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Socioeconomic impact of chronic hepatitis-B virus and HIV co-infection among young adult female pregnancy in Rwanda (CSS)

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Abstract

Background: *Worldwide, Hepatitis-B virus and HIV count for 370 million and 40 million infections respectively. 2-4 million people infected with HIV are estimated to have chronic Hepatitis-B co infection.*

Purpose: *The study aimed at providing socioeconomic impact of chronic Hepatitis-B virus and HIV co-infection among young adult female pregnancy in Rwanda by using cross sectional study.*

Methods: *Hepatitis-B surveillance through antibody screening test among pregnant women attending antenatal clinics were performed in 30 HIV sentinel surveillance district in Rwanda. Some literature published from 2000 to 2021 focusing on low- and middle-income countries. Search engines used was Google Scholar and Research-Gate which was also available for this study.*

Results: *Among 12,829 pregnant women tested at antenatal clinics, 335 (2.6% [95% Confidence Interval 2.32–2.87]) tested positive for Hepatitis-B Anti-bodies. The prevalence of Hepatitis-B Ab in women aged 25–49 years was 2.8% compared to 2.4% in women aged 15–24 years (aOR = 1.3; [1.05–1.59]); Hepatitis-B Virus infection in non-salaried employment proportion was 2.7% [2.37–2.94] in pregnant women in engaged in compared to Pregnancy woman HB infection proportion with 1.2% [0.24–2.14] in those engaged in salaried employment (aOR = 3.2; [1.60–6.58]). The proportion of Hepatitis-B Ab-positive co-infected with HIV was estimated at 3.9% (13 cases). Women in urban residence were more likely to be associated with Hepatitis-B-infection (OR = 1.3; 95%CI [1.0–1.6]) compared to those living in rural site.*

Conclusion: *Hepatitis-B and HIV co-infection still remain public health issues with concern on pregnant women in Rwanda urbanization. Few pregnant young women were co-infected with Hepatitis-B and HIV in the sub-urban. There might be an association with young female adult pregnancy women living in the urban with Hepatitis-B and HIV Co-infection.*

Recommendation: *This study recommend health system strengthen and awareness on preventive measures among young adult female living in urban site on the prevalence of HIV or Hepatitis-B virus infectious.*

Keywords*: HIV, Hepatitis-B, Pregnant female, Rwanda.*

Introduction

Hepatitis-B virus infection is a life-threatening problem. Hepatitis-B virus can be transmitted from one person to another through contacts of body fluids. People at risk of getting this infection are those with health professionals, intravenous drug users, sex workers. Since the introduction of several protective measures and extended understanding of the virus and introduction of the vaccine, the virus epidemiology has been decreasing gradually. However, Hepatitis-B virus chronic infection remains a global public health concern. More than 350 million people worldwide are chronically infected by Hepatitis-B virus and are at risk of developing hepatic decompensation, hepatic cirrhosis and hepatocellular carcinoma (Liaw YF, Chu CM. , 2009). In Rwanda, Hepatitis-B virus prevalence is currently 3.9%. different age groups have deferent prevalence, the highest prevalence is found in people aged from 35 to 44 and is 4.2%. Several factors are proven to be associated with increased infection of Hepatitis-B, single male with history of surgical operation, exposure to traditional practices, and having a family relative infected by Hepatitis-B virus (Makuza JD, Rwema JOT, Ntihabose CK, Dushimiyimana D, Umutesi J, Nisingizwe MP, et al. , 2019). HIV prevalence is currently 3% among general population despite several control measures (Mutagoma M, Nyirazinyoye L, Sebuhoro D, Riedel DJ, Ntaganira J. , 2017). Poor controlled HIV infection lead to immunosuppression and the AIDS. The immunosuppression effect of HIV makes patients vulnerable to get many diseases, this bring social

discrimination and much more financial burden to the family that cares the patient. In a study done to assess socio economic effect of HIV on African countries found drop in agricultural production, families and communities break apart and making the future of young children insure (Isaksen J, Songstad NG, Spissøy A. , 2002). The co infection of both viruses (Hepatitis-B virus and HIV) causes more severe infection that is difficult to be managed. The co infection also carries social and financial burden of both diseases causing more mortality and morbidity than each virus alone. This literature review focus much more on Hepatits B and HIV virus co infection among Rwandan pregnant female, assessing its socioeconomic impact.

Problem statement

Worldwide, Hepatitis-B virus and HIV count for 370 million and 40 million infections respectively. 2-4 million people infected with HIV are estimated to have chronic Hepatitis-B co-infection. Hepatitis-B virus infection is the leading cause of chronic liver disease and is more prevalent in countries with high burden of HIV infection, leading to HIV/HBV co infection. This leads to increased liver related morbidity and mortality, severe immunosuppression complicating management. Hepatitis- B virus is easily vertically transmitted from mother to child during delivery hence raising more financial burden to the family to care the child who is born with Hepatitis-B virus infection.

This research brings the contribution to the socioeconomic impact of chronic Hepatitis-B virus and HIV co infection among adult pregnant females in Rwanda

General objective

Overall objective of this research paper is to assess the socioeconomic impact of chronic Hepatitis-B virus and HIV co-infection among young adult female pregnancy in Rwanda by using cross sectional study.

Research questions

- What is the epidemiology of Hepatitis-B virus, HIV and their co infection in Rwandan pregnant mother?
- What is Hepatitis-B virus and HIV co infection social impact among adult pregnant?
- What is the socioeconomic burden due to HIV and Hepatitis-B virus co infection in Rwanda?

Relevant Literatures

A literature review of relevant published articles was done. Google scholar, Pub med and Research gate search engines were used to find relevant papers published from 2000 to 2021.

Methodology

Introduction

This chapter indicates various methods and techniques used by the researcher during gathering relevant information from the field. It also describes methods and techniques used i.e., Research design, target population, sample design, data collection procedures and data analysis.

Research design

According to (Creswell, 2003), a research design is a careful systematic study or investigation in some field of knowledge, undertaken to establish some facts or principle. It is also an entire process of studying the problem formulation through dissemination of findings. In my case, this research will be descriptive research design conducted from National institute of statistics of Rwanda. It provided quantitative and qualitative data from the questions that were asked and analysis of possible documents which were available.

Study population and sample size

The target population of the study was 12,829 respondents, according to (Robert V. Krejcei, Daryle W. Morgan,, 1970), they recommend that, if a researcher has a target population of 12,829, the sample size for the study is 12,829.

Nature of Data

According to (Vernon T. Clover, Balsley L Howard, , 1974), a source is one of the materials the researcher uses for collecting information during the investigation. In conducting the research study, the required data were gathered from both primary data and secondary data sources.

Primary data

According to (Cochran W. G., 1963.), primary data is the information originated by the researcher for the purpose of the investigation at hand. He continues to say that primary data are those data collected to solve specific problems under study. He also postulated that primary source of data come straight from people, or the researcher's works you are researching on, and hence direct information one can collect. Thus, primary sources are first-hand information gathered for the purpose of investigation. Simply, primary data are data that the researcher gathered directly from the field.

Secondary data

According to (Cochran W. G., 1963.), secondary data is defined as the information not gathered for the immediate study at hand but for some other purpose. Moreover, (DK, 1978), contended that secondary data is the information that has been gathered and only might be relevant to the problem at hand. This type of data is somewhere defined as the data already existing in boxes in some organizations basement or stored in the core of computers. Secondary data are the one that already and that the researcher can use to

help her understand better the subject under study or improve her knowledge. In this respect, secondary data were taken from various sources especially textbooks, magazines, internet source and other documents that were deemed necessary.

Research Instruments

While collecting data, both primary and secondary data were used. Therefore, interview, questionnaire, and document analysis techniques were used depending on the nature of the data.

Structured Questionnaire

According to (Cochran J. , 1996), who describes questionnaire as a document containing all respondents' answers or reaction. It is indeed, an instrument meant to register and keep or store collected data. According to Bailey (1978), a questionnaire is also defined as a set of questions handed to the respondents and filled in by them with no help of the interviewer. Questionnaires were used to collect the required data from respondents. The questionnaires were considered as most appropriate technique to collect information.

Interview guide

According to Bailey (1978), an interview is a special case of social interaction between two persons. Interviews were conducted where necessary to obtain relevant required data. With this technique,

This technique involved exchange of ideas between the interviewer (researcher) and the interviewees. The information obtained supplemented the information obtained through interview in operations and finance departments. Qualitative data will be collected from the informants using interviews

Validity and reliability

The data a collection tools shall be pre-tested on a smaller number of respondents from each category of the population to ensure that the questions are accurate clear and in line with each objective of the study.

Validity

It is the degree to which results obtained from the analysis of the data represents the phenomenon understudy, (Mugenda, OM. Mugenda, AG, 2003). To ensure validity of instrument close guidance of the supervisor will be adopted. This will help to identify ambiguous questions in the interval and be able to re-align them to the objectives.

According to (Yamane, 1967) and (Sekaran, 2003), defined validity as the appropriateness meaningfulness and usefulness of the inferences a researcher makes.

Validity has to do with instrument and is the most important idea to consider when preparing or selecting an instrument for use, data findings and explanations in research.

Reliability

Test-retest method of determine the reliability will be carried out at another school with similar characteristic to avoid information bias. This method involves giving the same test to the same respondents on two separate occasions. The scores on the two occasions are the correlated. This correlation is known as the coefficient of stability. The closer each respondent's scores are on T1 and T2, the more reliable the test measure (and the higher the coefficient of stability). A coefficient of stability of one (1) indicates that each respondent's scores are perfectly correlated. That is, each respondent scores the exact same thing on T1 as they did on T2. A coefficient correlation of zero (0) indicates that the respondent's score at T1 were completely unrelated to their scores at T2; therefore, the test is not reliable (Oladunni, 1996). One-week duration will be allowed between the first test T1 and the second T2 and the coefficient of stability will be obtained.

Data processing

Usually, data collected from respondents is in a raw form, which is not easy to process and analyse to make conclusions. So, there is a need to process it before proper analysis can be made.

Coding

According to (Sekaran, 2003), the purpose of coding surveys is to classify the answers to questions in meaningful categories to bring out their essential pattern. Coding consists of two steps. In this regard, first the coding frame is

developed. Second, the answers of respondents are coded (classified) according to the categories of the coding frame.

Coding refers to, assigning a symbol or a number to response for identification purposes. The purpose of coding in research was put forward by Clover & Howard, (1974) who argued that it is to classify the answers to question into meaningful categories so as to bring out their essential pattern. This was used to summarize data by classifying the different responses given into categories for easy interpretation.

Editing

According to Cochran (1996), editing of data collected aims at improving the quality of information from respondents. In Cochran's view (1996), editing is the process whereby the completed questionnaires and interview schedules are analysed in the hope of amending recorded errors, or at least of deleting data that are obviously erroneous. In other words, editing is a process of re-evaluation and collection of errors either by judgment or fact. It also involves correction of spellings, punctuation or capitalization. After collection of questionnaires from the respondents, it was the time for editing that is collecting and editing errors and mistakes.

Tabular presentation

According to (Yamane, 1967), tabulation refers to the orderly arrangement of data in a table or other summary format achieved by counting the frequency of responses to each question. Bailey (1978) also said that tabulation is putting

data into statistical tables showing the number of occurrence of responses to questions.

Data analysis

The study used both quantitative and qualitative data. After the data were collected, they were organized, edited, and coded; quantitative data were entered into Statistical Package for Social Science (SPSS) and excel. HCV prevalence, HCV-HIV co-infection proportions and 95% confidence limits were estimated separately by levels of socio-demographic factors. Bivariate logistic regression analysis was used to test for associations between screened HCV infection and potential risk factors. The multivariate analysis was performed to determine factors that were associated with HCV infection in the bivariate analysis at the ≤0.1 significance level to develop the final multi-variable model using a backward elimination method

Ethical considerations and Confidentiality

Data respondent identity will be kept confidential; data collection records will be kept as soft copy in a secured password protected computer and hard copies will be stored in a secured place.

Results and discussion

This section provides the empirical results and as well as their interpretations.

Table 1 Hepatitis-B virus and HIV co-infection among pregnant women attending ante-natal clinics in Rwanda, 2021.

Characteristics	Total	Hepatitis B prevalence			HIV co-infection proportion among HBV Ab- positive		
	N	n	%	[95% C.I]	n	%	[95% C.I]
Age group	**12,829**				1		
15–24	4,669	109	2.3	[1.91–2.77]	12	0.9	[-0.78–2.38]
25–49 yrs	8,160	226	2.8	[2.41–3.13]		5.3	[1.76–6.19]
Marital status	**12,829**				1		
Single	1,438	35	2.4	[1.64–3.23]	11	2.9	[-1.94–5.78]
Married/Cohabiting	11,166	291	2.7	[2.32–2.92]	1	3.8	[1.30–4.94]
Divorced/Separated/Widow	225	8	3.9	[1.22–6.51]		12.5	[-5.47–15.47]
Education	**12,829**				12		
Illiterate/Primary	11,319	305	2.7	[2.40–2.99]	1	3.9	[1.40–4.99]
Secondary/University	1,510	26	1.8	[1.96–2.45]		3.8	[-2.25–6.55]
Employment	**12,829**				1		
Salaried	561	6	1.2	[0.24–2.14]	12	16.7	[-26.18–59.60]
Non-salaried	12,268	326	2.7	[2.37–2.94]		3.7	[1.27–4.49]
Residence	**12,829**				4		
Rural	6,416	151	2.4	[1.98–2.73]	9	2.6	[0.77–6.76]
Urban	6,413	184	2.8	[2.43–3.25]		4.9	[1.17–4.75]
Number of Pregnancies	**12,829**				0		
1 Pregnancya	3,886	100	2.6	[2.75–3.72]	8	0	
2-3 pregnancies	4,944	130	2.6	[2.18–3.76]	4	6.2	[1.25–6.67]
4-5 pregnancies	2,384	61	2.6	[1.92–3.19]	1	6.6	[0.84–7.26]
> = 6 pregnancies	1,356	38	2.8	[1.92–3.68]		2.6	[-3.62–1.51]
HIV status	**12,829**				-		
Negative	12,400	322	2.6	[2.36–2.86]	13	-	-
Positive	429	13	3	[1.42–4.66]		100	
Source:Researcher,2021							

The 12,829 pregnant women enrolled in the survey, 63.8% were 25 years old and above, 87.2% were married or cohabitating and 88.6% were illiterate. By source of income, 96.1% were not salaried. A proportion of 39.5% of women were at their 2–3 parity, 30.7% were at their first parity. Among all pregnant women, 12,903 (97.1%) were screened for Hepatitis-B Ab, 335 (2.6%) [95%CI: 2.3–2.9] were identified Hepatitis-B Ab-positive.

The prevalence of hepatitis-b-screened positive was 2.4% [95% CI: 1.6–3.2] among single pregnant women, 2.7% [95% CI: 2.3–2.9] among married pregnant women, and 3.9% [95% CI: 1.2–6.5] among separated, divorced or widowed pregnant women. The prevalence of Hepatitis-B-screened positive was higher in pregnant women with low education level (illiterate and primary education level) compared to those with high education level (secondary and university education level): 2.7% [95% CI: 2.4–3.0] for illiterate pregnant women or pregnant women with primary education level vs. 1.8% [95%CI: 2.0–2.4 with secondary or university level]. Prevalence of Hepatitis-B-screened positive was higher among pregnant women in unsalaried employment compared to pregnant women in salaried employment with 2.7% [95%CI: 2.4–3.0] and 1.2% [95%CI: 0.2–2.1] respectively.

HIV infection among Hepatitis-B Ab positive was analysed. Out of 335 screened Hepatitis-B Ab-positive, 13 women were co-infected with HIV. The proportion of HIV infection among Hepatitis-B-infected women was estimated at 3.9% [95% CI: 1.4–4.7]. This co-infection among Hepatitis-B infected women varied in the different socio-demographic characteristics of pregnant women attending ANC (Table 1).Education level, employment and residence were considered in determining factors associated with Hepatitis-B infection (Table 2). In multivariate analysis, there is evidence that Hepatitis-B among pregnant women was associated with urban residence with aOR = 1.3 [95% CI: 1.0–1.6].

Table 2 Hepatitis-B Virus infection associated factors among pregnant women attending ante-natal clinics in Rwanda, 2021

	Bivariate			Multivariable		
	cOR	P-value	[95% CI]	aOR	p-value	[95% CI]
Age group						
15–24 years						
25–49 years	1.19	0.14	[0.95,1.50]			
Education						
Illiterate/primary						
Secondary/University	0.65	0.04	[0.43,0.98]	0.69	0.1	[0.45,1.07]
Marital status						
Single						
Married/cohabiting	1.07	0.7	[0.75,1.53]	-		
Divorced/Separated/Widow	1.61	0.23	[0.74,3.52]	-		
Employment						
Salaried						
Non-salaried		0.04	[1.00,5.12]	1.87	0.15	[0.80,4.40]
Residence						
Rural						
Urban	1.21	0.09	[0.97,1.51]	1.28	0.03	[1.02,1.60]
Pregnancies						
1 Pregnancy						
2-3 pregnancies	1.02	0.87	[0.79,1.33]			
4-5 Pregnancies	0.99	0.97	[0.72,1.37]			
> = 6 Pregnancies	1.09	0.65	[0.75,1.59]			
HIV status						
Negative						
Positive	1.18	0.57	[0.67,2.07]			

All attendees to ANC services participated in the study and all consented for Hepatitis-B testing. The overall prevalence of Hepatitis-B Ab screened positive among pregnant women in sentinel sites in Rwanda was estimated at 2.6%. Due to insufficient blood sample, 2.9% of participants were not tested for Hepatitis-B. Pregnant women aged between 25 and 49 years were more likely to be infected with Hepatitis-B than younger pregnant women (15–24 years old). The proportion of HIV-positive among Hepatitis-B Ab-positive pregnant women in ANC sentinel surveillance sites was (3.9%).

The Hepatitis-B prevalence among pregnant women in sentinel sites in Rwanda was similar to the overall Hepatitis-B prevalence in sub-Sahara African countries (3.0%) and the prevalence of Hepatitis-B in Central African region (2.0%)

Conclusions

HIV and Hepatitis-B virus co infection among adult pregnant female is a public health concern in Rwanda. It is likely be found in female with multiple pregnancies or multiple partners. It has both negative social and economic effects to individuals, families and the country generally.

Education activities among communities to improve their knowledge about transmission and preventions is recommend to reduce stigma and traumatic events infected female can face. Antenatal screening among pregnant female can significantly help to prevent mother to child transmission during birth and can help the government in securing funds that could otherwise be used to take care of infected children and female.

Epidemiology of HIV/Hepatitis-B virus co infection among adult pregnant women in Rwanda.

Not much is known about Hepatitis-B virus and HIV co infection among pregnant female. According to Mutagoma *et al.* (2017), Hepatitis-B virus prevalence in pregnant female is somehow low compared to its prevalence in general population; 3.7 % and 3.9% respectively (Mutagoma M, Balisanga H, Malamba SS, Sebuhoro D, Remera E, Riedel DJ, et al. , 2017). Surprisingly, women in urban areas tend to have more prevalence of HIV and Hepatitis-B virus co infection. This may be linked to increased sexual activities in urban cities compared to rural areas. Prevalence of HIV and Hepatitis-B virus co infection also tend to increase as the number of pregnancy increases. Female

with one child or who are pregnant for their first time are at low risk of being co infected with HIV and Hepatitis-B compared to female with more than one children or pregnancy. HIV and Hepatitis-B virus co infection was also found to be more associated with syphilis infection.

Social impact of Hepatitis-B virus and HIV co infection among adult pregnant women in Rwanda.

Social impact of Hepatitis-B virus and HIV co infection does not differ much from the social impact of each virus alone. They are both highly infective and life-threatening infections causing several social problems in people suffering from them and their communities in general.

Due to limited community knowledge about HIV and Hepatitis-B virus infections mainly about transmission ways, treatment options and vaccination lead to stigma among communities with infected people. HIV patients have complicated histories, such as traumatic event which may lead to mental illness. When mental illness come to be associated with HIV infection, patients are at risk of poor adherence and general low quality of life (Whetten K, Reif S, Whetten R, Murphy-Mcmillan LK. , 2008).

The socioeconomic burden of HIV and Hepatitis-B virus co infection among adult pregnant women in Rwanda.

On family level

Medical care or health services coverage is among primary cause of financial risks to Rwandan community as well as globally. Families with HIV or

Hepatitis-B infected patients are on the increased with financial risk. When the patient becomes co-infected by both virus, the outcomes tend to be worsen to both care seeker and care-giver, indicating much more spending to cover required medical bills (R, 1994).

When it comes to pregnant women, the family at large has a higher negative impact, it is required to cover medical bills for infected mother and infected child as Hepatitis-B is highly dismissible and a child can easily get it during birth.

Secondly, HIV and Hepatitis-B co infected people tend to develop severe liver disease ranging from decompensated liver failure to cirrhosis and hepatocellular carcinoma. As Hepatitis-B case become complicated, it increases treatment time, required resources with poor outcomes.

On country level

The country in charge of ensuring good health of its people, it also have face several negative economic impact due to HIV and Hepatitis-B co infection in pregnant women. A study by Mutagoma *et al.* (2017), declared HIV and Hepatitis-B virus co infection as a potential public health problem that needs a close attention. They also suggested a routine antenatal Hepatitis-B virus screening in all pregnant female to prevent maternal to child transmission. This significantly increase financial burden to the government as it has to set required staff and materialistic recourses to start screening all female during antenatal period. From the above data, we have shown clearly that HIV and

Hepatitis-B virus co-infection is a public health issues and Rwanda is not an exception. Therefore, stakeholders and policy makers should put in place required measures to advance hospitals healthcare services with well-equipped and competence staff to manage severe cases of chronic Hepatitis-B and its consequential impact on pregnant women. Moreover, resources should be allocated for fiscal and human capacity training both the medical personnel and installing all required equipment. Finally, we suggest that more epidemiological studies on the prevalence of Hepatitis-B and HIV co-infection among pregnancy women should be carry out at the district level to clearly ascertained and also compared data to inform decisions making across the 5 provinces of Rwanda.

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