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Economic Burden of Hepatitis in South Korea

Dear Editor: It is important to understand the relative economic burden of different diseases in order to make the best public health policy decisions. Therefore, we read with interest the recent paper by Shon et al. (1) who estimated the economic burden of hepatitis A, B, and C in South Korea. In their study, the population prevalence and mortality rates were estimated for each of these diseases over a 4-years study period, that is, 2008–2011. The mortality rates estimated in this study, expressed as the rate per 100,000 of the population, were over 10 times higher for hepatitis C virus (HCV) infection than for hepatitis B virus (HBV) infection. For example, mortality rate for HCV infection was 0.58 compared with 0.03 for HBV infection in 2011.

The prevalence of chronic HBV infection is considerably higher than that of HCV infection in South Korea. Furthermore, HBV was found to be associated with a majority of cirrhosis and hepatocellular carcinoma (HCC) cases in a large, single-center Korean cohort-based study (2), and the population-attributable fraction of HCC for HBV was estimated to be 68.1% (3). In contrast, Shon et al. reported higher mortality rates for HCV infection. Since the findings were unexpected, we reviewed the figures presented in the paper. We assumed that the absolute number of deaths (obtained from the Korean Statistical Information Service) were correct. Additionally, we assumed that the total number of cases of each disease (obtained from the Korean National Health Insurance Service) were correct. We obtained the total population number by back-calculation from the number of cases and population prevalence figures. Subsequently, we recalculated hepatitis B-related mortality rates (per 100,000) for each year and obtained the following numbers: 1.79 for 2008, 1.68 for 2009, 1.80 for 2010, and 1.73 for 2011. In contrast to the results published in the paper by Shon et al., we estimate that the mortality rates due to hepatitis B in South Korea were 3 to 5 times higher than those for hepatitis C.

We could not determine whether this correction of the mortality rate calculation for hepatitis B would have a significant impact on the indirect costs and calculated economic burden. However, if the authors agree with our revised mortality rate calculations, we suggest that they should confirm whether there is any impact on the estimations of the economic burden.

Additionally, our review of other figures revealed a discrepancy in the per capita total costs for hepatitis A in 2011. Our recalculation revealed a cost of 1.94, instead of 1.17 (thousands of US dollars), which is slightly higher than values reported for hepatitis B and C, and this brings it in line with the values determined for the prior 3 years for hepatitis A. Based on the original calculation showing hepatitis C accounted for the highest total per capita costs in 2011, the authors speculated that the relatively high cost of hepatitis C might be because of the higher cost of medicines used to treat that disease. However, if hepatitis A has the highest per capita cost, there might be other more important factors influencing the relative cost of the 3 diseases for each patient, which could be further investigated.

Conflict of interest HW, PM, and JE are employees of Sanofi R&D which is researching new treatments for viral hepatitis.

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In Reply: The critical comments of Watson et al. were very helpful. Accordingly, we again reviewed our manuscript. We found that the summing process of the values of each age group had errors, and some part of the paper required correction. In other words, the mortality rates for hepatitis B infection were 1.68, 1.59, 1.70, and 1.64 in 2008, 2009, 2010, and 2011, respectively. Additionally, the per capita cost due to hepatitis A infection in 2011 was found to be 1.93, rather than 1.17 thousand US dollars. Therefore, the mortality rates for hepatitis B infection was higher than those for hepatitis A and C infection during 2008–2011. However, the trend for mortality, including the increasing trend for hepatitis C infection-related mortality and steady trend for hepatitis B infection, did not change. In addition, the per capita cost for hepatitis A infection was higher than that for hepatitis B and C infection in 2011. In 2011, hepatitis A infection had the highest per capita cost, followed by hepatitis C and B infections. However, in 2010, hepatitis C infection had the highest per capita cost, followed by hepatitis A and B infections; hence, the per capita cost did not show a constant trend. Hepatitis A infection can result in severe diseases such as fulminant hepatic failure, especially in adults (1); this may explain the high per capita cost for hepatitis A infection. Table 3 also had an error in the exchange rate for the Korean won to US dollar, and this has been

Table 1. Four-year trends in hepatitis A, B, and C in Korea: numbers of patients and deaths, prevalence, and mortality rates

Year	Sex	Age group	Hepatitis A				Hepatitis B				Hepatitis C			
			No. of patients	No. of deaths	Prevalence[1]	Mortality[2] rate	No. of patients	No. of deaths	Prevalence	Mortality rate	No. of patients	No. of deaths	Prevalence	Mortality rate
2008	Men	≤19	1,410	0	22.73	0.00	12,939	4	208.59	0.06	322	0	5.19	0.00
		20–64	12,976	16	79.47	0.10	191,236	411	1,171.22	2.52	16,414	47	100.53	0.29
		≥65	148	0	7.24	0.00	11,722	77	573.16	3.77	4,940	36	241.55	1.76
		Men sum	14,534	16	59.14	0.07	215,897	492	878.48	2.00	21,676	83	88.20	0.34
	Women	≤19	1,037	0	18.48	0.00	8,958	3	159.61	0.05	164	0	2.92	0.00
		20–64	9,102	4	57.78	0.03	130,971	180	831.40	1.14	13,398	18	85.05	0.11
		≥65	176	2	5.85	0.07	14,666	146	487.73	4.86	5,985	74	199.03	2.46
		Women sum	10,315	6	42.32	0.02	154,595	329	634.30	1.35	19,547	92	80.20	0.38
	Subtotal		24,849	22	50.77	0.04	370,492	821	756.90	1.68	41,223	175	84.22	0.36
2009	Men	≤19	2,775	0	45.44	0.00	14,281	2	233.84	0.03	339	0	5.55	0.00
		20–64	29,520	42	179.78	0.26	213,477	384	1,300.08	2.34	18,202	38	110.85	0.23
		≥65	286	1	13.38	0.05	13,576	98	635.28	4.59	5,558	52	260.08	2.43
		Men sum	32,581	43	132.10	0.17	241,334	484	978.47	1.96	24,099	90	97.71	0.36
	Women	≤19	2,054	0	37.09	0.00	10,662	2	192.50	0.04	181	0	3.27	0.00
		20–64	20,406	12	128.66	0.08	150,187	153	946.94	0.96	15,196	16	95.81	0.10
		≥65	334	1	10.71	0.03	17,293	141	554.47	4.52	6,972	99	223.55	3.17
		Women sum	22,794	13	92.97	0.05	178,142	296	726.59	1.21	22,349	115	91.16	0.47
	Subtotal		55,375	56	112.59	0.11	419,476	780	852.90	1.59	46,448	205	94.44	0.42
2010	Men	≤19	2,239	3	37.36	0.05	12,783	4	213.32	0.07	329	0	5.49	0.00
		20–64	19,897	17	120.31	0.10	208,398	439	1,260.10	2.65	17,622	52	106.55	0.31
		≥65	266	0	11.94	0.00	14,154	103	635.52	4.62	5,542	53	248.84	2.38
		Men sum	22,402	20	90.48	0.08	235,335	546	950.55	2.21	23,493	105	94.89	0.42
	Women	≤19	1,556	0	28.55	0.00	9,318	3	170.97	0.06	165	0	3.03	0.00
		20–64	15,125	7	94.67	0.04	146,560	143	917.31	0.90	15,115	19	94.60	0.12
		≥65	344	3	10.67	0.09	17,806	150	552.07	4.65	7,230	124	224.16	3.84
		Women sum	17,025	10	69.06	0.04	173,684	296	704.53	1.20	22,510	143	91.31	0.58
	Subtotal		39,427	30	79.79	0.06	409,019	842	827.80	1.70	46,003	248	93.10	0.50
2011	Men	≤19	1,403	0	23.87	0.00	11,813	5	201.01	0.09	384	0	6.53	0.00
		20–64	12,071	14	72.09	0.08	218,132	406	1,302.68	2.42	18,313	48	109.36	0.29
		≥65	139	1	5.99	0.04	15,086	96	650.06	4.14	5,916	67	254.92	2.89
		Men sum	13,613	15	54.58	0.06	245,031	507	982.39	2.03	24,613	115	98.68	0.46
	Women	≤19	1,033	0	19.26	0.00	8,354	0	155.78	0.00	216	0	4.03	0.00
		20–64	8,871	2	54.97	0.01	153,158	141	948.98	0.87	16,114	22	99.84	0.14
		≥65	195	1	5.85	0.03	19,137	167	573.78	5.01	7,761	136	232.69	4.08
		Women sum	10,099	3	40.66	0.01	180,649	308	727.34	1.24	24,091	158	97.00	0.64
	Subtotal		23,712	18	47.63	0.04	425,680	815	855.13	1.64	48,704	273	97.84	0.55

[1]: Prevalence/100,000.
[2]: Mortality rate/100,000.

Table 2. Four-year trends in the economic burden of hepatitis A, B, and C in Korea: total costs per capita[1]

Year	Sex	Age group	Per capita[2]		
			Hepatitis A	Hepatitis B	Hepatitis C
2008	Men	≤19	0.91	0.60	0.47
		20–64	3.22	1.94	2.44
		≥65	0.99	0.49	0.75
	Women	≤19	0.94	0.51	0.47
		20–64	1.95	0.80	1.14
		≥65	1.41	0.49	0.76
	Subtotal		2.50	1.35	1.55
2009	Men	≤19	0.80	0.47	0.51
		20–64	3.01	1.84	2.49
		≥65	0.58	0.58	0.86
	Women	≤19	0.76	0.38	0.38
		20–64	1.65	0.85	1.47
		≥65	0.98	0.57	0.88
	Subtotal		2.29	1.31	1.70
2010	Men	≤19	2.43	0.74	0.70
		20–64	2.39	2.00	2.89
		≥65	0.52	0.63	0.89
	Women	≤19	0.57	0.52	0.70
		20–64	1.24	0.87	1.61
		≥65	0.69	0.62	0.90
	Subtotal		1.85	1.41	1.89
2011	Men	≤19	0.57	0.90	0.53
		20–64	2.69	1.99	2.85
		≥65	0.50	0.68	0.89
	Women	≤19	0.59	0.24	0.41
		20–64	1.30	0.91	1.61
		≥65	0.62	0.67	0.90
	Subtotal		1.93	1.43	1.86

[1]: Units of cost shown are thousands of dollars (US $1 = 1160.81 South Korean won, average exchange rate between 2008 and 2011).
[2]: The burden per capita caluated episode-based.

Table 3. Four-year trends in economic burden associated with drug expenditure for hepatitis A, B, and C in Korea[1]

Year	Sex	Age group	Hepatitis A		Hepatitis B		Hepatitis C	
			Drug[1] expenditure	Per capita[2]	Drug expenditure	Per capita	Drug expenditure	Per capita
2008	Men	≤19	16.14	0.01	644.62	0.05	8.21	0.03
		20–64	328.61	0.03	63,723.24	0.33	2,483.01	0.15
		≥65	5.39	0.04	1,920.79	0.16	853.25	0.17
	Women	≤19	77.16	0.07	77.16	0.01	2.89	0.02
		20–64	177.94	0.02	25,074.87	0.19	1,910.72	0.14
		≥65	3.81	0.02	2,322.26	0.16	1,084.71	0.18
	Subtotal		609.05	0.02	93,762.95	0.25	6,342.78	0.15
2009	Men	≤19	29.82	0.01	713.55	0.05	8.45	0.02
		20–64	701.86	0.02	84,006.25	0.39	3,129.35	0.17
		≥65	6.97	0.02	2,729.78	0.20	1,092.89	0.20
	Women	≤19	14.18	0.01	288.25	0.03	2.30	0.01
		20–64	341.36	0.02	34,491.10	0.23	2,316.48	0.15
		≥65	8.37	0.03	3,444.92	0.20	1,440.75	0.21
	Subtotal		1,102.57	0.02	125,673.85	0.30	7,990.22	0.17
2010	Men	≤19	17.25	0.01	658.42	0.05	9.78	0.03
		20–64	425.03	0.02	89,388.61	0.43	3,279.42	0.19
		≥65	4.38	0.02	3,243.73	0.23	1,072.50	0.19
	Women	≤19	8.41	0.01	253.94	0.03	6.47	0.04
		20–64	220.19	0.01	38,564.86	0.26	2,463.17	0.16
		≥65	5.31	0.02	4,083.66	0.23	1,500.69	0.21
	Subtotal		680.56	0.02	136,193.22	0.33	8,332.02	0.18
2011	Men	≤19	10.70	0.01	638.26	0.05	8.46	0.02
		20–64	290.01	0.02	101,155.74	0.46	3,297.94	0.18
		≥65	2.09	0.02	3,923.30	0.26	1,136.89	0.19
	Women	≤19	6.47	0.01	228.90	0.03	3.45	0.02
		20–64	143.45	0.02	44,620.11	0.29	2,506.38	0.16
		≥65	3.36	0.02	4,954.86	0.26	1,532.05	0.20
	Subtotal		456.08	0.02	155,521.17	0.37	8,485.18	0.17

[1]: Units of cost shown are thousands of dollars (US $1 = 1160.81 South Korean won, average exchange rate between 2008 and 2011).
[2]: The burden per capita caluated episode-based.

corrected. The recalculated values are presented in Tables 1–3.

However, the loss in productivity due to premature death was based on the number of mortality cases by 5-year age groups instead of the per capita mortality, and the total economic burden of hepatitis A, B, and C infections did not change. Therefore, our major findings, including a decreasing trend of hepatitis A infection, and increasing trends of hepatitis B and C infections, is identical for economic burden, thus, the importance of prevention and management of hepatitis B and C infections should be highlighted. Moreover, we sincerely appreciate the valuable points brought up by Watson et al.

Conflict of interest None to declare.

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