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URBAN-RURAL COMPARISON OF GROUP B STREPTOCOCCUS INFECTION IN PREGNANCY AMONG ANTENATAL WOMEN IN CROSS RIVER STATE

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ABSTRACT: *Group B streptococcus (GBS) infection is a common cause of infection among the newborn in developing countries. Neonatal mortality is high in Nigeria due to preventable causes which include vertical transmission of Group B streptococcus (GBS) infection. The objective was to determine GBS anogenital infection among pregnant women in rural and urban settings in Cross River State and to compare GBS infection among pregnant HIV positive and negative women. The study was conducted at the antenatal care clinics of University of Calabar Teaching Hospital (UCTH), Calabar as the urban study site and Akamkpa General Hospital (AGH), Akamkpa as the rural site. Study populations were HIV negative and positive pregnant women that were in their third trimester between 35 to 37 weeks of pregnancy in both rural and urban areas. A total of 84 pregnant women were recruitment in each study sites and data were collected on socio-demographic and obstetric history, as well as laboratory samples for assessment of GBS colonization. Each subject recruited in the rural study site was matched with pregnant woman in the urban study site on socio-demographic characteristic which includes age, marital status, and parity. The Prevalence of GBS infection was 13.1% among the rural subjects compared to 8.3% in urban subject and the difference was not statistically significant (p=0.32). Among urban subjects, the prevalence of GBS infection among HIV positive subjects compared to HIV negative subjects were 9.5% and 7.1% respectively and the difference was not statistically significant (p=0.69). Among rural subjects, the prevalence of GBS infection among HIV positive subjects compared to HIV negative subjects (21.4 vs. 4.8%) was statistically significant (p=0.02). Anogenital colonization with GBS is slightly high among pregnant women in rural than urban area, although, it was not statistically significant. Preventive approach is a worthy measure through screening especially among high risk pregnancies in rural areas and follow-up treatment to prevent feto-maternal adverse effects.*

KEYWORDS: group B streptococcus, HIV, pregnancy

INTRODUCTION

Transmission of GBS is a leading cause of perinatal morbidity and mortality being responsible for meningitis, pneumonia and sepsis in neonates (Moyo SR, Modzori J, Tswana SA and Maeland JA, 2000). Maternal infection or ano-genital colonization with vertical transmission during delivery or premature rupture of foetal membranes is the commonest and most important risk factor for neonatal infection with GBS (Moyo SR, Modzori J, Tswana SA and Maeland JA, 2000). It has been noted that colonization can still occur even in women without obvious risk factors and this poses a very great deal of challenge in the identification of these women and this group can

transmit GBS infection to 25-30% of their neonates (Azam M, Allen NM, O'Donovan D and Moylett E, 2011). The global HIV burden which is unevenly distributed and commonly in Sub-Saharan Africa, harbors about 72% of the total HIV cases worldwide has been identified as a contributor to the increase in GBS infection (Harms G and Feldmeier H, 2005).

The prevalence of GBS vaginal colonization among pregnant women varies regionally and between different ethnic groups, ranging from 1.3% to 36.0% (Palazzi, DL, Rench MA et al, 2004). The prevalence of maternal GBS colonization also varies based on individual characteristics such as age, parity, socio-economic status, race, presence of sexually transmitted disease and sexual behavior (Perovic O, 1998; Quiroga M, Pegels E et al, 2008). Irrespective of HIV status, place of residence has been found to significantly contribute to risk of GBS colonization among pregnant women. A study in Poland, found two-thirds (33.6%) of pregnant women infected with GBS and a significantly higher prevalence in rural (42%) compared with urban (21%) subjects (Dybas I, Sidor-Wojtowicz A and Koziol-Montewka M, 2005). A study on rural-urban comparative among 300 urban and 100 rural pregnant women in Zimbabwe, found significantly higher prevalence of GBS colonization in rural (60%) compared with urban (46%) settings. Persistence of colonization was also found to be more prevalent in rural (48%) compared with urban (12%) settings (Mavenyengwa RT, Masunga P, Meque E et al, 2006). Even among HIV positive pregnant women, place of residence has been found to significantly influence the risk of GBS colonization. A facility-based survey of GBS, HIV and Hepatitis B virus (HBV) co-infection among 369 pregnant women in diverse rural, semi-urban and urban settings found significantly higher prevalence of GBS/HIV co-infection (9.2%), compared with GBS/HBV (0.5%), HIV/HBV (0.8%), and GBS/HIV/HBV (0.3%) co-infections (Mavenyengwa RT, Moyo SR and Nordbo SA, 2010). In that study, only co-infection with GBS/HIV was found to be significantly higher in semi-urban compared with rural and urban settings, with other forms of co-infection not seen to be influenced by place of residence.

Maternal and neonatal GBS colonization rates have been found to vary between countries and between different areas within the same country (Onwuezobe IA, Effiom RA, 2016; Onipede A, Adefusi O, Adeyemi A, 2012). Despite high clinical significance of GBS infection, limited data are available regarding the prevalence of GBS colonization in HIV-infected pregnant women in rural and urban areas in our locality. As a result of paucity of literature on GBS, most cases of neonatal sepsis presented in hospitals had primary clinical diagnosis focused on malaria, septicemia and meningitis of other commonly isolated pathogens with less possible implication of GBS infection and definitive management is usually delayed and morbidity increases. This condition markedly poses more management challenge to the health staff and increases the cost of healthcare delivery. Findings from studies conducted in other parts of Africa and South America, suggested possible association between maternal GBS infection and HIV infection [Joao EC, Gouvêa MI, Menezes JA, et al. 2011; Dangor Z, Kwatra G, Izu A, et al. 2015]. This raises the need for GBS surveillance among pregnant women living with HIV for early diagnosis, treatment and prevention of vertical transmission to their babies. There is also evidence that socio-demographic, obstetric, and immunologic factors which were not investigated in some studies may be important in determining the risk of GBS infection among pregnant women. These factors include social

class, rural-urban residence, gestational age, parity, and CD4 count levels [Joao EC, Gouvea MI, Menezes JA, et al. 2011]. Therefore, this work was designed to examine the rate of GBS in pregnancy in both rural and urban areas in relation to HIV status. It is hoped that the finding from this study will be used to improved policy formulation and contribute to the body of knowledge on epidemiology of GBS infection among pregnant women in rural and urban area in Nigeria towards improved policy formulation and implementation.

SUBJECTS AND METHODS

This was a cross-sectional study conducted at the antenatal care clinics of University of Calabar Teaching Hospital (UCTH) located in Calabar as the urban study site, and Akamkpa General Hospital (AGH) located in Akamkpa as the rural study site. The antenatal clinic in UCTH runs on each of the weekdays, except Wednesdays. Akamkpa General Hospital (AGH) is a secondary healthcare facility in rural settings of Akamkpa, as well as a referral centre to the surrounding Primary Health Centers. Unlike Calabar where most of the residents are civil servants, most of the residents in rural settings of Akamkpa are farmers and fishermen.

A total of 84 (42 HIV positive and 42 HIV negative) pregnant women from rural area were recruited to compare with 84 (42 HIV positive and 42 HIV negative) pregnant women in the urban area. The pregnant women were between 35 to 37 weeks of gestational age. The exclusion criteria were non-consenting pregnant women and patients that received any form of antibiotic therapy within two weeks prior to commencement of the study.

Ethical approval was obtained from the hospital before the commencement of the study. Eligible pregnant women that consented to participating were counseled on the objectives and benefits of the study, and available treatment options. Recruitment in both study sites was followed by data collection on socio-demographic and Obstetric history, as well as laboratory samples for assessment of GBS colonization.

In the rural study site (AGH), forty (42) HIV positive subjects and forty (42) HIV negative subjects were recruited into the study. Clients that already know their HIV status to be positive had their status confirmed by re-testing.

For each HIV positive subjects that was recruited in the rural study site, a socio-demographically similar HIV positive pregnant woman was recruited in the urban study site. Similarly, for each HIV negative pregnant woman that was recruited in the rural study site, a socio-demographically similar HIV negative pregnant woman was also recruited in the urban study site. Socio-demographic similarity is by age, marital status and parity.

Separate swabs samples were used to collect samples from the vagina and anus from each patient. Swabs specimens were transported to hospital laboratory using Amies transport medium for analysis. Data was analyzed using Software Package for Social Science (SPSS) version 20. Chi-

square tests were used to compare categorical variables. The results were presented in tables and graph. Alpha level of statistical significance was set at 0.05, with 95% confidence interval.

RESULT

One hundred and sixty-eight (168) subjects were surveyed from 1st march to 31st August, 2016, from equal proportion of four groups of urban and rural pregnant women with and without HIV infection. The prevalence of GBS infection was found to be about 11(13.1%) among the rural subjects compared to urban subjects 7(8.3%) as shown in figure 1. There was no statistically significant difference between the anogenital colonization of GBS among rural and urban subjects (p=0.32).

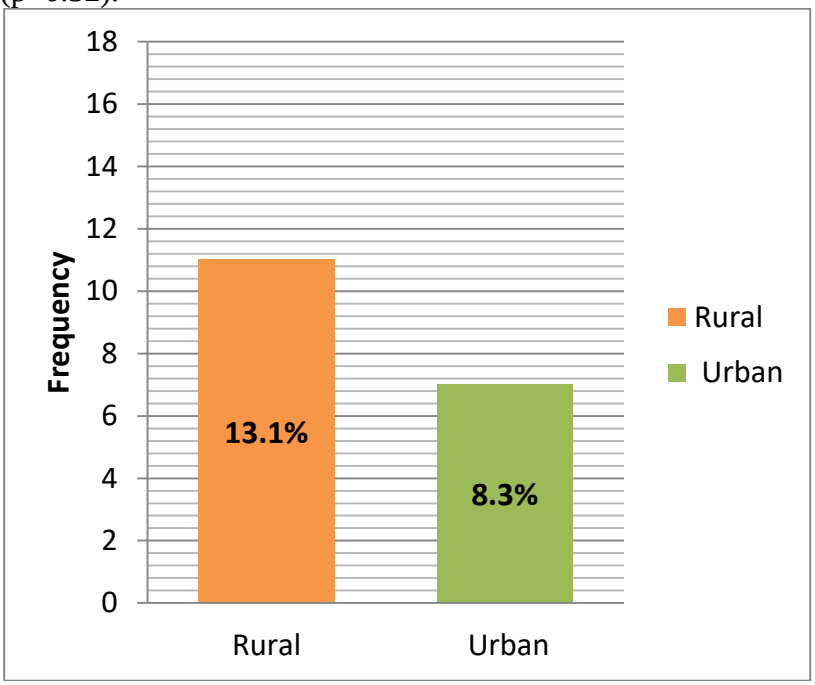

Figure 1: Bar chart showing prevalence of GBS infection by location

Majority of the participants in the urban area were 25-30 years age group, traders and with tertiary education, while most participant from rural area were farmers with secondary education (table 1). Farming was commoner among rural subjects (78.8 vs. 21.2%). Most subjects had at least secondary level of education, and significantly higher proportion of urban subjects had tertiary level of education (65.8 vs. 34.2%).

Table 1

Variable	Urban n (%)	Rural n (%)	Total n (100)
Age group (years)			
≤ 20	1 (12.5)	7 (85.7)	8 (100)
21-25	11 (30.6)	25 (69.4)	36 (100)
26-30	34 (56.7)	26 (43.3)	60 (100)
31-35	27 (55.1)	22 (44.9)	49 (100)
36-40	10 (71.4)	4 (28.6)	14 (100)
>40	1 (100)	0 (0)	1 (100)
Occupation			
Trader/business	26 (51.0)	25 (49.0)	51 (100)
Farmer	7 (21.1)	26 (78.8)	33 (100)
Civil servant	14 (53.8)	12 (46.2)	26 (100)
Artisan	10 (41.7)	14 (58.3)	24 (100)
Student	13 (86.7)	2 (13.3)	15 (100)
Unemployed	7 (63.6)	4 (36.4)	11 (100)
Housewife	7 (87.5)	1 (12.5)	8 (100)
Educational level			
Primary	5 (45.5)	6 (54.5)	11 (100)
Secondary	29 (35.8)	52 (64.2)	81 (100)
Tertiary	50 (65.8)	26 (34.2)	76 (100)
Tribe			
Ibibio/Annang	21 (53.8)	18 (46.2)	39 (100)
Efik	16 (59.3)	11 (40.7)	27 (100)
Ibo	13 (52.0)	12 (48.0)	25 (100)
Ekoi	11 (47.8)	12 (52.2)	23 (100)
Ejagham	6 (27.3)	16 (72.7)	22 (100)
Others	17 (53.1)	15 (46.9)	32 (100)

In general, 18(10.7%) of pregnant women in this study tested positive to GBS, 11(13.1%) in rural area while 7(8.3%) in urban area. Among HIV positive pregnant women, 13(15.5%) tested positive to GBS infection while 5(6.0%) tested positive to GBS infection among HIV negative women (table 2).

Table 2: Prevalence of Group B Streptococcus infection

Variable	Frequency	Percentage
General (n=168)		
Yes	18	10.7
No	150	89.3
Total	168	100
Rural subjects (n=84)		
Yes	11	13.1
No	73	86.9
Total	84	100
Urban subjects (n=84)		
Yes	7	8.3
No	77	91.7
Total	84	100
HIV positive subjects (n=84)		
Yes	13	15.5
No	71	84.5
Total	84	100
HIV negative subjects (n=84)		
Yes	5	6.0
No	79	94.0
Total	84	100

Table 3 shows higher prevalence of GBS infection of 15.5% among subject with HIV compared with those without HIV infection 6.0% and this was statistically significant (p=0.045). Among urban subjects, prevalence of GBS infection among HIV positive subjects comparing that of HIV negative subjects (9.5% vs. 7.1%) was not statistically significant (p=0.69). Also, among rural subjects only, prevalence of GBS infection among HIV positive subjects compared with that of HIV negative subjects (21.4 vs. 4.8%) was statistically significant (p=0.02).

Table 3: GBS infection by HIV status and location of the subjects

Variable	GBS present n (%)	GBS absent n (%)	Total n (100)	Chi-square tests	p-value
HIV status					
HIV positive	13 (15.5)	71 (84.5)	84 (100)	3.98	0.04
HIV negative	5 (6.0)	79 (94.0)	84 (100)		
location					
Rural area	11(13.1%)	73(86.9)	84 (100)	1.00	0.318
Urban area	7(8.3%)	77(91.7)	84 (100)		
Urban location					
Urban HIV positive subjects	4 (9.5)	38 (90.5)	42 (100)	0.16	0.69
Urban HIV negative subjects	3 (7.1)	39 (92.9)	42 (100)		
Rural location					
Rural HIV positive subjects	9 (21.4)	33 (78.6)	42 (100)	5.1	0.02
Rural HIV negative subjects	2 (4.8)	40 (92.2)	42 (100)		

DISCUSSION

Female genital tract colonization by GBS infection in pregnancy is high in this study and this may increase the risk of chorioamnionitis and onward transmission of the infection to the foetus in our area. This finding is worsened by high burden of HIV infection in our geographic location and HIV infection have been shown to influence the risk of this GBS colonization and persistence (Milledge J, Calis JC, Graham SM et al, 2013; Gray KJ, Kafulafula G et al 2011).

In this study, rural subjects were younger, less educated and commonly engaged in farming, compared with urban subjects. This finding is not unexpected in view of possible socio-cultural and economic factors that support early marriage and childbearing in rural settings of many developing countries. This is in contrast to the urban participants in this study were majority were within 25-30 years age group, traders and with tertiary education.

There was no significant difference in prevalence of GBS infection comparing rural and urban subjects (13.1% vs 8.3%; p=0.32). The reason for no difference in prevalence of GBS colonization comparing rural and urban subjects in this study calls for further studies and suggests that there may be similarity in factors that determine infectivity and pathogenicity with GBS infection comparing the geographic settings. These factors may include pattern of use and abuse of antibiotics, predominant forms of pathogenic strains of GBS, level of environmental hygiene and genetic susceptibility. This finding is in contrast to a study in Poland, which found significantly higher prevalence of infections of GBS in rural (42%) compared with urban (21%) subjects

($p<0.01$) (Dybas I, Sidor-Wojtowicz A and Koziol-Montewka M, 2005). Also, rural-urban comparative study on pregnant women in Zimbabwe, found significantly higher prevalence of GBS colonization in rural (60%) compared with urban (46%) settings ($p<0.05$) ((Mavenyengwa RT, Masunga P, Meque E et al, 2006). Persistence of colonization was also found to be more prevalent in rural (48%) compared with urban (12%) settings in that study. The reasons for the difference in prevalence of maternal GBS colonization may be due to individual characteristics such as age, parity, socio-economic status, race, presence of sexually transmitted disease and sexual behavior (Foxman B, Gillespie, BW, Manning SD and Marrs, CF, 2007; Sharmila V, Joseph NM, Arun BT, Chaturvedula L and Sistla S, 2011).

In this study, women with HIV compared to those without HIV infection, had significantly higher prevalence of GBS infection. Also, women with HIV in rural area have higher prevalence of GBS compared to HIV negative women in rural area. This is similar to the study in Brazil and Belgium where GBS colonization rate was significantly higher in HIV-infected mothers than HIV-uninfected women (El Beitune P, Duatarte G, Maffei CM, et al, 2006; Epalza C, Goetghebuer T, Hainaut M, 2010). The reason for this finding may be that HIV infection in developing countries is usually associated with malnutrition, which usually worsens the immunosuppressive effect of retroviral disease with increased susceptibility to infections. People with weakened immune system have been shown to experience much more severe disease (Shah M, Aziz N, Leva N, Cohan D, 2011; Gray KJ, Kafulafula G et al, 2011).

CONCLUSION AND RECOMMENDATION

This study revealed a high prevalence of anogenital colonization of GBS among the rural (13.1%) and urban pregnant women (8.3%) in Cross River State. Among the rural subjects, the prevalence of GBS infection among HIV positive subjects (21.4%) compared to HIV negative subjects (4.8%) was statistically significant. This finding is worsened by high burden of HIV infection in our geographic area and HIV infection have been shown to influence the risk of this GBS colonization [Dauby N, Chamekh M, Melin P, Slogrove AL and Goetghebuer T, 2016]. It further revealed that GBS infection is assuming a rural dimension and efforts should be geared toward reducing the infection rate especially among the rural women. Further studies on GBS infection on other rural and urban sites in our region with diverse socio-cultural setting are advocated to add to the body of knowledge on local content and authenticate this finding. Preventive approach in pregnancy in both rural and urban areas is a worthy measure. Screening for GBS especially among high risk pregnancies and follow-up treatment to prevent feto-maternal adverse effects is advocated.

Conflict of interest: There was no conflict of interest in this study

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