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Knowledge, Attitudes, and Practices (KAP) Regarding Hepatitis B Vaccination among Healthcare Workers in Mongolia

Nyamsuren Naranzul[1], Badrakh Burmaajav[2,3], Altangerel Enkhjargal[4], Byamba Tumurbat[4], Badamjav Amgalan[4], Batbaatar Suvd[2], Nyamdavaa Khurelbaatar[1], Oidov Baatarkhuu[1,3]

[1]Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia
[2]Ach Medical University, Ulaanbaatar, Mongolia
[3]Academy of Medical Science, Ulaanbaatar, Mongolia
[4]Anagaakh Ukhaanii Mergejiltnuudiin Academy, Ulaanbaatar, Mongolia
Email: ajargal8@gmail.com

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Abstract

Background: Mongolia is no exception and experiencing the burden of HBV among the population. In the last decade, the prevalence of HBV among the relatively healthy population of Mongolia has ranged between 11.8 percent and 10.6 percent, and acute cases are between 1.7 and 1.1 per 10,000 people. We aimed to determine healthcare workers (HCWs) knowledge, attitude, and practices regarding HBV prevention compared to vaccination coverage. **Methods:** This cross-sectional study was conducted among HCWs from the selected sites through multi-stage sampling. The study involved 1135 HCWs, including medical doctors, nurses, clinicians in both surgical and medical specialties, laboratory technicians, and other staff working in all departments from primary and referral levels in 36 healthcare facilities in two urban and four rural provinces of Mongolia. Participants who consented to the study completed a standardized self-administered questionnaire between July and Dec 2019. **Results:** Most participants (82.0%) were born before 1992 or before starting a birth vaccination against HBV in Mongolia. The mean age of the participants was 38 years and the participants' median employment year in the health sector was seven years. Most participants were medical doctors (29.1%) and nurses (28.0%). Five questions explored HCWs' knowledge about hepatitis B virus infection and prevention, and the correct response ranged between 15.6% and 95.4%. 2.8% of the respondents answered five questions correctly. Men, those with higher levels of education, those over the age of 30, soum family health center HCWs, and doctors and senior medical professionals answered many questions correctly, which is statistically significant. 98.9% of respondents believe that HCWs should vaccinate against HBV. The younger

the age (%), management professionals, and service staff are confident in vaccines. A significant difference between age groups, perception of HBV infection, and formal attendance to the official training positively relate to vaccination coverage. Specially survey respondents who knew about the adverse effects of overdosing, learning about total doses of the vaccine, and the effectiveness of the hepatitis B vaccine were more tent to have full doses of the HBV vaccine. Knowledge and working conditions are increasing factors in receiving full doses of the HVB vaccine. **Conclusion:** The overall knowledge of HBV and its vaccination is fair among the HCWs; however, there is a need to intensify the training on some of the details and increase the training frequency at the workplace. Attitude and practice on infection protection and vaccination are still essential to be promoted among the HCWs. The low level of vaccination coverage is relevant to the level of KAP among the HCWs of the country.

Keywords

Hepatitis B, Healthcare Workers, KAP, Vaccination, Coverage

1. Introduction

The Hepatitis B virus (HBV) has been a global health concern and economic burden over the past century. It causes acute or chronic liver infection with a high risk of developing complications of cirrhosis and hepatocellular carcinoma. HBV spreads by percutaneous or mucosal exposure to infected blood and various body fluids. Around the world (2019), there are 296 million people with chronic hepatitis B infection, adding to 1.58 million new cases annually, resulting in 820,000 deaths, mostly from cirrhosis and hepatocellular carcinoma [1].

Mongolia is no exception and experiencing the burden of HBV among the population. In the last decade, the prevalence of HBV among the relatively healthy population of Mongolia has ranged between 11.8 percent and 10.6 percent, and acute cases are between 1.7 and 1.1 per 10,000 people [2] [3].

Healthcare workers (HCWs) are at a higher risk of exposure to blood-borne viral diseases, including HBV, due to the occupational exposure resulting from sharp injuries. Each year, 5.9% of the HCWs worldwide are exposed to HBV annually. Healthcare workers (HCWs) are at a higher risk of exposure to blood-borne viral diseases, including HBV, due to the occupational exposure resulting from sharp injuries. Each year worldwide, 5.9% of the HCWs worldwide are exposed to HBV annually [4] [5]. In Mongolia, the risk of post-exposure infections in healthcare workers is 0.2% - 0.5% for HIV, 2% - 40% for HBV, and 1.8% - 10% for HCV, respectively [6] [7].

Prevention through vaccination and increasing knowledge are effective strategies for reducing the infection prevalence among HCWs. HBV vaccination has been recommended for all newborns since 1997 [8] and for adults at high risk for HBV infection, such as those who regularly require blood and blood prod-

ucts, those who inject drugs, families of people with chronic HBV infection, sexual partners, people with multiple sexual partners, and health care providers [9]. Although the Government has been working to intensify the vaccination among the total population and HCWs, there is a lack of evidence on vaccination coverage, prevalence reduction, and existing gaps. Moreover, the significant role of educated HCWs on HBV infection and the importance of vaccination is not well-known. The level of knowledge is not explored among the HCWs nationwide. Therefore, we aimed to determine healthcare workers' (HCWs) knowledge, attitude, and practices regarding HBV prevention compared to vaccination coverage.

2. Materials and Methods

2.1. Study Design and Population

This cross-sectional study was conducted among HCWs from the selected sites through multi-stage sampling: Ulaanbaatar and Orkhon as urban areas and Arkhangai, Govi-Altai, Dornod, and Umnugobi as rural areas. A simple random sampling method was applied using the frame comprising a list of HCWs of the selected 36 healthcare facilities.

When determining the sample size, the percentage of HBsAg of the target group is considered as 50.0% with a probability of 95% (Z = 1.96), standard deviation (p = 0.05), and complex sample impact coefficient (1.5). The minimum required sample size for the study was calculated with a 10% non-response rate. In total, 1200 doctors and medical staff were estimated to be involved in the study. Totally 1135 HCWs working in all departments, including medical doctors, nurses, clinicians in both surgical and medical-related specialties, laboratory technicians, and other staff, were attended after the administration of the inclusion and exclusion criteria and the after completing the data processing. In terms of the selection of participants, medical professionals such as physicians, midwives, feldsher, dentists, traditional medicine doctors, nurses, pharmacists, rehabilitation specialists, and medical staff such as other workers who are employed at the selected medical facility were selected in the study. Sampling units and participants are selected based on the human resource database of healthcare organizations. Informed consent was introduced and if agreed upon and signed those are included in the study.

2.2. Data Collection

Participants who consented to the study completed a standardized self-administered questionnaire between July and Dec 2019. The questionnaire included HCWs' demographic characteristics, knowledge, attitude and practice information, and HBV vaccination status. Knowledge assessment questions were related to HBV, the vaccine doses, and the importance of vaccination for HBV. Attitude and practice covered areas of belief about vaccination, the importance of following standard guidelines, and capping the needles. The questionnaire was developed based on WHO and other international agencies' guidelines contextualized by

the Mongolian context. The team revised the questionnaire after conducting pilot testing.

2.3. Statistical Analysis

The study data were analyzed using SPSS-21 software for Windows. The results are expressed as a percentage and mean of the knowledge and attitudes of the study population. Estimates (prevalence) and differences between groups were calculated using 95% confidence intervals. The sampling errors that may affect the accuracy of the study population results were measured by the variables and the standard error of the results. According to the Kolmogorov-Smirnov test, all data were not normally distributed and used relevant non-parametric tests such as the Mann-Whitney U and Kruskal-Wallis tests. The Chi-square test was used for the statistical analysis of categorical variables.

2.4. Ethical Consideration

The ethical permission for the survey was optioned by the Medical Ethics and Monitoring Committee (MACC) at the Ministry of Health on June 24, 2019, Order # 108.

3. Results

3.1. Socio-Demographic Characteristics of Study Participants

The study involved 1135 HCWs, including medical doctors, nurses, clinicians in both surgical and medical specialties, laboratory technicians, and other staff working in all departments from primary and referral levels in 36 healthcare facilities in two urban and four rural provinces of Mongolia. Most participants (82.0%) were born before 1992 or before starting a birth vaccination against HBV in Mongolia. The mean age of the participants was 38 years and the participants' median employment year in the health sector was seven years. 60.6% (688) have worked in the health sector for up to 10 years. Most participants were medical doctors (29.1%) and nurses (28.0%). Midwives, laboratory assistants, and dental technicians accounted for 24.3% of the study participants. Of the total survey respondents, 38.9% (442) worked in high-risk [10] jobs for HBV exposure, 31.9% (362) worked in medium-risk jobs, and 29.2% (331) worked in low-risk jobs. Of the physicians, 12.2% (138) of the respondents were surgeons, 10.7% (121) were obstetricians, and 42.6% (484) were specialists in infectious diseases, resuscitation, and trauma departments (**Table 1**).

Table 1. Participants socio-economic characteristics.

Characteristic	*Frequency* (*n*) *Interquartile Range/percentage/95% CI*	
Gender		
Male	158	13.9 [12.0 - 15.9]
Female	977	86.1 [12.0 - 15.9]

Continued

Highest Level of Educational Attainment		
High school diploma	204	18.0 [15.9 - 20.3]
Vocational/College	207	18.2 [16.1 - 20.6]
University	589	51.9 [49.1 - 54.8]
Masters/ PhD	135	11.9 [10.1 - 13.8]
Marital status		
Unmarried	206	18.1 [15.9 - 20.4]
Married	875	77.1 [74.5 - 79.6]
Domestic partnership	18	1.6 [0.9 - 2.3]
Widowed/divorced	36	3.2 [2.2 - 4.2]
Age group		
Mean age	38	18
Years in work		
Average years in work	7	16
Occupation		
Management	58	5.1 [3.8 - 6.4]
Physician	330	29.1 [26.4 - 31.6]
Nurse	318	28.0 [25.4 - 30.6]
Laborant	40	3.5 [2.5 - 4.7]
Nursing Assistant	153	13.5 [11.5 - 15.6]
Other	196	17.3 [15.2 - 19.6]
Midwife	40	3.5 [2.6 - 4.7]
Levels of Healthcare		
Secondary level	399	35.2 [32.3 - 38.1]
Primary care	135	11.9 [10.0 - 13.8]
Private care	121	10.7 [8.7 - 12.3]
Tertiary care	480	42.3 [39.4 - 45.1]
Department		
General surgery	138	12.2 [10.3 - 14.1]
Obstetrics and Gynecology	121	10.7 [8.8 - 12.3]
Emergency medicine	30	2.6 [1.8 - 3.7]
Intensive care unit	40	3.5 [2.5 - 4.7]
Outpatient	65	5.7 [4.4 - 7.0]
Laboratory	51	4.5 [3.3 - 5.8]
Infectious	35	3.1 [2.1 - 4.1]
Internal Medicine	50	4.4 [3.3 - 5.6]
Central Sterile Services	27	2.4 [1.6 - 3.3]
Administration, Logistics	94	8.3 [6.8 - 10.0]
Other (trauma etc)	484	42.6 [39.7 - 45.7]
Level of risk in the workplace		
High risk	442	38.9 [36.1 - 41.8]
Moderate risk	362	31.9 [29.3 - 34.6]
Low risk	331	29.2 [26.7 - 31.9]
Total	**1135**	

3.2. Knowledge of HBV and Source of Information

Five questions explored HCWs' knowledge about hepatitis B virus infection and prevention, and the correct response ranged between 15.6% (virus survival timeline) and 95.4% (protection after full doses) (Table 2). The total number of correct answers is 2.35 ± 1.25 among the participants. There were not much of a difference in terms of the healthcare facility: HCWs from PHC 2.59 ± 1.04, the referral 2.42 ± 1.20, the private 2.31 ± 1.28, and the specialized hospitals had 2.24 ± 1.33 correct answers ($F = 3.5$, $p = 0.015$). Only 2.8% of the respondents answered five questions correctly, 14.6% answered four questions correctly, 30.3% answered three questions correctly, 30.1% answered two questions correctly, and 11.2% answered 1 question correctly. Men, those with higher levels of education, those over the age of 30, soum family health center HCWs, and doctors and senior medical professionals answered many questions correctly, which is statistically significant. However, the number of correct answers tends to increase with the number of years worked by the study participants, but it is not statistically significant ($\chi^2 = 78.28$, $p < 0.001$).

Another aspect is the HCWs' knowledge of HVB infection risk group identification. More than half (68%) of the HCWs identified themselves within the risk group. The participants have different levels of correct understanding of other risk groups: sexual partners infected with the hepatitis B virus (20.81%), children born to infected mothers (16.89%), intravenous (12.81%), and hemodialysis patients (9.53%).

Figure 1 shows the highest risk group for hepatitis B virus infection. 31.24% of the respondents correctly identified medical professionals and HCWs as the highest-risk group. However, the medical professional correctly answered that they are the highest risk group but did not answer other questions satisfactorily. Only 20.81% of respondents knew that sexual partners infected with the hepatitis B virus are a risk group. 16.89% knew that children born to infected mothers are the risk group too. There is 12.91% of them knew that intravenous drug users or needles exchanging behaviors were the risk group, and 9.53% knew that hemodialysis patients were the risk group (Figure 1).

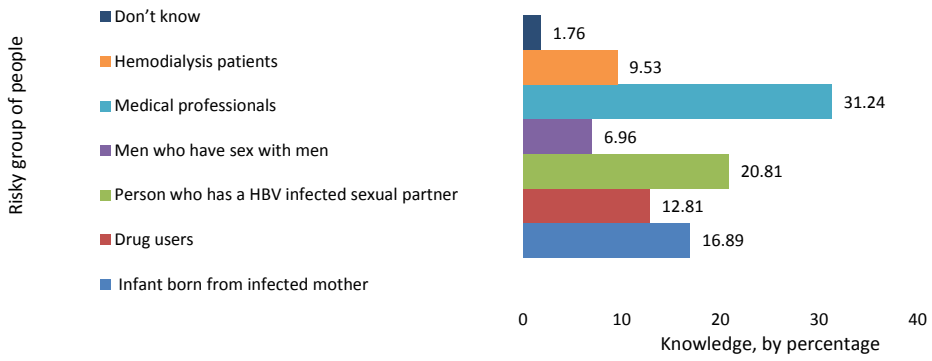

Figure 1. The knowledge of population at risk for HBV infection in percentage, duplicate, Mongolia, 2019.

Table 2. Percentage of participants with a correct response regarding HBV infection knowledge.

Characteristic	Number, n	Correct answer percentage, 95% CI
1. *How long does the hepatitis B virus survive in the environment*?	177	15.6 [13.7 - 17.7]
2. *Are there any adverse effects from overdosing on the hepatitis B vaccine or repeating three doses of the HBV vaccine*?	276	24.3 [21.9 - 26.8]
3. *Did you know that complete protection comes after three doses of the hepatitis B vaccine*?	1083	95.4 [94.2 - 96.6]
4. *Do you think the hepatitis B vaccine is effective in preventing the disease*?	835	73.6 [70.8 - 76.1]
5. *What do you think is the importance of the HBV vaccination*?	541	47.7 [44.4 - 50.6]

We identified sources of information on HBV vaccines from the study participants. The most common sources are the workplace (33.7%) and the medical university (17.9%), while the combined sources were named the workplace, TV, and social media (22.2%). The primary source of information for HCWs of private entities is during students' years, while it was mainly from public media for HCWs of public hospitals and family medicine centers (Table 3).

This information is confirmed by the table of compulsory and in-service training of HCWs in the private sector. For example, 35.5% of HCWs in the private sector received training on HBV prevention, which is 1.5 times lower than referral hospitals, 1.9 times lower than that of primary or soum family health centers, and 1.3 times lower than that of specialized hospitals. However, training on infection control is conducted in private (60.3%) healthcare facilities at a frequency similar to that of other public healthcare facilities (52.6% - 67.4%) (Table 4).

3.3. The Attitude of Prevention towards HBV of HCWs

We asked if the healthcare facilities have a specialist in charge of HBV vaccination coverage in their organization, and if so, what the role of the specialist was. Most participants mentioned that all healthcare organizations surveyed had a staff member in charge of this issue concerning implementing the "Whole Liver Mongolia" national program. The hospital's epidemiologists often performed this role. They had files and notebooks that recorded information about the vaccination status of all HCWs and whether they were infected with the hepatitis virus. In addition, in some hospitals, the staff selected for the study often did not know when or what vaccinations they had received. However, we confirmed their vaccination coverage from an epidemiologist's record. 88.1% of respondents are completely confident in the hepatitis B vaccine. HCW with a lower level of education (93.1%) ($\aleph^2 = 11.15$, $p = 0.07$), HCW with 40 - 49 years old (93.6%) ($\aleph^2 = 22.70$, $p = 0.001$), service staff (92.8%) ($\aleph^2 = 12.36$, $p = 0.417$), and those who had

HBV training (92.6%) ($א^2$ = 3.8, p = 0.434) are more likely to have complete confidence in the vaccine (Table 5). In addition, 98.9% of respondents believe HCWs should be vaccinated against HBV. The younger the age (%), management professionals, and service staff are confident in vaccines, which is statistically significant.

According to the self-estimation, the risk of HBV infection among the respondents was 30.2% high, 23.0% moderate, and 15.0% low. Among the respondents, 7.8% of those who considered themselves to be at high risk and 59.2% of those who considered themselves to be at risk were engaged in low-risk work ($א^2$ = 189.49, p < 0.001) (Table 6).

Table 3. The number of respondents with a correct response by demographics and healthcare facility.

Characteristic	Total	Number of questions with a correct response					
		Don't know	1 question	2 question	3 question	4 question	5 question
Gender, $א^2$ = 4.11, p = 0.033							
Male	158	23 (14.6%)	16 (10.1%)	43 (27.2%)	44 (27.8%)	26 (16.5%)	6 (3.8%)
Female	977	101 (10.3%)	111 (11.4%)	299 (30.6%)	300 (30.7%)	140 (14.3%)	26 (2.7%)
Highest Level of Educational Attainment, $א^2$ = 45.67, p < 0.001							
High school diploma	204	26 (12.7%)	37 (18.1%)	68 (33.3%)	45 (22.1%)	26 (12.7%)	2 (1.0%)
Vocational/College	207	21 (10.1%)	14 (6.8%)	77 (37.2%)	66 (31.9%)	24 (11.6%)	5 (2.4%)
University	589	62 (10.5%)	66 (11.2%)	174 (29.5%)	179 (30.4%)	89 (15.1%)	19 (3.2%)
Masters/PhD	135	15 (11.1%)	10 (7.4%)	23 (17.0%)	54 (40.0%)	27 (20.0%)	6 (4.4%)
Years in work, $א^2$ = 17.53, p = 0.288							
Less than 5 years	463	54 (11.7%)	62 (13.4%)	140 (30.2%)	129 (27.9%)	63 (13.6%)	15 (3.2%)
6 - 10 years	225	29 (12.9%)	26 (11.6%)	64 (28.4%)	68 (30.2%)	34 (15.1%)	4 (1.8%)
11 - 15 years	112	10 (8.9%)	14 (12.5%)	28 (25.0%)	41 (36.6%)	14 (12.5%)	5 (0.5%)
More than 16 years	335	31 (9.3%)	25 (7.5%)	110 (32.8%)	106 (31.6%)	55 (16.4%)	8 (2.4%)
Healthcare, $א^2$ = 18.40, p = 0.049							
Public	929	110 (11.8%)	103 (11.1%)	272 (29.3%)	282 (30.4%)	138 (14.9%)	24 (2.6%)
Private	121	13 (10.7%)	15 (12.4%)	41 (33.9%)	32 (26.4%	14 (11.6%)	6 (5.0%)
Mixed (Primary care)	85	1 (1.2%)	9 (10.6%)	29 (34.1%)	30 (35.3%)	14 (16.5%)	2 (2.4%)
Occupation, $א^2$ = 74.73, p < 0.001							
Management	58	4 (6.9%)	2 (3.4%)	20 (34.5%)	22 (37.9%)	9 (15.5%)	1 (1.7%)
Physician	330	34 (10.3%)	20 (6.1%)	77 (23.3%)	118 (35.8%)	64 (19.4%)	17 (5.2%)
Nurse	318	28 (8.8%)	34 (10.7%)	103 (32.4%)	101 (31.8%)	45 (14.2%)	7 (2.2%)
Laborant	40	4 (10.0%)	7 (17.5%)	15 (37.5%)	10 (25.0%)	4 (10.0%)	0 (0.0%)
Nursing Assistant	153	23 (15.0%)	26 (17.0%)	57 (37.3%)	29 (19.0%)	17 (11.1%)	1 (0.7%)
Other	196	27 (13.8%)	32 (16.3%)	55 (28.1%)	56 (28.6%)	21 (10.7%)	5 (2.6%)
Midwife	40	4 (10.0%)	6 (15.0%)	15 (37.5%)	8 (20.0%)	6 (15.0%)	1 (2.5%)
Total	**1135**	**124 (10.9%)**	**127 (11.2%)**	**342 (30.1%)**	**344 (30.3%)**	**166 (14.6%)**	**32 (2.8%)**

Table 4. Sources of information on HBV vaccination of study participants.

Sources of information	State	Private	Primary care	Total
When I was a student	155 (16.7%)	31 (25.6%)	17 (20.0%)	203 (17.9%)
Formal training	93 (10.0%)	4 (3.3%)	14 (16.5%)	111 (9.8%)
At work, in a unified manner	331 (35.1%)	30 (24.8%)	21 (24.7%)	382 (33.7%)
Social media	26 (2.8%)	7 (5.8%)	1 (1.2%)	34 (3.0%)
Television	17 (1.8%)	5 (4.1%)	4 (4.7%)	26 (2.3%)
Internet	8 (0.9%)	3 (2.5%)	0 (0.0%)	11 (1.0%)
At work and other media	51 (5.5%)	5 (4.1%)	5 (5.9%)	61 (5.4%)
When I was a student and formal training	16 (1.7%)	1 (0.8%)	2 (2.4%)	19 (1.7%)
When I was a student and at work, in a unified manner	15 (1.6%)	0 (0.0%)	4 (4.7%)	19 (1.7%)
Formal training, at work in a unified manner	85 (9.1%)	17 (14.0%)	6 (7.1%)	108 (9.5%)
At work in a unified manner, social media	32 (3.4%)	2 (1.7%)	1 (1.2%)	35 (3.1%)
All of the above	100 (10.8%)	16 (13.2%)	10 (11.8%)	126 (11.1%)
Total	**929**	**121**	**85**	**1135**

Table 5. Attendance at HBV training of respondents by the level of healthcare, Mongolia, 2019.

Characteristic	*Secondary care*	*Primary care*	*Private care*	*Tertiary care*	*Total*
Attendance at HBV training course, $\chi^2 = 34.69$, $p < 0.001$					
Attended	205 (51.4%)	92 (68.1%)	43 (35.5%)	215 (44.8%)	555 (48.9%)
Did not attended	157 (39.3%)	36 (26.7%)	68 (56.2%)	219 (45.6%)	480 (42.3%)
Do not remember	37 (9.3%)	7 (5.2%)	10 (8.3%)	46 (9.6%)	100 (8.8%)
Whether there is an internal meeting about HBV, $\chi^2 = 28.2$, $p = 0.001$					
Yes, always	210 (52.6%)	91 (67.4%)	73 (60.3%)	285 (59.4%)	659 (58.1%)
Yes, sometimes	171 (42.9%)	34 (25.2%)	32 (26.4%)	166 (34.6%)	403 (35.5%)
No	6 (1.5%)	4 (3.0%)	8 (6.6%)	11 (2.3%)	29 (2.6%)
Don't know	12 (3.0%)	6 (4.4%)	8 (6.6%)	18 (3.8%)	44 (3.9%)

3.4. The Practice of Prevention of HBV in HCWs

There are 4.7% of the participants are infected with HBV. In the last six months, the risk of being stabbed with sharps was 9.4 percent higher among HBV-infected HCWs than those not infected with HBV (Figure 2). On the other hand, the percentage of the participants who did not have a sharp exposure is more in the HBsAg negative group.

Table 6. The attitude of whether those respondents are fully confident in the HBV vaccine.

Characteristic	Yes	No	Don't know	Total
Highest Level of Educational Attainment, $\chi^2 = 11.15$, p = 0.07				
High school diploma	190 (93.1%)	5 (2.5%)	9 (4.4%)	204
Vocational/College	183 (88.4%)	12 (5.8%)	12 (5.8%)	207
University	511 (86.8%)	23 (3.9%)	55 (9.3%)	589
Masters/PhD	116 (85.9%)	4 (3.0%)	15 (11.1%)	135
Age group, $\chi^2 = 22.70$, p = 0.001				
20 - 29 years old	247 (86.4%)	16 (5.6%)	23 (8.0%)	286
30 - 39 years old	277 (83.2%)	17 (5.1%)	39 (11.7%)	333
40 - 49 years old	291 (93.6%)	4 (1.3%)	16 (5.1%)	311
>50 years old	185 (90.2%)	7 (3.4%)	13 (6.3%)	205
Occupation, $\chi^2 = 12.36$, p = 0.417				
Management	51 (87.9%)	1 (1.7%)	6 (10.3%)	58
Physician	285 (86.4%)	12 (3.6%)	33 (10.0%)	330
Nurse	282 (88.7%)	17 (5.3%)	19 (6.0%)	318
Laborant	33 (82.5%)	3 (7.5%)	4 (10.0%)	40
Nursing Assistant	142 (92.8%)	3 (2.0%)	8 (5.2%)	153
Other	172 (87.8%)	6 (3.1%)	18 (9.2%)	196
Midwife	35 (87.5%)	2 (5.0%)	3 (7.5%)	40
Attendance at HBV training course, $\chi^2 = 3.8$, p = 0.434				
Attended	514 (92.6%)	13 (2.3%)	28 (5.0%)	555
Did not attended	402 (83.8%)	25 (5.2%)	53 (11.0%)	480
Do not remember	84 (84.0%)	6 (6.0%)	10 (10.0%)	100
Total	**1000 (88.1%)**	**44 (3.9%)**	**91 (8.0%)**	**1135**

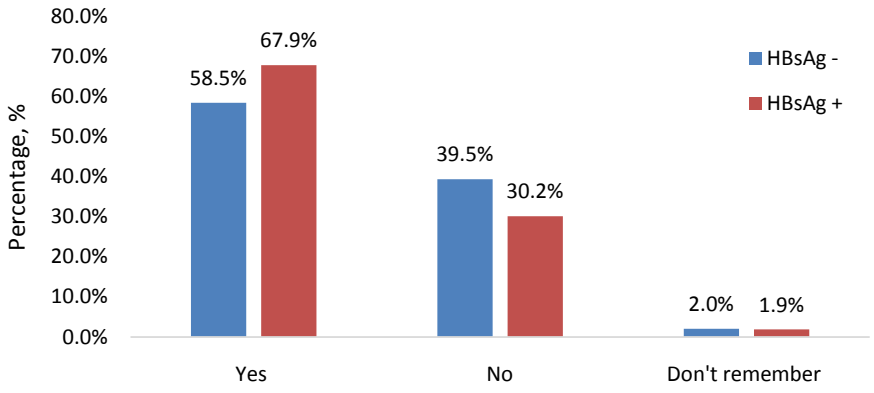

Figure 2. Participants' exposure to sharps by HBV status, percentage.

If HCWs are exposed to a sharp-edged tool, they wash with water (34.3%) and alcohol (20.5%). According to Order A537 of the Minister of Health, 15.6% of post-exposure measures are reported to hospital epidemiologists. However, only 4.5% reported receiving HBV immunoglobulin within 24 hours. 23.5% of the respondents did not follow the safety instructions and checks when performing any procedure, and 54.6% did not follow the instructions not to close the needle before discarding it (Table 7).

More than half (58.9%) of the participants were exposed to sharps within the last six months, and high (73.5%) and moderate (62.4%) risk groups people had more occurrences. After exposure practice, they mainly wash with water (34.3%) and alcohol (20.5%). The correct practice is maintained at a comparatively low level among the participants that are reporting to the hospital in-charge officer/epidemiologist (15.6%) and the receiving dose of HBV immunoglobulin (4.5%) (Figure 3).

Table 7. Occupational risk and self-assessment of the risk of hepatitis B virus infection in respondents.

Self-estimation to the infection at the workplace	Level of risk in the workplace			
	Low risk	Moderate risk	High risk	Total
No risk	58 (17.5%)	25 (6.9%)	15 (3.4%)	98 (8.6%)
Very low	25 (7.6%)	14 (3.9%)	7 (1.6%)	46 (4.1%)
Low	73 (22.1%)	56 (15.5%)	40 (9.0%)	169 (14.9%)
Moderate	101 (30.5%)	85 (23.5%)	76 (17.2%)	262 (23.1%)
High	59 (17.8%)	124 (34.3%)	184 (41.6%)	367 (32.3%)
Very high	15 (4.5%)	58 (16.0%)	120 (27.1%)	193 (17.0%)
Total	**331**	**362**	**442**	**1135**

$\chi^2 = 189.49$, $p < 0.001$.

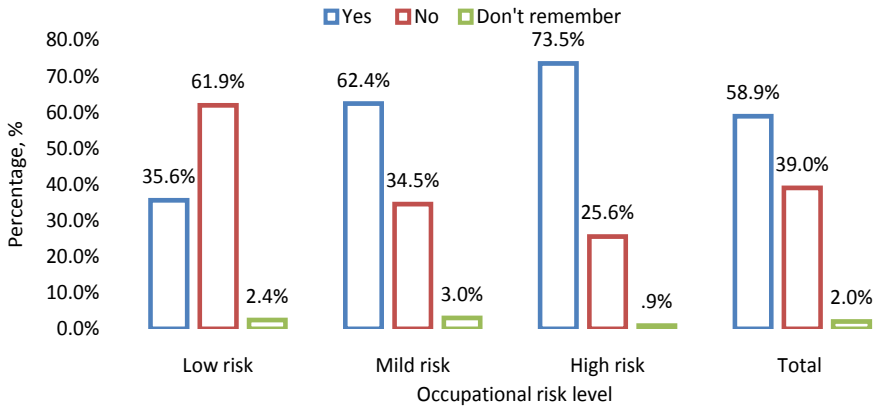

Figure 3. Healthcare workers' exposure to sharps at the workplace, by the percentage of respondents.

3.5. Knowledge, Attitude, and Practices and the HBV Vaccination Coverage

Almost half (n = 538, 47.4%) of the participants had a full three doses of the HBV vaccine. The rate of the correct answer and vaccination doses are related, where the correct answers (3 - 5) were higher in the group of participants who had a full dose of the vaccines. No correct response rate was higher, mainly among the participants who were not vaccinated, one dose, and already infected groups. Also, more people knew 3 - 5 questions than those with no correct and one correct answer. Regarding vaccination and defining their risk level, almost all respondents who managed to define the risk of the work environment had three full doses. 71.9% of those assessed as having a high risk were fully vaccinated against HBV. A significant difference was observed between age groups (χ^2 = 12.57, p < 0.001), perception of HBV infection (χ^2 = 8.14, p = 0.004), and formal attendance to the official training (χ^2 = 28.28, p < 0.0001). Specially survey respondents who knew about the adverse effects of overdosing, knowing about a full dose of the vaccine, and the effectiveness of the hepatitis B vaccine was more tent to have a full dose of the HBV vaccine. All the selected indicators presented in Table 8, 1.02 - 1.99 times higher tend to receive all three full doses HVB vaccine than the rest of the group (Table 8, Table 9).

Table 8. Occupational risk and prevention practices of the respondents, Mongolia, 2019.

Characteristic	Number	Percentage, 95% CI
Do you follow a standard or checklist when performing any procedure?		
Always	695	76.5 [73.7 - 79.3]
Sometimes	111	12.2 [10.1 - 14.4]
Not always	45	5.0 [3.6 - 6.4]
Occasionally	34	3.7 [2.5 - 5.1]
Never	24	2.6 [1.7 - 3.7]
Do you recap the needle before discarding it?		
Yes, always	378	41.6 [38.6 - 45.1]
Yes, sometimes	118	13.0 [10.8 - 15.2]
Never	413	45.4 [42.1 - 48.5]
If you have any open wounds on your skin, do you bandage them before you start work?		
Yes, always	646	71.1 [68.2 - 73.8]
Yes, sometimes	166	18.3 [15.7 - 20.8]
Yes, but the bandage falls off them during work	37	4.1 [2.9 - 5.5]
Never	60	6.6 [5.0 - 8.3]
Total	909	80.09 [76.0 - 85.8]
What measures do you take after direct contact with blood or being pricked by a sharp object?		
Report to hospitals Infection control practitioner	45	4.4 [3.2 - 5.7]
Get immunoglobulin against the B virus within 24 hours	5	0.5 [0.1 - 1.0]

Continued

Clean with alcohol	75	7.3 [5.8 - 9.0]
Wash with water	158	15.3 [13.1 - 17.6]
All of the above	85	8.2 [6.6 - 9.9]
This has never happened before	221	21.4 [19.0 - 24.1]
Other	69	6.7 [5.2 - 8.1]
Report to hospitals Infection control practitioner, get immunoglobulin against the B virus within 24 hours	11	1.1 [0.5 - 1.7]
Report to hospitals Infection control practitioner, wash with water	80	7.7 [6.2 - 9.3]
Get immunoglobulin against the B virus within 24 hours, wash with water	8	0.8 [0.3 - 1.4]
Clean with alcohol, wash with water	178	17.2 [15.0 - 19.6]
Report to hospitals Infection control practitioner, get immunoglobulin against the B virus within 24 hours, wash with water	44	4.3 [3.0 - 5.7]
Report to hospitals Infection control practitioner, clean with alcohol, wash with water	54	5.2 [3.9 - 6.6]
Total	**1033**	**91.01 [88.5 - 93.5]**

Table 9. Some factors of KAP and a full dose of the HBV vaccine.

Indicators	Received full doses of vaccine	χ^2	OR [95% CI]	P value
Female	12.8%	0.965	1.09 [0.94 - 1.28]	0.326
Before 1992	13.9%	12.57	1.29 [1.14 - 1.47]	<0.0001
Rural	34.9%	2.02	1.10 [0.96 - 1.30]	0.155
High-risk job	71.9%	0.57	1.05 [0.93 - 1.19]	0.451
Contacted with blood or body fluids	55.2%	0.20	1.03 [0.91 - 1.16]	0.657
Being bitten by a sharp-edged tool	60.2%	1.45	1.08 [0.96 - 1.21]	0.229
3 - 5 correct answers	52.2%	8.14	1.42 [1.12 - 1.80]	0.004
The hepatitis B virus survives time	16.0%	0.06	1.02 [0.87 - 1.20]	0.806
On adverse effects from overdosing	of	of	1.37 [1.06 - 1.44]	0.004
Knowing about full doses of the vaccine	97.2%	6.86	1.39 [1.14 - 1.70]	0.009
The effectiveness of the hepatitis B vaccine	78.6%	12.20	1.26 [1.11 - 1.42]	<0.0001
The importance of HBV vaccination	44.6%	2.59	1.11 [0.98 - 1.27]	0.108
Attended formal training on HBV prevention	62.0%	28.28	1.99 [1.54 - 2.56]	<0.0001

4. Discussion

We randomly selected 1135 HCWs from 36 healthcare facilities. 86.1% of the participants are women, 51.9% have a bachelor's degree, and 77.1% are married. The majority of them, or 82%, were born before 1992, 24 hours after the start of HBV vaccination in Mongolia. The median age of the participants was 38 ± 18 years, and the median number of years working in the hospital was 7 ± 16 years. 38.9% (442) of the participants work in high-risk jobs for HBV exposure, 31.9%

(362) work in medium-risk jobs, and 29.2% (331) work in low-risk jobs.

4.1. Knowledge of HCWs towards HBV

According to the current survey findings, there is a lack of knowledge about hepatitis B virus infection and its prevention. Men, those with higher levels of education, those over the age of 30, soum family health center HCWs, and doctors and senior medical professionals have a relatively higher level of knowledge. The most common source of information about the HBV vaccine is obtained at work or as a student. Private HCWs, on the other hand, are more likely to use social media as a source of information or obtain it when they are students. Inadequate training on hepatitis B infection prevention has been conducted.

Similar findings were observed that knowledge of HBV and vaccination among HCWs could differ among the studies due to the settings, legal environment, campaign level, and surveyed questions. The study, which administered 12 questions on knowledge, presented the overall knowledge of HCWs as 86.58%, and 92.23% of the participants had good knowledge of HBV [11]. According to this study, among the HCWs, the group with higher education levels had better knowledge than those with lower education levels ($p < 0.0001$). In addition, women showed a good level of knowledge compared to men ($p = 0.022$). Other studies suggest that 62.5% [12], 67.6% [13], 73.1% [14], and 81.0% [15] of the study, respondents had a piece of good knowledge. In China [15], 5% of the respondents answered all of the questions [16] on knowledge correctly, while the same indicator is 2.8% for the presenting study.

Another survey [11] explored that HCWs with higher levels of education showed more favorable attitudes than those with lower levels of education ($p < 0.0001$). In addition, men showed more favorable attitudes than women ($p = 0.18$). Medical doctors have 8.4 times better knowledge of HBV and its vaccination than other professionals (adjusted odds ratio = 8.399, CI 95%: 1.536 - 45.936) [14]. The result is quite similar to our findings where men ($p = 0.033$), those with higher levels of education ($p < 0.001$), those over the age of 30 ($p = 0.012$), PHC facility HCWs ($p = 0.049$), and doctors and senior medical professionals ($p < 0.001$) answered 4 or 5 questions correctly.

We explored a correlation between the number of correct responses and the number of doses of HBV vaccine administered ($א^2 = 78.28$, $p < 0.001$). 47.4% and 22.6% of the HCWs had 3 and 2 doses of the vaccine, respectively. According to Shrestha DB *et al.*, 2020, only 37.0% were fully vaccinated against hepatitis B, while half the study participants (50.8%) had good knowledge, attitude, and practice regarding hepatitis B [16]. Our survey's vaccination coverage was close to Roien R *et al.*, 2021, where only 56.97% of the participants had been vaccinated (6.77% and 45.61% completed three and two doses) and 86.58% of the respondents had an overall understanding of HBV prevention methods [11].

4.2. HBV Risk and Practice of HCWs

HCWs are at risk for HBV, HCV, and HIV due to their occupational characte-

ristics. Because HBV is more contagious than HCV and HIV, people living with HBV are more likely to spread the infection. Of the 35 million HCWs globally in 2002, 2 million were infected each year due to skin damage, according to the WHO. Therefore, the prevention measures for HBV infection among HCWs is a crucial issue. However, 31.24% of the participants identified the high-risk group correctly. However, other questions were not answered correctly. For HCWs, the risk of infection is an accidental injury to the skin or mucous membranes by needles or other sharp instruments contaminated with infected blood. HBV, HCV, and HIV infection risk is 37.6%, 39%, and 4.4%, respectively [17].

In a healthcare setting, the main transmission route from a patient to an HCW is through sharp, pointed instruments. 73.9% of the participants worked with blood and blood products, and 53.7% were at risk of direct contact with blood. Also, 58.9% were exposed to sharp, pointed tools. In the last 6 months, 46.4% were exposed to sharp needles or other objects. However, a person who has not been vaccinated against HBV has a 6% - 30% risk of infection if he or she is exposed to an HBV-infected needle [18].

HBV may be stable in dried blood and blood products at 25˚C for up to 7 days and resistant to washing powder and alcohol [19]. Hand Contact with blood-contaminated surfaces may transfer the virus to skin or mucous membranes. The virus can be transmitted through direct contact with a patient or accidental injury to infected material or sharp instruments [20]. Participants in this study were asked how many days HBVs were resistant to the external environment, and the percentage of correct answers increased as their level of education improved. It is noted that the level of care they work with and the number of HBV training they have received in the last two years have not affected their ability to answer knowledge questions correctly. In other words, there is a need to reconsider the quality of training.

HBV is an occupational risk to HCWs due to its high level of infection and survival in the environment. Participants in this study were exposed to HBV, regardless of the degree of workplace risk. HBV infection is an occupational hazard to patients and/or healthcare workers who come into contact with infectious materials such as blood, semen, vaginal secretions, infected medical equipment, and the surface of an infected environment.

The risk for acquiring HBV infection from occupational exposures is dependent on the frequency of percutaneous and mucosal exposures to blood or body fluids (e.g., semen, saliva, and wound exudates) containing HBV, particularly fluids containing HBeAg (a marker for high HBV replication and viral load) [21]. A safe and effective vaccine with 95% protection against hepatitis B is available. The HBV vaccine has been on the vaccination schedule since 1991, and the WHO has recommended that the HBV vaccine be made mandatory in all countries [1]. Increasing the level of vaccination coverage by HCWs will reduce the risk of HBV transmission to HCWs and patients [22]. Approximately 50% of the participants answered correctly that they prevent infection for themselves and their patients, indicating that not a sufficient proportion of HCWs know.

There is a need to conduct advocacy work in this area and to include it in the undergraduate and postgraduate curricula. In 2013, the US CDC recommended that all unvaccinated HCWs be vaccinated against HBV and that a serum test be performed 1 - 2 months after vaccination to determine the need for additional doses [23].

Regarding the history of accidental exposure, 80.07% of the participants reported needle prick injuries in the past. The accident was the highest among midwives (87.98%) and the lowest among anesthetists (69.23%). Only 69.12% of the participants stated that they consistently report needle stick injury [11]. Only about half of the respondents (50.6%) knew they should not recap the needle with two hands to prevent needle stick injury, and they should dispose of the used needle and syringe into a sharp container immediately without recapping the needle (47.1%) [24]. Another study disclosed that (81%) of the responding providers routinely used to recap needles after use, and only (33%) of doctors were always wearing gloves. More than 50% ($p < 0.001$) of healthcare workers were not vaccinated against HBV [25]. Similar results were also recorded in current survey findings.

4.3. Knowledge, Attitude, and Practice toward the Vaccination Coverage

HCWs in high-risk departments ($p = 0.011$), with more knowledge of the hepatitis B vaccine ($P < 0.001$), and with fewer working years ($p = 0.002$) were more likely to be vaccinated against HBV. Infectious diseases and occupational health managers had positive attitudes toward hepatitis B vaccination[1] [26]. The majority of survey respondents from Nepal [16] Preclinical medical students were not fully vaccinated against Hepatitis B, and only half had acceptable knowledge, attitude, and practice towards Hepatitis B, making them vulnerable to the infection. This pattern was also defined among the HWCs of our survey respondents.

We revealed that a significant difference was observed between age groups, perception of HBV infection, and formal attendance to the official training positively related to vaccination coverage. Specially survey respondents who knew about the adverse effects of overdosing, knowing about full doses of the vaccine, and the effectiveness of the hepatitis B vaccine was more tent to have ll doses of the HBV vaccine. Knowledge and working conditions are increasing factors to receive full doses of the HVB vaccine.

The limitation of this study is recall-based therefore some participants may have forgotten about the date and vaccination period.

In conclusion, the overall knowledge of HBV and its vaccination is fair among the HCWs; however, there is a need to intensify the training on some of the details and increase the training frequency at the workplace. Attitude and practice

[1]Liu Y, Ma C, Jia H, *et al.* Knowledge, attitudes, and practices regarding hepatitis B vaccination among hospital-based doctors and nurses in China: Results of a multi-site survey. Vaccine. 2018; 36(17): 2307-2313. doi:10.1016/j.vaccine.2018.03.018.

on infection protection and vaccination are still essential to be promoted among the HCWs. The low level of vaccination coverage is relevant to the level of KAP among the HCWs of the country; therefore, intensive campaigns should be conducted with a focus on the particular issue.

Author Contributions

All authors discussed the results and commented on the manuscript. N.N, B.B., A.E. and B.T. contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript. B.A, B.S, N.K, and O.B. contributed to the editing and revising of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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