.140 {0.620, 1.933} ^a	1.126 {0.642, 1.817} ^a
Rural	0.644 {0.163, 1.904} ^b	1.030 {0.577, 1.767} ^a	0.971 {0.576, 1.570} ^a
Sindh	0.430 {0.109, 1.213} ^b	0.756 {0.410, 1.271} ^b	0.626 {0.365, 1.026} ^b
Urban	0.415 {0.098, 1.206} ^b	1.108 {0.621, 1.870} ^a	0.905 {0.527, 1.496} ^a
Rural	0.453 {0.115, 1.334} ^b	0.480 {0.265, 0.818} ^b	0.534 {0.313, 0.860} ^b
KPK	0.665 {0.169, 1.908} ^b	0.769 {0.416, 1.330} ^b	0.762 {0.438, 1.249} ^a
Urban	0.665 {0.169, 1.908} ^b	1.031 {0.534, 1.870} ^a	0.993 {0.552, 1.690} ^a
Rural	0.650 {0.169, 1.910} ^b	0.740 {0.407, 1.290} ^a	0.726 {0.415, 1.204} ^b
Baluchistan	0.583 {0.154, 1.744} ^b	0.732 {0.396, 1.287} ^a	0.777 {0.442, 1.317} ^b
Urban	1.015 {0.207, 4.608} ^a	0.712 {0.349, 1.427} ^b	0.849 {0.442, 1.550} ^a
Rural	0.513 {0.129, 1.648} ^b	0.731 {0.391, 1.291} ^a	0.702 {0.402, 1.195} ^b
Islamabad			
Gilgit-Baltistan	0.580 {0.095, 3.270} ^b	0.932 {0.415, 2.116} ^a	0.860 {0.421, 1.855} ^a
Educational level			
Illiterate	0.408 {0.306, 0.536} ^c	0.413 {0.349, 0.488} ^c	0.420 {0.363, 0.481} ^d
Primary	0.553 {0.406, 0.747} ^d	0.420 {0.346, 0.505} ^d	0.450 {0.385, 0.525} ^d
Middle	0.606 {0.441, 0.842} ^d	0.457 {0.369, 0.565} ^d	0.501 {0.417, 0.597} ^d
Matriculation	0.893 {0.645, 1.239} ^d	0.535 {0.440, 0.645} ^d	0.608 {0.516, 0.719} ^d
Higher	Reference	Reference	Reference
Income level			
Least	0.435 {0.331, 0.563} ^d	0.624 {0.550, 0.708} ^d	0.584 {0.521, 0.654} ^d
Lower-middle	0.492 {0.374, 0.640} ^d	0.610 {0.537, 0.692} ^d	0.586 {0.524, 0.655} ^d
Middle	0.670 {0.508, 0.887} ^d	0.688 {0.610, 0.776} ^d	0.684 {0.609, 0.776} ^d
Upper-middle	0.785 {0.592, 1.041} ^d	0.776 {0.686, 0.871} ^a	0.780 {0.696, 0.878} ^d
Highest	Reference	Reference	Reference

TABLE 7: Comparison of ORs for respondents who have heard of hepatitis using BMLRM based on data from PDHS 2017–18.

Age	Men	Women	Total
15–19	0.814 {0.323, 2.571} ^b	0.427 {0.343, 0.531} ^d	0.381 {0.313, 0.463} ^d
20–24	0.789 {0.485, 1.344} ^b	0.753 {0.634, 0.896} ^d	0.686 {0.578, 0.811} ^d
25–29	0.955 {0.611, 1.468} ^a	1.163 {0.937, 1.389} ^b	1.061 {0.901, 1.246}
30–34	1.278 {0.819, 2.023} ^b	1.088 {0.909, 1.309} ^a	1.041 {0.884, 1.233}
35–39	0.935 {0.609, 1.445} ^a	1.121 {0.930, 1.355} ^a	1.049 {0.885, 1.239}
40–44	1.254 {0.784, 2.028} ^b	1.046 {0.860, 1.273} ^a	1.048 {0.873, 1.253}
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	Reference	Reference
Rural	0.609 {0.457, 0.809} ^d	0.638 {0.575, 0.703} ^d	0.626 {0.568, 0.687} ^d
Educational level			
Illiterate	0.143 {0.079, 0.238} ^d	0.141 {0.108, 0.181} ^d	0.142 {0.103, 0.167} ^d
Primary	0.260 {0.141, 0.449} ^d	0.260 {0.197, 0.342} ^d	0.257 {0.197, 0.330} ^d
Middle	0.318 {0.165, 0.584} ^d	0.288 {0.211, 0.389} ^d	0.296 {0.223, 0.390} ^d
Matriculation	0.715 {0.360, 1.398} ^a	0.419 {0.305, 0.566} ^d	0.463 {0.352, 0.609} ^d
Higher	Reference	Reference	Reference
Income level			
Least	0.212 {0.134, 0.325} ^d	0.232 {0.195, 0.273} ^d	0.229 {0.196, 0.268} ^d
Lower-middle	0.342 {0.210, 0.542} ^d	0.337 {0.284, 0.398} ^d	0.336 {0.286, 0.398} ^d

TABLE 7: Continued.

Age	Men	Women	Total
Middle	0.501 {0.314, 0.803} ^c	0.415 {0.334, 0.497} ^d	0.422 {0.356, 0.496} ^d
Upper-middle	1.131 {0.632, 2.046} ^a	0.527 {0.441, 0.630} ^d	0.559 {0.471, 0.667} ^d
Highest	Reference	Reference	Reference
Region			
Punjab	1.341 {0.319, 3.789} ^b	0.947 {0.496, 1.620} ^a	1.117 {0.669, 1.788} ^a
Urban	2.345 {0.731, 6.250} ^c	1.668 {0.878, 2.937} ^b	1.675 {0.951, 2.758} ^b
Rural	1.231 {0.301, 3.723} ^b	0.766 {0.411, 1.296} ^b	0.822 {0.478, 1.320} ^a
Sindh	1.188 {0.379, 3.101} ^a	0.503 {0.268, 0.860} ^b	0.594 {0.354, 0.968} ^b
Urban	1.221 {0.284, 3.654} ^b	0.537 {0.285, 0.932} ^b	0.613 {0.350, 1.008} ^b
Rural	0.503 {0.129, 1.454} ^b	0.467 {0.255, 0.813} ^b	0.523 {0.306, 0.849} ^b
KPK	1.607 {0.445, 4.375} ^b	0.729 {0.403, 1.265} ^b	0.850 {0.493, 1.372} ^a
Urban	1.620 {0.339, 6.684} ^b	1.949 {0.938, 3.860} ^c	1.826 {0.949, 3.352} ^c
Rural	0.995 {0.226, 2.993} ^a	0.618 {0.327, 1.091} ^b	0.729 {0.424, 1.188} ^b
Baluchistan	0.780 {0.245, 2.015} ^b	0.618 {0.327, 1.091} ^b	0.219 {0.123, 0.357} ^d
Urban	1.104 {0.229, 4.555} ^a	0.298 {0.154, 0.540} ^d	0.395 {0.225, 0.664} ^d
Rural	0.382 {0.098, 1.152} ^c	0.158 {0.085, 0.272} ^d	4.950 {3.672, 6.689} ^d
Islamabad	Reference	Reference	Reference
Gilgit-Baltistan	0.252 {0.065, 0.700} ^d	0.102 {0.055, 0.170} ^d	0.112 {0.065, 0.185} ^d

*a: *P* value ≥0.05; b: *P* value <0.05; c: *P* value <0.01; and d: *P* value <0.001.

TABLE 8: Comparison of ORs for respondents who know about the preventive measures for hepatitis using BMLRM based on data from PDHS 2017–18.

Age	Men	Women	Total
15–19	1.876 {0.664, 3.952} ^c	0.893 {0.636, 1.247} ^a	1.042 {0.772, 1.435} ^a
20–24	0.812 {0.543, 1.218} ^b	0.803 {0.629, 1.011} ^b	0.842 {0.688, 1.042} ^b
25–29	0.671 {0.481, 0.932} ^c	0.956 {0.758, 1.194} ^a	0.895 {0.743, 1.076} ^a
30–34	1.278 {0.883, 1.812} ^b	1.117 {0.877, 1.395} ^b	1.076 {0.946, 1.395} ^a
35–39	1.253 {0.866, 1.823} ^b	0.837 {0.665, 1.049} ^a	0.939 {0.773, 1.135} ^a
40–44	0.903 {0.642, 1.300} ^a	0.832 {0.640, 1.071} ^b	0.861 {0.706, 1.054} ^a
45–49	Reference	Reference	Reference
Residence			
Urban	Reference	Reference	Reference
Rural	0.906 {0.729, 1.124} ^a	0.673 {0.591, 0.763} ^a	0.733 {0.658, 0.816} ^d
Educational level			
Illiterate	0.497 {0.349, 0.712} ^c	0.445 {0.357, 0.553} ^d	0.508 {0.388, 0.561} ^d
Primary	0.381 {0.265, 0.534} ^d	0.637 {0.495, 0.815} ^d	0.540 {0.438, 0.655} ^d
Middle	0.591 {0.389, 0.880} ^b	0.701 {0.529, 0.946} ^b	0.653 {0.517, 0.821} ^c
Matriculation	0.588 {0.407, 0.851} ^b	0.762 {0.580, 0.992} ^d	0.678 {0.548, 0.848} ^c
Higher	Reference	Reference	Reference
Income level			
Least	0.933 {0.646, 1.358} ^a	0.441 {0.362, 0.534} ^d	0.519 {0.436, 0.616} ^d
Lower-middle	0.636 {0.456, 0.888} ^b	0.533 {0.439, 0.651} ^d	0.558 {0.472, 0.661} ^d
Middle	0.492 {0.357, 0.672} ^d	0.648 {0.532, 0.791} ^d	0.602 {0.508, 0.717} ^d
Upper-middle	0.673 {0.480, 0.921} ^b	0.719 {0.588, 0.878} ^d	0.700 {0.594, 0.832} ^c
Highest	Reference	Reference	Reference
Region			
Punjab	0.648 {0.200, 1.643} ^b	1.252 {0.638, 2.235} ^b	0.947 {0.529, 1.579} ^a
Urban	0.725 {0.258, 1.803} ^b	1.210 {0.590, 2.258} ^b	1.073 {0.580, 1.797} ^a
Rural	0.613 {0.206, 1.508} ^b	1.006 {0.497, 1.823} ^a	0.896 {0.498, 1.491} ^a
Sindh	2.078 {0.630, 5.479} ^c	0.779 {0.391, 1.438} ^b	0.994 {0.560, 1.630} ^a
Urban	1.880 {0.575, 5.163} ^c	1.338 {0.678, 2.441} ^b	1.346 {0.747, 2.285} ^b
Rural	2.326 {0.656, 6.702} ^c	0.568 {0.279, 1.067} ^b	0.748 {0.420, 1.273} ^b
KPK	1.625 {0.490, 4.236} ^b	0.634 {0.319, 1.120} ^b	0.772 {0.436, 1.279} ^b
Urban	0.989 {0.290, 3.066} ^a	0.830 {0.384, 1.644} ^b	0.887 {0.478, 1.596} ^a
Rural	2.000 {0.584, 5.598} ^c	0.587 {0.303, 1.087} ^b	0.764 {0.404, 1.415} ^b
Baluchistan	1.538 {0.449, 4.472} ^b	1.292 {0.602, 2.532} ^b	1.386 {0.744, 2.569} ^b
Urban	4.754 {0.843, 8.466} ^d	1.125 {0.459, 2.555} ^a	0.024 {0.000, 0.237} ^a
Rural	1.160 {0.323, 3.482} ^a	1.435 {0.615, 3.125} ^b	1.339 {0.685, 2.541} ^b
Islamabad	Reference	Reference	Reference
Gilgit-Baltistan	0.766 {0.231, 1.990} ^b	0.408 {0.193, 0.768} ^b	0.478 {0.267, 0.803} ^b

*a: *P* value ≥0.05; b: *P* value <0.05; c: *P* value <0.01; and d: *P* value <0.001.

TABLE 9: Comparison of AICs and BICs for CMLRM and BMLRM using data from PDHS 2012–13.

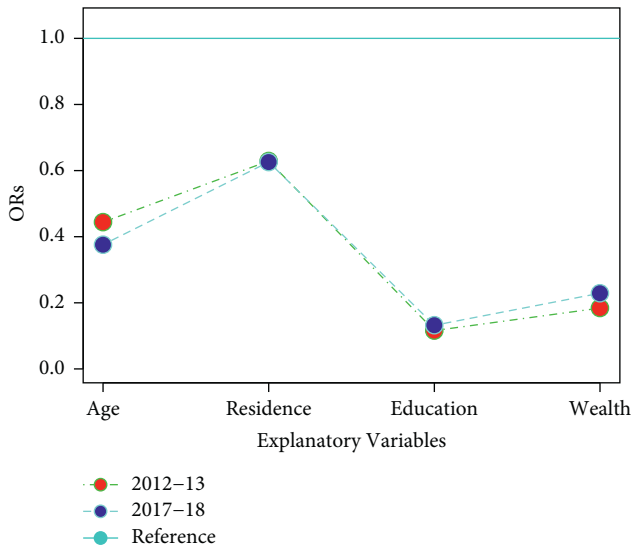
Variables	Heard about HCV				Knowing preventive measures for HCV			
	CMLRM		BMLRM		CMLRM		BMLRM	
Age	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
15–19	17.90	15.29	16.88	14.31	17.88	15.27	16.58	14.22
20–24	19.23	16.62	18.04	15.57	19.64	17.03	18.51	15.98
25–29	19.51	16.90	18.43	15.70	19.91	17.29	18.82	16.26
30–34	19.48	16.87	18.43	15.75	19.86	17.25	18.36	16.37
35–39	19.30	16.69	17.99	15.42	19.79	17.18	18.66	16.18
40–44	19.12	16.50	18.00	15.40	19.61	16.99	18.44	15.96
45–49	Reference							
Residence	Reference							
Urban	Reference							
Rural	21.52	18.91	19.81	17.93	21.97	19.36	20.57	18.07
Region	Reference							
Punjab	13.45	10.83	12.65	10.12	14.33	11.72	13.36	10.92
Urban	13.41	10.80	12.47	10.01	14.30	11.68	13.41	11.06
Rural	13.44	10.83	12.55	10.11	14.33	11.71	13.32	11.05
Sindh	13.43	10.82	12.52	10.00	14.31	11.70	13.22	10.78
Urban	13.40	10.78	12.55	9.99	4.27	11.65	4.00	11.03
Rural	13.41	10.79	12.46	10.07	14.27	11.66	13.21	11.06
KPK	13.41	10.79	12.38	10.18	14.28	11.67	13.56	10.93
Urban	13.12	10.51	12.20	9.69	13.97	11.35	13.05	10.59
Rural	13.39	10.78	12.53	9.94	14.27	11.66	13.32	10.76
Baluchistan	13.31	10.69	12.35	10.07	14.13	11.51	13.37	10.77
Urban	12.81	10.19	11.80	9.57	13.45	10.84	12.77	10.26
Rural	13.27	10.66	12.56	9.88	14.07	11.45	13.00	10.69
Islamabad	Reference							
Gilgit-Baltistan	12.52	9.91	11.89	9.32	12.74	10.13	12.04	9.37
Educational level	Reference							
Illiterate	18.39	15.78	17.13	14.86	19.80	17.19	18.66	16.04
Primary	17.97	15.36	16.71	14.16	19.30	16.69	17.81	15.78
Middle	17.46	14.84	16.44	13.82	18.81	16.19	17.80	15.36
Matriculation	17.55	14.93	16.16	14.10	19.01	16.40	17.55	15.36
Higher	Reference							
Income level	Reference							
Least	19.68	17.07	18.30	16.08	20.29	17.68	18.89	16.42
Lower-middle	19.63	17.01	18.44	16.04	20.39	17.78	18.96	16.37
Middle	19.56	16.94	18.07	16.06	20.39	17.78	19.22	16.63
Upper-middle	19.56	16.95	18.02	15.99	20.44	17.82	18.91	16.52
Highest	Reference							

TABLE 10: Comparison of AICs and BICs for CMLRM and BMLRM using data from PDHS 2017–18.

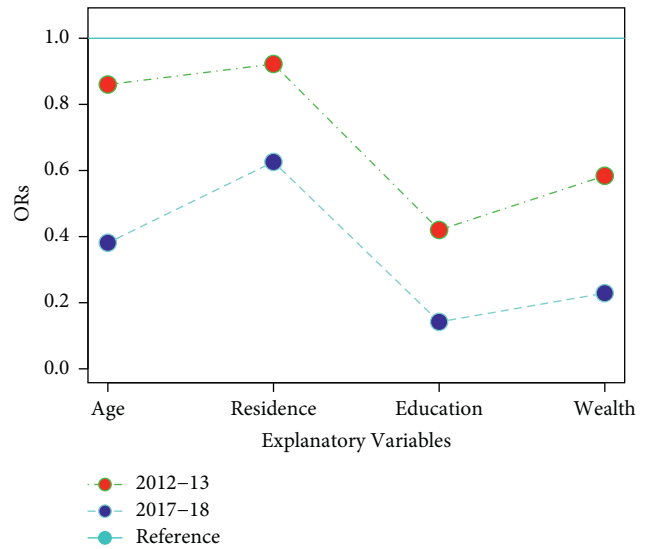
Variables	Heard about HCV				Knowing preventive measures for HCV			
	CMLRM		BMLRM		CMLRM		BMLRM	
Age	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
15–19	17.99	15.38	16.31	13.89	16.93	14.31	15.34	12.88
20–24	19.15	16.54	17.94	15.07	18.66	16.04	16.88	14.83
25–29	19.33	16.72	17.80	15.51	18.99	16.37	17.58	15.12
30–34	19.30	16.69	17.99	15.37	18.87	16.26	17.45	15.13
35–39	19.24	16.62	17.76	15.37	18.88	16.27	17.73	14.91
40–44	18.92	16.30	17.66	14.97	18.60	15.99	17.28	14.80
45–49	Reference							
Residence	Reference							
Urban	Reference							
Rural	21.57	18.95	20.15	17.73	21.21	18.60	19.81	16.91

TABLE 10: Continued.

Variables	Heard about HCV				Knowing preventive measures for HCV			
	CMLRM		BMLRM		CMLRM		BMLRM	
	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
Age								
Educational level								
Illiterate	18.98	16.37	17.51	15.22	19.46	16.85	18.03	15.39
Primary	18.51	15.89	16.73	14.44	18.91	16.29	17.28	15.29
Middle	18.11	15.49	16.73	14.56	18.39	15.78	16.90	14.73
Matriculation	18.20	15.59	17.04	14.20	18.65	16.04	17.23	14.55
Higher					Reference			
Income level								
Least	19.62	17.01	18.42	15.38	19.38	16.77	17.62	15.44
Lower-middle	19.64	17.02	18.43	15.62	19.49	16.88	17.78	15.35
Middle	19.61	17.00	18.16	15.90	19.52	16.90	17.68	15.67
Upper-middle	19.58	16.96	18.22	15.79	19.54	16.92	18.35	15.79
Highest					Reference			
Region								
Punjab	14.91	12.29	13.77	11.17	14.73	12.12	13.65	11.09
Urban	14.83	12.21	13.74	11.43	14.68	12.06	13.61	11.13
Rural	14.89	12.28	13.67	11.13	14.72	12.10	13.77	11.02
Sindh	14.88	12.27	13.53	11.41	14.69	12.07	13.27	11.30
Urban	14.83	12.21	13.85	11.23	14.60	11.99	13.50	10.94
Rural	14.81	12.20	13.84	11.11	14.61	12.00	13.15	11.23
KPK	14.84	12.22	13.45	11.33	14.66	12.05	13.71	11.04
Urban	14.25	11.63	13.11	10.78	14.27	11.65	13.15	10.89
Rural	14.82	12.20	13.40	11.05	14.63	12.02	13.41	10.96
Baluchistan	14.70	12.09	13.65	11.34	14.32	11.70	13.31	10.81
Urban	14.23	11.62	12.97	10.75	13.59	10.98	12.53	9.96
Rural	14.61	11.99	13.69	11.11	14.15	11.53	12.95	10.56
Islamabad					Reference			
Gilgit-Baltistan	14.03	11.42	12.99	10.45	14.14	11.52	13.03	10.68



(a)



(b)

FIGURE 1: Comparison of trends (over time) regarding awareness of hepatitis in the respondents. (a) Knowledge of hepatitis. (b) Hepatitis preventable.

know that hepatitis is a preventable disease are even lower in 2017–18 as compared to 2012–13. This is really a matter of concern for the stakeholders.

4. Conclusions

The study deals with the analysis of knowledge and awareness of respondents about hepatitis. The data regarding the disease have been taken from PDHS conducted during 2012–13 and 2017–18, respectively. The said data have been collected from all provinces of the country. There have been some contributions regarding the analysis of knowledge and awareness about hepatitis in the country. However, very few of them have utilized nationally representative data. In addition, the change (over time) in levels of knowledge and awareness about the said disease has rarely been investigated. Furthermore, the earlier contributions regarding the analysis of knowledge and awareness of the hepatitis have utilized classical models such as the classical multiple logistic regression model. We have proposed the Bayesian multiple logistic regression model for such analysis. The performance of the BMLRM has been judged against CMLRM using widths of 95% CI for the corresponding ORs.

The results indicated that the proposed BMLRM performed better as compared to CMLRM. This is due to fact that widths of 95% CIs were smaller for BMLRM as compared to CMLRM. For the analysis of knowledge and awareness about hepatitis, the following response variables were used: (i) whether the respondents have heard about hepatitis and (ii) whether the respondents have known the preventive measures for hepatitis. The following explanatory variables were used for the analysis: (i) age, (ii) residence, (iii) marital status, (iv) gender, (v) region, (vi) education, and (vii) wealth of the respondents.

From the results, it can also be assessed that the ORs for the respondents having heard about hepatitis have not changed much in 2017–18, as compared to those in 2012–13. In particular, the ORs for respondents having heard about hepatitis have slightly increased for lower levels of education and wealth in 2017–18, as compared to 2012–13. Unfortunately, the ORs for respondents who know ways to prevent hepatitis were even lower in 2017–18, for respondents with the lowest level of education and wealth, as compared to 2012–13. However, in the case of respondents living in the rural areas, the said odds have not significantly changed. Similarly, the decreasing levels of ORs have also been observed in respondents belonging to KPK and Punjab as compared to the capital city Islamabad. However, the knowledge of hepatitis increased in Sindh and Baluchistan in 2017–18, as compared to 2012–13.

The findings of this study suggest that there are severe disparities (with respect to different socioeconomic groups) in the knowledge and awareness of respondents for hepatitis. The levels of knowledge and awareness about the said diseases are drastically low for respondents living in rural areas, having lower levels of education and wealth. These disparities seem to persist, as the corresponding odds have not changed much during the period 2012 to 2018. The policy-

maker should plan and implement strategies to reduce the observed disparities for different sectors of society [18].

Data Availability

Data are available in the paper.

Additional Points

The study has employed the Bayesian models for the analysis of knowledge and awareness about hepatitis in Pakistan. The study has considered the analysis under updated nationally representative data. The said methodology can be used for data from any other country. The change (over time) in knowledge and awareness about hepatitis has also been reported. The data have been collected using a comprehensive methodology, resulting in improved reliability of the results. The findings of this study are in close agreement with recent studies conducted in Pakistan and abroad. These studies include the contributions of Ahmed et al. [19]; Chan et al. [20]; Dehghani et al. [21]; Maqsood et al. [22]; and Li et al. [23]. However, the information on all the response variables was not available for all the PDHS. In addition, the information on such diseases may include social disability biases.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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