



## OPEN Knowledge, attitudes, and factors associated with vertical transmission of hepatitis B among pregnant women in Gurage Zone, Ethiopia

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Hepatitis B virus is a highly contagious virus and a significant public health issue globally. Its prevalence among the general and prenatal populations indicates its endemicity in Ethiopia. Mother-to-child transmission is a key route of transmission, and preventing this is crucial to controlling the spread of HBV. Effective prevention requires sufficient knowledge and a positive attitude toward HBV and its modes of transmission. However, research on pregnant women's knowledge and attitudes regarding mother-to-child transmission of HBV in Ethiopia is limited. To assess pregnant women's knowledge, attitudes, and associated factors regarding vertical transmission of HBV among women attending the ANC clinic at Gurage Zone Hospitals, Central Ethiopia. An institutional-based cross-sectional study was conducted among 419 pregnant women attending antenatal care at Atat Hospital from January to March 2024. A systematic sampling technique was used, and data were collected through a pre-tested, structured, interviewer-administered questionnaire. The data were entered into Epi Data 4.6 and analyzed using SPSS 26. Binary logistic regression was used to determine associations between the outcome and explanatory variables, with a  $P$  value  $< 0.05$  considered statistically significant. Of the 414 participants (98% response rate), 80.7% were not knowledgeable about the vertical transmission of HBV, and 77.1% had a favorable attitude toward the vertical transmission of HBV. Factors associated with knowledge included urban residence (AOR 8.7, 95% CI 4.3, 17.64), being single (AOR 5.6, 95% CI 1.17, 27.4), and educational level (AOR 6.8, 95% CI 2.4, 19.1). Attitude was associated with urban residence (AOR 4.9, 95% CI 2.1, 11.3), being single (AOR 5, 95% CI 1.17–27.39), income of 2000–4000 ETB (AOR 17.3, 95% CI 5.0–60.03), and primigravidity (AOR 17.8, 95% CI 5.6–56.6). Residence was associated with both knowledge and attitude. Overall knowledge of vertical transmission of HBV was poor, and attitudes toward transmission, screening, and vaccination were generally positive. Residence, being single, educational level, and monthly income were significantly associated with knowledge and attitude. There is a need for enhanced education and awareness-creation programs on HBV transmission and prevention in this population.

**Keywords** Hepatitis B, Maternal health, Pregnant women, Vertical transmission, Ethiopia

### Abbreviations

AH	Atat hospital
ANC	Antenatal care
HBV	Hepatitis B virus
HBsAg	Hepatitis B surface antigen
HBeAg	Hepatitis B e antigen

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KA	Knowledge and attitude
MTCT	Mother-to-child transmission
PMTCT	Prevention of mother-to-child transmission
VT	Vertical transmission

## Background information

Hepatitis B is the foremost prevalent serious liver disease in the world. It is caused by the hepatitis B virus (HBV), which attacks liver cells and can advance to liver failure, cirrhosis (scarring), or liver cancer afterward in life<sup>1</sup>. The virus can transfer from a hepatitis B-positive mother to her unborn child during pregnancy or childbirth, as well as through direct contact with infected blood or bodily fluids<sup>2</sup>. Not everyone infected with HBV develops symptoms, while those who may experience fatigue, poor appetite, stomach pain, nausea, and jaundice. For others, it can turn into a long-term, chronic infection that can cause serious, even fatal, health problems such as liver disease or liver cancer<sup>3</sup>. Among the different modes of transmission, vertical transmission from mother to child during pregnancy or childbirth is a vital route that contributes to the burden of HBV disease, especially in endemic regions<sup>4</sup>.

The presence of hepatitis B e antigen (HBeAg), a serum marker of high viral replication, and HBV deoxyribonucleic acid (DNA) levels, significantly influences the risk of mother-to-child transmission (MTCT) from HBV-infected women represented by positive HBsAg<sup>5</sup>. Depending on the age at which a person is infected with HBV progression is probable from acute to chronic stage. There is a high risk of becoming chronic when they are infected in early life<sup>6</sup>. Perinatal transmission is an important source of HBV infection in newborns, and therefore, HBV-positive pregnant women predispose their infants to serious risk of transmission during birth. All pregnant women undergo routine laboratory testing for the hepatitis B virus. If a pregnant woman tests positive for HBsAg, her HBV DNA viral load will be determined. A newborn baby can be protected from hepatitis B infection if the first dose of the hepatitis B vaccine is given to the baby during delivery or within the first 24 h of life<sup>1</sup>.

Hepatitis B infections remain an important global health problem. Globally approximately 290 million people are infected with the hepatitis B virus, making it a serious global health problem<sup>7</sup>. It is responsible for approximately 1.4 million deaths each year due to cirrhosis and acute and chronic hepatitis-related carcinomas<sup>8</sup>. Studies worldwide have shown that there is a lack of adequate knowledge about hepatitis B virus transmission in pregnant women, which represents a barrier to preventing mother-to-child transmission of HBV. In China, 21% of pregnant women do not fully understand how HBV is transmitted. In Africa, levels of knowledge and attitudes regarding hepatitis B virus transmission among pregnant women range from 20 to 52.5% and 21.5 to 71.3%, respectively<sup>6,9</sup>. In Ethiopia, the knowledge of pregnant women towards vertical transmission of HBV is 10.4% while 50% have a favorable attitude<sup>10</sup>.

The consequences associated with poor knowledge and attitude toward HBV among pregnant women on vertical transmission lead to increased MTCT rates due to inadequate knowledge about the virus and its transmission routes<sup>9</sup>. Inadequate knowledge and negative attitudes toward HBV transmission can result in a lack of adherence to preventive measures such as antenatal screening, vaccination, and proper healthcare-seeking behavior, this increases the risk of chronic HBV infection in newborns, potentially leading to long-term health complications<sup>11</sup>. Several factors influence the knowledge, attitudes, and practice regarding vertical transmission of hepatitis B virus in pregnant women including educational status, income level, place of residence, gravida, vaccination history, access to health education programs, attitudes toward screening and prevention, and differences between Hospitals all play a crucial role in shaping the knowledge, attitudes, and practice toward hepatitis B virus<sup>8,9,12,13</sup>.

Available strategies to prevent or reduce mother-to-child transmission of HBV include the administration of a Hepatitis B vaccine and hepatitis B immunoglobulin (HBIG) to newborns of HBV-infected mothers within the first 12 h of birth. This remains an effective intervention, preventing approximately 90–95% of MTCT of HBV infections and using antiviral prophylaxis in pregnancy in women<sup>14</sup>. Despite routine screening for hepatitis B during the prenatal period and mandatory hepatitis B vaccination for infants at birth, there are still some mothers who do not comply with these measures, leading to a continuous increase in the prevalence of the disease<sup>8</sup>. However, there is a lack of comprehensive data on the level of knowledge and attitudes of pregnant women regarding vertical transmission of the hepatitis B virus and its associated factors.

The extent to which pregnant women are familiar with the vertical transmission of hepatitis B remains unclear. Understanding the level of knowledge regarding the transmission routes, preventive measures, and risks to their newborns, and assessing attitudes toward vaccinations, screening, and lifestyle changes is essential for controlling the spread of HBV. Identifying knowledge gaps and associated factors will aid in developing targeted interventions to reduce vertical transmission. This study aimed to assess pregnant women's knowledge, attitudes, and associated factors regarding vertical transmission of HBV among women attending ANC clinics at Gurage Zone Hospitals, Central Ethiopia.

## Methods and materials

### Study area and period

The study was conducted at Atat Hospital which is located in Gurage Zone, 175 km south of Addis Ababa. Gurage Zone has a total population of 1,635,311 people, with 842,065 women and 793,246 men, according to the Ethiopian Central Statistical Agency's 2017 population forecast. Atat Hospital was 43 years in operation owned by the Catholic Church in Ethiopia and has a catchment area of about one million people. The hospital ANC clinic gives routine screening services such as HIV, HBsAg, hemoglobin, blood group, rapid plasma regains, and urinalysis (glucose, protein, infection) tests for more than 16 pregnant women per day<sup>15</sup>. The study was conducted from January to March 2024 G.C.

## Study design

An institutional-based cross-sectional study design was implemented.

## Population

### Source population

All pregnant women who attend the ANC clinic at Atat Hospital.

### Study population

All pregnant women who attend ANC follow-up at Atat Hospital during the data collection period.

## Eligibility criteria

### Inclusion criteria

Women who attended the ANC clinic during the data collection period were included.

### Exclusion criteria

Women who were seriously ill which means those individuals with acute medical emergencies requiring intensive care, or those with conditions deemed unstable or critical at the time of enrollment.

## Sample size determination

The sample size was determined by using the single population proportion formula. By considering the following assumptions: prevalence of 54% according to the previous study<sup>8</sup>, 95% confidence level, and 5% margin of error. Therefore, the sample size was

$$n = \frac{(Z \alpha/2)^2 P (1 - P)}{d^2}$$

where n = minimum sample size required for the study;  $(Z \alpha/2)^2$  = standard normal distribution ( $Z = 1.96$ ) with a confidence interval of 95%; P = proportion (54%)<sup>16</sup>; d = is a tolerable margin of error ( $d = 0.05$ )

$$n = \frac{(1.96)^2 \times (0.54)(0.46)}{(0.05)^2} = 381$$

By adding 10% of the non-response rate the sample size was 419.

## Sampling technique

A systematic sampling technique was implemented, taking into account that the ANC clinic at the Atat Hospital served an average of 16 pregnant women per day, and data collection was scheduled for two months:  $k = N/n = 960/419 = 2$ . Then, every second woman who came to the clinic and met the inclusion criteria was recruited.

## Variables of the study

### Dependent variables

- Knowledge and attitude of MTCT of HBV

### Independent variables

- *Sociodemographic characteristics* including age, residence, religion, educational level, occupation, marital status, and income
- Number of pregnancy
- Parity
- Knowledge of HBV

## Data collection tool and procedures

The data collection tool was adapted by reviewing related literature and modified according to the local situation of the study area. A pre-tested structured and interviewer-administered questionnaire was used to collect the data. The questionnaire was divided into three sections, such as Socio-demographic characteristics, knowledge of respondents on transmission of HBV, and attitudes about HBV. The Socio-demographic characteristics included age, religion, residence, marital status, monthly income, level of education, occupational status, parity, gravida, and HBV vaccination history. Grouping monthly income was based on established categorization used in previous studies within similar demographic contexts. The age categories used in the study were based on the Ethiopian Demographic and Health Survey, which is a widely recognized framework for demographic and health research in Ethiopia. The knowledge section has three parts general knowledge of HBV, modes of transmission, and knowledge of vaccine and MTCT of HBV. The attitude section consisted of 4 items and it was mainly about the prevention of MTCT of HBV and follow-up after birth. The data was collected and supervised by trained midwives.

### Data quality control

The data collection tool was prepared first in English by the Investigator and then translated into the Amharic language and then translated back to English to check the consistency of language experts. One-day training about the objectives and process of the data collection was given to data collectors and supervisors. Trained supervisors will supervise the data collectors daily for the completeness and consistency of the filled questionnaires. Before the actual data collection, a pretest of the questionnaire was conducted on 5% of the sample size in a hospital out of the study area. In addition, the data was thoroughly cleaned and carefully entered into a computer for analysis.

### Data processing and analysis

The data was checked, coded, cleaned, and entered into Epi Data version 4.6 before being exported to Statistical Package for Social Sciences (SPSS) 25 for analysis. A correct response to each question was coded 1 point, and incorrect responses were coded zero points. The HBV knowledge score was calculated based on the sum of correct answers to the knowledge questions. The attitude score was calculated as the sum of the correct answers to the questions. Categorical variables were computed by using frequencies and percentages, whereas for continuous variables mean and standard deviation were used. Frequencies were used to summarize descriptive statistics. Binary logistic regression was used to determine the association between the outcome variable and explanatory variables. All variables in the bivariate logistic regression model whose *P* value is less than or equal to 0.25 were included in the multivariable analysis model. Adjusted odds ratios with their corresponding 95% CI were computed to determine the presence and strength of the association. A *P* value of < 0.05 was taken to declare the presence of statistical significance. The final model goodness of fit was checked by Hosmer-Lemeshow's test and the multi-co-linearity test was carried out to see the relationship between independent variables by using the variance inflation factor. The analyzed data was presented using text, tables, and figures.

### Ethics approval and consent to participate

Ethical clearance was obtained from the Wolkite University, College of Medicine and Health Sciences, Ethical Review Committee with a reference number of /603/2024. The study was conducted based on the ethical standards of the Declaration of Helsinki. The ethical letter was given to the Hospital to get permission for the data collection process. The purpose of the study and their right to refuse was explained to the study participants and informed written consent was taken. Coding was used to eliminate names and other personal identification of respondents throughout the study process to ensure participant confidentiality.

## Results

### Sociodemographic characteristics

A total of 414 pregnant women participated with 98% of the response rate. The respondents had an average age of 32 ( $\pm 5.971$ ) years. The majority of participants (254, 61.4%) were rural residents. Regarding educational status, 90 (21.7%) of the respondents were able to read and write. More than half 262 (63.3%) of the study participants had 2000–4000 birr monthly (Table 1).

### Knowledge of pregnant women regarding VT of HBV

The majority 334 (80.7%) of the participants were not knowledgeable about vertical transmission of HBV (Fig. 1). Nearly half 197 (47.6%) of the respondents had a knowledge of HBV transmitted through blood transfusion. More than half 293 (70.8%) of pregnant women were unaware HBV can be transmitted from the mother to the unborn fetus. Only 129 (31.2%) of pregnant women knew the presence of a vaccine for HBV and 75 (18.1%) of pregnant women were aware that mother-to-child transmission of hepatitis B virus is preventable (Table 2).

### Attitudes of pregnant women regarding VT of HBV

The majority 319 (77.1%) of pregnant women had a favorable attitude toward vertical transmission of the hepatitis B virus (Fig. 1). The majority 263 (63.5%) of participants were willing to screen for hepatitis B virus surface antigen. Of 141 (34.1%) pregnant were not willing to let their infant take hepatitis B antibodies if they have hepatitis B virus (Table 3).

### Factors affecting the knowledge and attitudes of pregnant women toward HBV.

Binary logistic regression was employed to evaluate the association between different independent variables and dependent variables. Variables with a *P* value  $\leq 0.25$  in the bivariable logistic regression analysis were entered into the multivariable logistic regression and analyzed by using the backward likelihood ratio method. Hence, variables with a *P* value < 0.05 and AOR with their corresponding 95% CI were considered statistically significant. Model fitness was tested with Hosmer and Lemeshow's goodness of fit test and fit with a *P* value (of 0.183). Multicollinearity among the independent variables was assessed using the variance inflation factor, and no Multicollinearity issues were found, as all variables had a variance inflation factor of less than 8.64. According to the results of the multivariable logistic regression analysis, independent variables including, residence, education, gravidity, marital status, and monthly income are found as associated factors with the knowledge and attitude of pregnant women regarding the vertical transmission of hepatitis b virus.

After adjusting for confounding variables, the findings of this study show that pregnant women in urban areas were eight times (AOR 8.7, 95% CI (4.3–17.64)) more knowledgeable than those who live in rural areas. Single pregnant women were five times (5.6, 95% 1.17, 27.39) more knowledgeable than their counterparts. Pregnant women with educational levels of college and above were six times (AOR 6.8, 95% CI (2.4, 19.1)) more likely to be knowledgeable as compared to their counterparts.

Pregnant women in urban areas were five times (AOR 4.9, 95% CI (2.1–11.3)) more likely to have a favorable attitude than those who live in rural areas. Pregnant women who have a monthly income of 2000–4000 were more

Variables	Category	Number	Percentage
Age in year	15–19	20	4.8
	20–24	41	9.9
	25–29	69	16.7
	30–34	143	34.5
	35–39	101	24.4
	40 and above	40	9.7
Marital status	Single	28	6.8
	Married	321	77.5
	Widowed	29	7.0
	Divorced	36	8.7
Religion	Muslim	288	69.6
	Orthodox	41	9.9
	Protestant	65	15.7
	Catholic	20	4.8
Residence	Rural	254	61.4
	Urban	160	38.6
Monthly income in ETB	< 2000	36	8.7
	2000–4000	262	63.3
	> 4000	116	28.0
Educational status	No education	66	15.9
	Read and write	90	21.7
	Primary	113	27.3
	High school	106	25.6
	College and above	39	9.4
Occupation	Housewife	157	37.9
	Employed	94	22.7
	Daily laborers	45	10.9
	Student	39	9.4
	Merchant	79	19.1
Gravida	Primigravid	121	29.2
	Multigravida	293	70.8

**Table 1.** Socio-demographic characteristics of pregnant women in Gurage zone Atat Hospital Central Ethiopia 2024 (N = 414).

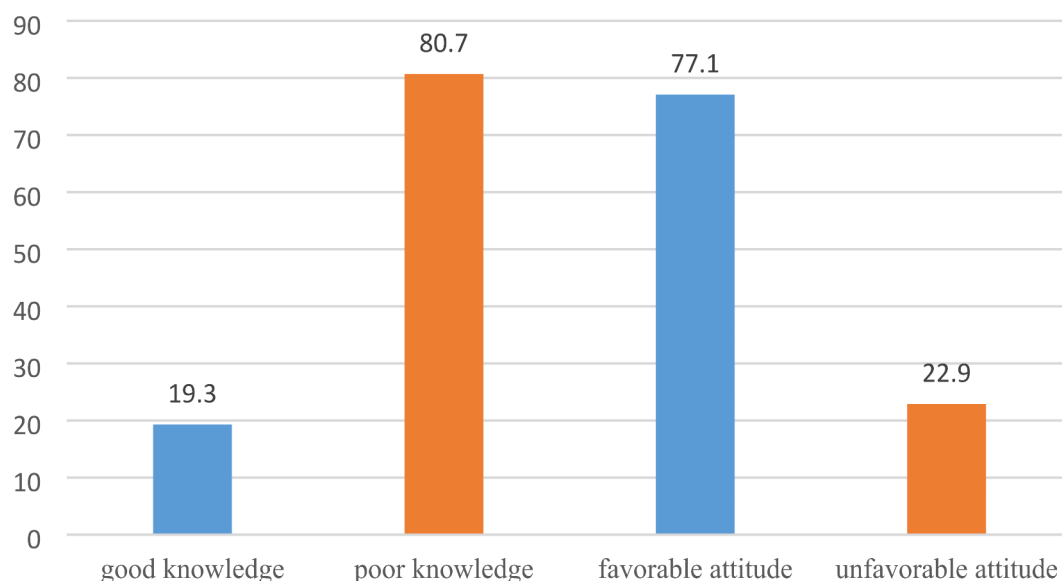
likely (AOR 17.3, 95% CI (5.0, 60.03) to have a favorable attitude compared to their counterparts. Participants who were primigravid were (AOR 17.8, 95% CI (5.6, 56.6) more likely to have a good attitude than those who were multigravida (Table 4).

## Discussion

This study investigated knowledge, attitude, and associated factors among pregnant women regarding the MTCT of HBV. The finding revealed that 80.7% of pregnant women had poor knowledge. This finding was higher than other studies conducted in Nigeria (47.7%)<sup>6</sup>, Ghana (54%)<sup>14</sup>, Cameroon (46%)<sup>12</sup>, and a study conducted in the Gondar, Amhara region of Ethiopia (73.4%)<sup>16</sup>. This may be differences in socioeconomic, year of study, limited accessibility of healthcare, availability of health facilities, and low educational status of the participants. In contrast, the finding was lower than a study conducted in Vietnam (89.2%)<sup>17</sup> and In the Amhara region tertiary hospitals (89.6%)<sup>8</sup>.

In our study, 24.2% of the participants knew that HBV can be caused by a virus. This finding is lower than studies conducted in China (56.6%)<sup>18</sup> and Saudi Arabia (48.1%)<sup>19</sup>, where a higher percentage of pregnant women were aware that hepatitis B is a virus. However, it is higher than the awareness levels reported in studies from Baghdad, Iraq (20%)<sup>20</sup> and the Amhara region of Ethiopia (13.6%)<sup>8</sup>. According to the findings of this study where measures against HBV mode of transmission, only 47.6% of the participants knew HBV is transmissible through blood and blood products, 31.2% through unsafe sex, and 29.2% from mother to child during pregnancy. This finding was higher than studies conducted in Baghdad, Iraq 3.5% knew HBV is transmissible through blood and blood products, 20.5% through unsafe sex, and 19% from mother to child<sup>20</sup>, a study conducted in the Amhara region of Ethiopia 18.4% of the respondents know HBV is transmissible through blood and blood products, 14.2% through unsafe sex, and 17.2% from mother to child during pregnancy<sup>16</sup>. In contrast, this finding was lower than a study conducted in China 53.3% knew HBV is transmitted with unprotected sexual intercourse<sup>18</sup>, a study conducted in Saudi Arabia reported that 75% of the respondents knew HBV is transmissible through blood, and blood products and 63% also knew HBV is transmitted through unsafe sex<sup>19</sup>. The discrepancy may

## KA TOWARD HBV AMONG PREGNANT WOMEN



**Fig. 1.** Level of Knowledge and Attitude towards Hepatitis B virus among pregnant women attending Atat Hospital, central, Ethiopia, 2024.

Knowledge items	Category	Number	Percent
Hepatitis B is caused by a virus	Yes	100	24.2
	No	314	75.8
Hepatitis B can be transmitted through blood transfusion	Yes	197	47.6
	No	217	52.4
Hepatitis b can be transmitted through unprotected sexual intercourse	Yes	129	31.2
	No	285	68.8
Hepatitis b can be transmitted from infected mother to her unborn fetus	Yes	121	29.2
	No	293	70.8
Hepatitis b can be transmitted through the use of unsafe needles	Yes	179	43.2
	No	235	56.8
Can hepatitis b causes liver cancer	Yes	124	70
	No	290	30
Can hepatitis b causes cirrhosis	Yes	118	28.5
	No	296	71.5
There is a vaccine for the hepatitis b virus	Yes	129	31.2
	No	285	68.8
Babies that are infected perinatally are at high risk of chronic disease cirrhosis or liver cancer	Yes	126	30.4
	No	288	69.6
MTCT of HBV is preventable	Yes	75	18.1
	No	339	81.9

**Table 2.** Knowledge of pregnant women regarding VT of HBV in Gurage zone Atat Hospital Central Ethiopia 2024 (N = 414).

be due to a difference in socio-cultural, population educational status, and availability of means of gathering information. For instance, in a well-developed country like China, the respondents were well-educated and easily accessed information about the hepatitis B virus through different media than our respondents. In addition to this in our country, there is a misconception regarding to HBV source and mode of transmission. They belief that HBV is a disease of bats and transmitted or came from the urine and faces of bats rather than unsafe sex, blood and from mother to her fetus. This traditional belief and thinking may inhibit their level of knowledge regarding mode of transmission of HBV.



Attitude items	Category	Number	Percent
Are you willing to be screened for hepatitis?	Yes	263	63.5
	No	151	36.5
Are you willing to let your baby take an HBV vaccine?	Yes	231	55.8
	No	183	44.2
If you have a hepatitis infection, are you willing to let your baby take antibodies of hepatitis B?	Yes	273	65.9
	No	141	34.1
Are you willing to take your baby back to the clinic after birth screening for hepatitis b virus?	Yes	137	33.1
	No	277	66.9

**Table 3.** Attitude of pregnant women regarding VT of HBV in Gurage zone Atat Hospital Central Ethiopia 2024 (N = 414).

Variable	Category	Knowledge		AOR (95% CI)	Attitude		AOR (95% CI)
		Not knowledge	Knowledge		Unfavorable attitude	Favorable attitude	
Residence	Rural	233	21	1	12	148	1
	Urban	101	59	8.7 (4.3, 17.64)**	83	171	4.9 (2.1, 11.3)**
Marital status	Single	16	12	5.6 (1.17, 27.39)*	9	19	1.2 (0.2, 5.5)
	Married	270	51	0.5 (0.16, 1.65)	64	257	1.7 (0.5, 5.3)
	Widowed	19	10	1.3 (0.28, 6.43)	11	18	0.8 (0.1, 4.15)
	Divorced	29	7	1	11	25	1
Educational level	Unable to read and write	50	16	1	15	51	1
	Read and write	85	5	0.36 (0.1, 1.3)	42	48	0.9 (0.3, 2.5)
	Primary	94	19	1.4 (0.5, 3.8)	23	90	2.2 (0.8, 5.7)
	High school	87	19	0.6 (0.27, 1.78)	9	97	2.4 (0.7, 7.4)
	College and above	18	21	6.8 (2.4, 19.1)**	6	33	1.4 (0.4, 5.08)
Occupation	Housewife	120	37	1	32	125	1
	Employed	71	23	2.2 (0.7, 6.4)	19	75	1.3 (0.6, 3.0)
	Daily laborers	39	6	1.4 (0.4, 4.5)	7	38	0.6 (0.2, 1.61)
	Student	33	6	0.8 (0.1, 3.54)	9	30	1.1 (0.3, 4.57)
	Merchant	71	8	0.7 (0.16, 3.39)	28	51	0.8 (0.2, 2.63)
Income (ETB)	< 2000	22	14	1	12	24	1
	2000–4000	211	51	1.0 (0.25, 3.9)	37	225	17.3 (5.0, 60.1)**
	> 4000	101	15	0.75 (0.1, 3.22)	46	70	2.6 (0.7, 9.03)
Gravida	Primigravid	72	49	1.8 (0.7, 6.4)	5	122	17.8 (5.6, 56.6)**
	Multigravida	262	31	1	90	197	1

**Table 4.** Multivariable Analysis of Sociodemographic Variables with Knowledge and Attitude of Pregnant Women in Gurage zone Atat hospital central Ethiopia 2024 (N = 414). Double asterisk (\*\*) shows  $P < 0.001$  and single asterisk\* shows  $P < 0.05$ . AOR, adjusted odds ratio; CI, Confidence Interval; ETB, Ethiopian Birr.

This study also revealed that 18.1% of the respondents were aware that mother-to-child transmission of HBV is preventable and 31.2% knew the presence of a vaccine. This finding was lower than a study conducted in China, 74.7% were aware of the presence of vaccines and 95% knew HBV was preventable<sup>18</sup>. This finding was higher than a study conducted Amhara region of Ethiopia 14.1% of the respondents knew the presence of the vaccine<sup>8</sup>. The finding of this study was found 77.1% of pregnant women had a favorable attitude toward vertical transmission of hepatitis B virus. Our finding was relatively higher as compared to similar studies conducted in China 68.5%<sup>18</sup> and in the Amhara region of Ethiopia 54%<sup>16</sup>. Only 63.5% of participants were willing to screen for hepatitis B virus surface antigen. This finding was relatively higher than the same study conducted in the Amhara region of Ethiopia 60.3% of the study participants were willing to screen for HBV<sup>16</sup>. However, this study was lower than a study conducted in China 83.3%<sup>18</sup>. 65.9% of pregnant women did not have the willingness to let their infant take hepatitis B antibodies. This was higher than in a study in Ethiopia 57% of pregnant women were willing to let their baby receive the HBV vaccine<sup>16</sup>. However, this study was lower than a study conducted in Saudi Arabia 80.1% of the participants were likely to allow their children's vaccination.

The findings of this study show that pregnant women in urban areas were eight times (AOR 8.7, 95% CI (4.3–17.64)) more knowledgeable and five times (AOR 4.9, 95% CI (2.1–11.3)) more likely to have a favorable attitude than those who live in rural areas. This finding was supported by a study conducted in Gondar Comprehensive Specialized Hospital, Ethiopia<sup>16</sup>. This may be because urban residents have better access to information and healthcare resources.

Pregnant women with educational levels of college and above were six times (AOR 6.8, 95% CI (2.4, 19.1)) more likely to be knowledgeable as compared to their counterparts. This finding was similar to other studies conducted in Guangdong province, China, Saudi Arabia, Amhara region of Ethiopia<sup>16,18,19</sup>. This may be due to highly educated people having easily gather and access information and be able to understand and interpret it. Single pregnant women were five times more knowledgeable than their counterparts. Other studies did not report the finding of this association but on the contrary, a study conducted in Ghana married women were more knowledgeable than their counterparts<sup>14</sup>. This may be due to Single women proactively seeking more information due to a greater need for self-reliance.

Pregnant women who have a monthly income of 2000–4000 were more likely (AOR 17.3, 95% CI (5.0, 60.03)) to have a favorable attitude compared to their counterparts. This finding was supported by a study conducted in Gondar Comprehensive Hospital Ethiopia<sup>16</sup>. This may be due to the increased financial ability to afford healthcare services, such as regular screenings, vaccinations, and other preventive measures. Higher income also often correlates with better access to health information and healthcare resources, allowing wealthier women to take more steps in managing their health<sup>21</sup>. Participants who were primigravida were (AOR 17.8, 95% CI (5.6, 56.6)) more likely to have a good attitude than those who were multigravida. This was supported by other studies conducted in Ghana<sup>14</sup>.

## Implications for public health and policy

### Implications for public health practice

The high percentage of pregnant women with poor knowledge about HBV creates an immediate call for health education targeting specifically ANC. Strengthening health literacy programs on HBV transmission, prevention, and vaccination in pregnancy could dramatically improve maternal and child health.

The discordance visible in rural–urban knowledge and attitudes points to the need for diverse community-based interventions. The HBV awareness programs can be extended to cover schools, community centers, and the mass media which could additionally help bridge the knowledge gap.

The relatively low uptake to screen for HBV and welcome neonatal immunization suggests barriers of misinformation, stigma, and access to healthcare. Using these findings, barriers to screening and vaccine acceptance could be reduced through culturally appropriate education and counseling.

### Implications for policy

Policymakers should consider giving HBV tests free or subsidies for pregnant women to increase access.

The study underlines the requirement of policies that ensure universal births HBV vaccination, especially in high-risk populations. It would be important to strengthen national vaccination programs and improve vaccine supply chains in rural areas.

Public health authorities should implement evidence-based communication strategies to remove myths and encourage preventive behavior. Cooperation with community leaders and religious organizations can help in broadcasting accurate information effectively.

### Limitations of the study

The study was conducted in a single antenatal clinic, thus limiting the generalizability of the research findings to all pregnant women in the study setting. Additionally, HBsAb tests were not conducted to identify vaccinated or previously exposed women among the respondents. Additionally, the results may have been impacted by rural–urban differences, as women in urban areas usually have more access to health services, health education, and media-based information. The difference in rural and urban settings may have contributed to the differences in HBV knowledge and attitude. Respondents are likely to give socially acceptable replies rather than share their true knowledge of HBV, and therefore, bias may have been introduced. Moreover, the cross-sectional nature of the study limits the ability to establish causal relationships or track changes over time. In the future, a mixed-methods approach that includes qualitative interviews will provide further insights into participants' points of view, which may significantly address the limitations.

## Conclusion

The overall knowledge of study participants was found to be inadequate. This research reveals a significant gap in knowledge among pregnant women regarding the transmission and prevention aspects of hepatitis B. The majority of participants demonstrated inadequate knowledge about the viral origin of hepatitis B, its transmission from mother to child, the existence of a hepatitis B vaccine, and the associated risks such as chronic disease and liver cancer. However, there was a positive attitude among a majority of pregnant women regarding the transmission, screening, and vaccination of hepatitis B. Education level, gravidity, residence, and income were found to be associated with the knowledge and attitude of pregnant women. It stresses the importance of strengthening health education in antenatal care to create more awareness and practice preventive measures. Healthcare providers should primarily embark on effective counseling and screening services to fill the existing knowledge gaps. Furthermore, the study emphasizes the need for policy-level interventions to include routine HBV screening and vaccination efforts, especially in the areas that are most neglected. Future research needs to investigate the barriers to hepatitis B prevention and the role of sociocultural beliefs in influencing health behavior. Providing solutions in these areas will go a long way toward improving maternal and neonatal health.

## Recommendations

Strengthening Health Education and Social Behavior Change (SBC) Campaigns:



- Design and implement targeted SBC campaigns aimed at educating pregnant women about HBV transmission, prevention, and the importance of vaccination.
- Employ multiple channels of communication to reach a broader audience, particularly through radio, television, social media, and community outreach programs in rural areas.
- Address common misconceptions related to HBV, for instance, the assumption that HBV comes from bats, through culturally tailored messages.

**Training Healthcare Providers:** Regular training programs for healthcare providers on prevention, screening, and counseling of patients regarding HBV. Train health workers in culturally sensitive communication to help dispel misconceptions and promote vaccines.

**Enhancing Policy and Research Initiatives:** Policymakers should thus highlight the necessity of policies for the prevention of HBV, which includes compulsory screening and improvement in vaccination coverage.

**Directions for Future Research:** Understanding the reasons for poor acceptance and uptake of HBV screening and vaccination using qualitative approaches.

## Data availability

The datasets used and/or analyzed in this study are available from the corresponding author on reason.

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### Author contributions

A.B. and M.A. Conceptualization, methodology, and writing—original draft. S.B. A.S. and F.E. formal analysis and visualization. M.A. and F.T. Data curation, Supervision, and writing—review & editing. A.A. and M.A. Methodology, Formal Analysis, and Writing: Original Draft All the authors have read and approved the final manuscript.

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### Declarations

### Competing interests

The authors declare no competing interests.

### Consent for publication

Not applicable.

### Additional information

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