

Probability of HBsAg Among Village Midwives in Khartoum State, Sudan, 2014

Taha Ahmed Elmukashfi Elsheikh^{1,*}, Yosra Mohammed Osman Abu Swait², Siham Ahmed Balla¹, Abdelgadir Ali Bashir², Asma Abdelaal Abdalla¹

¹Department of Community Medicine, Faculty of Medicine, University of Khartoum, Khartoum, Sudan

²Khartoum State Ministry of Health, Khartoum, Sudan

Email address:

tahamukashfi@hotmail.com (T. A. E. Elsheikh), tahamukashfi@uofk.edu (T. A. E. Elsheikh)

*Corresponding author

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Abstract: The risk of catching HBV infection varies between and in-between health institutions as well as at geographical areas for general population. An observational study was performed in order to determine the conditional probabilities of the prevalence of HBsAg among Village Midwives in Khartoum State, Sudan, 2014. Through one stage stratified, systematic random sampling three hundred and thirty five village midwives out of 1848 were selected. A close end questionnaire for demographic data was used. Using Eliza, blood was tested; sera of all participants were examined for Anti-HBcore (IgG and IgM). Positive specimens for Anti-HBcore and HBsAg were examined for HBsAg and HBeAg respectively. Statistical package of social sciences (SPSS) version (16) and Chi-square test were used. $P \leq 0.05$ was considered statistically significant. Probability was calculated manually using Bayesian analysis method. Participants were divided into three main age groups: (i) Age group less than 30 years (4.6%). (ii) Age group (30-49) represented by 65.8%. (iii) Age group more than 50 years (29.5%). For education (0.9%) university graduate, (9.8%) secondary certificate, (14.2%) intermediate, (50.2%) primary, (1.9%) Quranic School and (23%) were illiterate. About (61.8%) were married, (16.4%) widow, (11.3%) divorced and (4.8%) un-married. Thirty four percent of them were positive for Anti-HBcore (IgG) indicating past or on going infection. Out of these fifty seven percent were HBsAg positive. HBeAg and Anti-HBcore (IgM) were negative. The maximum conditional probabilities of positive HBsAg in relation to age, educational level, marital status, and duration of work was found to be: (0.576), (0.524), (0.676), and (0.633) respectively. While the overall conditional probability in relation to these factors was: (0.576), (0.451), (0.14), and (0.633). Conditional probabilities of positive HBsAg among village midwives in Khartoum State, Sudan, were high. Village midwives with duration of work for 1-2 years and age above 50 years have got high probability of positive HBsAg. Screening and vaccination of village midwives are recommended.

Keywords: Conditional Probability, HBsAg, Village Midwives, Khartoum State, Sudan

1. Introduction

1.1. Background Information

Internationally, HBV is at the top of other diseases regarding morbidity and mortality [1]. HBV is highly infectious. It is 50 – 100 times more infectious than HIV [2]. Healthcare providers are high risk groups for acquiring HBV infection in their institutions [3 - 5]. There is geographical

and institutional variation for HBV infection. Anti-HBcore is 79.1% in Western Brazilian Amazon [6]. Anti-HBcore (22.2%) and HBsAg (11%) are reported in Southern Iran [7]. In Bangkok, HBeAg, reflecting high infectivity rate, is 20% [8]. In sub-Saharan Africa, there are high numbers of HBV markers; above 60% for Anti-HBcore (indicating past or ongoing infection) and 8% for HBsAg (reflecting carrier rate) [9]. In Ethiopia, Nigeria and Tanzania, a carrier rate of 7%-40% is reported. Burundi, Central African Republic and

Uganda reported a range of a carrier rate (HBsAg) between 10% - 15% [10-14]. In Sudan, a carrier rate of 6% is reported among HCWs [15]. There is a significant correlation between occupational hazards and infection and carrier rates among HCWs in Public Hospitals in Khartoum State, Sudan [16]. Among general population in Gezira State, Central Sudan, the prevalence of infection (positive Anti-HBcore) and carrier (positive HBsAg) is 47.5% and 6.9% respectively [17-20]. HBV is highly endemic in Sudan, where it is ranked as the second cause of acute liver failure and the main cause of hepatocellular carcinoma [21]. Among health care providers in White Nile State, Sudan, there is a high prevalence and conditional probabilities of HBV markers. There is statistical association between carrier and highly infectivity rate of HBV and departments of Obstetrics & gynaecology, surgery, Laboratory technicians and HCWs with working duration up to 5 years [22, 23]

1.2. Objective

To determine the conditional probabilities of prevalence of HBsAg among Village Midwives, in Khartoum State, Sudan, 2014.

2. Materials and Methods

2.1. Study Design

It is an observational survey.

2.2. Study Area

The study was conducted in Khartoum State, Sudan; which composed of seven localities (Bahri, Sharg-Anil, Khartoum, Jabal awlia, Omdurman, Ombeda, and Karari).

2.3. Study Population

They are 1848 village midwives that trained to provide care and advice during pregnancy, delivery and postpartum period and distributed in the seven localities of Khartoum State, Sudan, 2013.

2.4. Sample Frame

It includes all village midwives that responsible for provision of care and advice during pregnancy, delivery and postpartum period in Khartoum State, Sudan.

2.5. Sampling Technique

One stratified, systematic random sampling

2.6. Sample Size

It was calculated using the formula:

$$n = \frac{N}{(N-1)d^2+1} = \frac{1848}{1847 \times 0.0025+1} = 329 \tag{1}$$

n = sample size

N = Total number of VMWs in Khartoum State, Sudan

d = 5% = 0.05 desired margin of error

NRR = Non-response rate = 1.8%

So, n = 329+6 = 335

Depending on the number of village midwives, the sample was distributed among the different state localities as shown in Table 1 below:

Table 1. Distribution of the Sample Size of village midwives among Khartoum State Localities, Sudan, 2014. (n=335).

Locality	No. of VMW	Sample Size
BAHRI	217 (11.6%)	39
SHARG-ANIL	480 (26.0%)	87
KHARTUOM	68 (3.9%)	13
JABAL AWLIA	293 (15.8%)	53
OMDURMAN	165 (9.0%)	30
OMBEDA	390 (21.2%)	71
KARARY	235 (12.5%)	42
TOTAL	1848 (100%)	335

2.7. Data Collection

- Study variables are:
 - A. Independent variables: 1. Age. 2. Level of education. 3. Marital status. 4. Duration of work.
 - B. Depandant variables: 1. Anti-HBcore (IgG). 2. Anti-HBcore (IgM). 3. HBsAg. 4. HBeAg.
- Tools of data collection: Questionnaire for demographic factors and blood sample for determination of HBV markers.

2.8. Data Analysis

Eliza was used. Sera of all participants were examined for Anti-HBcore (IgG and IgM). Positive specimens for Anti-HBcore and HBsAg were examined for HBsAg and HBeAg respectively. Statistical package of social sciences (SPSS) version (16) and Chi-square test were used. P value equal or less than 0.05 was considered statistically significant. Probability was calculated manually using Bayesian analysis formula below:

$$\Pr(A_i / B_j) = \Pr\left(\frac{A_i \cap B_j}{B_j}\right) = \Pr(A_i) * \frac{\Pr(B_j / A_i)}{\Pr(B_j)} \tag{2}$$

Application of Bayesian Analysis:-

Bayesian analysis was used for prediction, where the prior probability of the rate of HBV infection, carrier was calculated manually, given additional information about the village midwives in Khartoum State, Sudan. For medical and policy purposes, Bayesian analysis is usually used to infer and predict these rates, so that policy makers can react accordingly.

3. Ethical Consideration

Ethical approval was processed by Sudan Medical Specialization Board and Khartoum State Ministry of Health. Finally written consent from participants was taken.

4. Results

Three hundred and thirty five female village midwives participated in this study. Regarding locality distribution of the sample, (11.6%) in Bahri, (26.0%) in Sharg-Anil, (3.9%) in Khartoum, (15.8%) in Jabal awlia, (9.0%) in Omdurman, (21.2%) in Ombeda, and (12.5%) in Karari. The participants divided into three main age groups: (i) Age group less than 30 years (4.6%). (ii) Age group (30-49) represented by

65.8%. (iii) Age group more than 50 years (29.5%). For education: university graduate (0.9%), secondary certificate (9.8%), intermediate (14.2%), primary (50.2%), Quranic School (1.9%) and illiterate (23%). About (61.8%) were married, (16.4%) widow, (11.3%) divorced and (4.8%) unmarried. Thirty four percent (113) of them were positive Anti-HBcore (IgG) indicating past or on going infection. Out of these fifty seven percent (57) were HBsAg positive. HBeAg and Anti-HBcore (IgM) were negative.

Table 2. Probability of HBsAg among village midwife characteristics, given that a village midwife is positive for Anti-HB core (IgG), in Khartoum State, Sudan; 2014.

Village midwife characteristics	+ve Anti-HB core (IgG) (n=113) Pr(B_j)	Joint Probability. $A_i \cap B_j$	Conditional Probability. Pr(A_i / B_j)	P-Value	
Age	< 30 years	0.533	0.211	0.396	0.026
	30-49	0.341	0.139	0.408	0.001
	> 50 years	0.302	0.174	0.576	0.001
	Missing	0.300	0.112	0.373	0.3
	TOTAL	0.337	0.034	0.101	0.001
Education	Postgraduate	1.00	0.337	0.337	
	University	0.00	0.000	0.000	
	Secondary	0.355	0.153	0.431	0.003
	Intermediate	0.378	0.198	0.524	0.001
	Primary	0.302	0.126	0.417	0.001
	Quranic School	0.000	0.000	0.000	
	Illiterate	0.37	0.175	0.473	0.001
	Missing	0.50	0.150	0.300	0.082
	TOTAL	0.337	0.152	0.451	0.001
	Marital status	Married	0.343	0.143	0.417
Single		0.250	0.169	0.676	0.05
Widow		0.345	0.177	0.513	.001
Divorce		0.316	0.169	0.535	0.001
Missing		0.368	0.145	0.394	0.036
TOTAL		0.337	0.140	0.415	0.001
Duration of work	< 1 year	0.333	0.000	0.000	
	1-2 years	0.267	0.169	0.633	0.057
	2- 5 years	0.462	0.169	0.366	0.07
	5 - 10 years	0.455	0.090	0.198	0.033
	10 – 20 years	0.287	0.174	0.606	0.001
	> 20 years	0.290	0.135	0.466	0.001
TOTAL	0.337	0.152	0.451	0.001	

4.1. Age Factor

The highest conditional probability (0.576; P-value = 0.001) for a village midwife to be HBsAg positive (carrier), given that she is Anti-HBcore positive (infected) was reported among the age group above 50 years. The overall conditional probability for a village midwife to be HBsAg positive (carrier), given that she is Anti-HBcore positive (infected) was 0.576; (P-value = 0.001). [Table 2].

4.2. Education Level Factor

Considering the different levels of education, the maximum conditional probability (0.524; P-value = 0.001) for a village midwife in Khartoum State, Sudan, to be a carrier (positive HBsAg) given that she an infected (positive Anti-HBcore), was found among the intermediate school graduates, while the minimum conditional probability (0.000) was reported among university and Quranic school graduates. The overall conditional probability of a village midwife to be a carrier (+ve HBsAg) given that she is infected (+ve Anti-HBcore), in relation to education, equals 0.451; (P-value =

0.001). [Table 2].

4.3. Marital Status Factor

For marital status, the maximum conditional probability (0.676) for a village midwife in Khartoum State, Sudan, to be a carrier (positive HBsAg) given that she is infected (positive Anti-HBcore) was reported among unmarried (single) group. P-value = 0.05. The overall conditional probability for a village midwife, with regard to marital status, to be HBsAg positive (carrier), given that she is Anti-HBcore positive (infected) was 0.14; (P-value = 0.001). [Table 2].

4.4. Duration of Work Factor

Regarding duration of work and the probability for the village midwife to be a carrier (positive HBsAg) given that she is infected (positive Anti-HBcore), the maximum score (0.633; P-value =.05) was reported among those who worked for 1-2 years, followed by 10-20 years a probability of (0.606; P-value = 0.001). The overall conditional probability for a village midwife, with regard to duration of work, to be HBsAg positive (carrier), given that she is Anti-HBcore

positive (infected) was 0.451; (P-value = 0.001). [Table 2].

5. Discussion

Three hundred thirty five village midwives in Khartoum State, Sudan, were investigated for HBV markers. One hundred and thirteen (34%) were found to be positive for Anti-HBcore (IgG), reflecting the infection rate among them. Probability of HBV carrier rate (positive HBsAg) among village midwives, given that she is infected (positive Anti-HBcore) was studied using Bayesian analysis method. The rate of HBV infection (positive Anti-HBcore) reported in this study (34%) is less than that among general population in Western Brazilian Amazon (79.1%) and sub-Saharan Africa (60%) [6, 9]. This may be due to that our study population is selective, i.e. special group. But it is higher than that in Southern Iran (22.2%) [7]. Looking at national studies in Sudan, infection rate is high among HCWs in White Nile State in Sudan, where it is mounted to 60% [24]. The possible explanation is that the rate of exposure of HCWs in these hospitals to HBV infection is higher than that of our study population. The maximum conditional probabilities in relation to age, educational level, marital status, and duration of work was found to be: (0.576), (0.524), (0.676), and (0.633) respectively. While the overall conditional probability in relation to these factors was: (0.576), (0.451), (0.14), and (0.633). Regarding age factor, the highest conditional probability for carrier rate (0.576) was reported among the age group above 50 years. HBV is highly endemic in Sudan. So, when the candidate contracted this infection early in life the chronic level may be more than 90%, i.e. high level of carrier rate. [21]. For education, the maximum conditional probability was related to intermediate graduate; while the minimal value was among university together with Quranic School graduates. This may be because the graduates of university were more aware than others, while the behaviour of Quranic School graduates is guarded by the Islamic religious regulations. About the marital status, the maximum conditional probability for a village midwife in Khartoum State, Sudan, to be a carrier (positive HBsAg) given that she is infected (positive Anti-HBcore) was reported among unmarried (single) group. This is consistent with studies done in Nigeria that showed high rates of HBsAg among illiterate, unmarried pregnant women attending ante natal care, and among HCWs in White Nile State, Sudan. [22, 25]. Regarding duration of work and the probability for the village midwife to be a carrier (positive HBsAg) given that she is infected (positive Anti-HBcore), the maximum score was reported among those who worked for 1-2 years, followed by 10-20 years. This finding is similar to a study done among HCWs in White Nile State, Sudan. [22].

6. Conclusion and Recommendations

Conditional probabilities of HBV carrier rate among village midwives in Khartoum State were high. Village midwives with duration of work for 1-2 years and age above

50 years have got high carrier rate. Screening and vaccination of village midwives are highly recommended.

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