Seroprevalence of anti-Chlamydia trachomatis IgA antibody in a Nigerian population: diagnostic significance and implications for the heterosexual transmission of HIV.

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Citation

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Abstract

The prevalence of Chlamydia trachomatis infection was determined in 102 Nigerians, comprising 69 volunteers of unknown HIV status (group 1) 17 screened HIV – seropositive subjects (group 2), 16 screened HIV – seronegative subjects (group 3) using an EIA kit capable of differential detection of IgA antibodies to Chlamydia trachomatis (Ct) in human serum. The prevalence of Ct in group 1 was 33% (23/69), while the prevalence in groups 2 and 3 were 50% (8/16) and 17.6% (3/17), respectively. The relatively high prevalence in group 1 is attributable to a number of risky sexual behaviours, like non-use of barriers and multiple sex partners that were common in the subjects. Because untreated Ct infection could predispose to HIV infection, such high prevalence could have additional health implications for the heterosexual transmission of HIV in Nigeria. Thus, current HIV control strategies in the country should include management of other STIs including Chlamydia trachomatis.

INTRODUCTION

Additional attention is being paid to a number non-viral, sexually transmitted infections (STIs) because of recent thinking that they predispose to heterosexual transmission of HIV infection by a variety of mechanisms. For example, the lesions created by the ulcerative STIs, like syphilis, are believed to serve as portals that facilitate the entry of HIV during heterosexual intercourse between an infected person and an uninfected partner [1]. On the other hand, the non-ulcerative STIs, for example, trichomoniasis, gonorrhoea and chlamydia, elicit localised inflammations and immune responses characterised by the infiltration and accumulation of immune cells expressing CD4 surface proteins essential for the binding of HIV prior to entry, thus also facilitating the entry of HIV [234]. By a combination of these mechanisms, both the ulcerative and non-ulcerative STIs are thought to serve as co-factors in the heterosexual transmission of HIV. Consequently, the risk of HIV transmission by these mechanisms increases when either the ulcerative or/and non-ulcerative STIs are left untreated for extended periods of time. The relatively high prevalence of these STIs in populations of low socioeconomic status in parts of Asia and sub-Saharan Africa has been blamed in part for the high rate of spread of HIV during heterosexual intercourse in these regions [567].

Whereas syphilis, trichomoniasis and gonorrhoea have since been known and treated as serious public health problems amongst sexually active people, Chlamydia trachomatis infection has recently grown from a relatively obscure infection to become the commonest sexually transmitted bacterial infection in many countries[8], where it is repeatedly associated with a variety of health complications including, infertility[9], pelvic inflammatory disease, ectopic pregnancy[10] and a number of equally serious complications in men[11]. These complications of Chlamydia trachomatis have prompted a number of developed countries, notably the United Kingdom, to offer free screening and treatment to sub-sections of the population associated with the highest prevalence of the disease.

On the contrary, across-the-board data on the prevalence of genital Chlamydia trachomatis in the developing countries of Africa are lacking. This is partly due to the high cost of current methods of detecting Ct infections and the technical difficulties associated with their use. The nucleic acid amplification tests (NAAT) and microimmunofluorescence (MIF) methods are too expensive and technically demanding for use in routine diagnosis in places and situations where

resources are limiting, while doubts have been raised about the sensitivity and diagnostic significance of the EIA - based antibody detection methods. Notwithstanding, available data from studies conducted so-far on different subsets of the population in a number of African countries, suggest that incidences of Ct infections are on the rise and there are indications that the prevalence figures may exceed those reported in developed countries[12131415]. This lends credence to the fear that Chlamydia trachomatis, like the ulcerative STIs, may have become an important, but silent, co - factor in the heterosexual spread of HIV in these African countries. The importance of C trachomatis as a possible silent co - factor in the heterosexual spread of HIV in Africa is further enhanced by the fact that many cases of Chlamydia trachomatis infection remain asymptomatic in both sexes[16] and therefore, remain undiagnosed and untreated for extended periods of time. The situation could be more critical in the many African countries where knowledge of the disease is very low and the facilities for its routine diagnosis are not readily available.

In this paper, we report the findings of a study on the prevalence of anti Chlamydia trachomatis IgA antibody in a population of Nigerians living in two cities in the South-Eastern part of the country. The results are discussed in terms of the diagnostic significance of the use of antibody detection in studying the prevalence of Chlamydia trachomatis as well as the possible role of untreated genital Chlamydia trachomatis infection as a risk factor in the heterosexual transmission of HIV in South Eastern Nigeria.

MATERIALS AND METHODS

SUBJECTS AND LOCATION

The subjects used for the study were Nigerian residents of two cities, Owerri (urban) and Nsukka (semi – urban), both in South – Eastern Nigeria. The subjects were aged between 17 and 42 years and comprised 69 volunteers of unknown HIV status (group 1), 17 screened HIV-positive subjects (group 2) and 16 screened HIV-negative subjects.

The volunteers of unknown HIV status were recruited from students of Federal University of Technology Owerri and University of Nigeria, Nsukka, while the screened HIV-positive and HIV – negative groups were recruited from the HIV monitoring unit of the Federal Medical Centre, Owerri. Socio - demographic data were collected on a standard questionnaire together with information on their sexual behaviour and knowledge of Chlamydia trachomatis as a sexually transmitted infection.

ANTI – CHLAMYDIA TRACHOMATIS ELISA

Chlamydia trachomatis infection was determined serologically using the ImmunoComb Chlamydia trachomatis IgA test – an indirect solid phase Enzyme Immunosorbent Assay (EIA) kit manufactured by Orgenics Israel). The kit is capable of qualitative determination of IgA antibodies to Chlamydia trachomatis in human serum or plasma [17].

ANTI-HIV ELISA

Detection of the HIV antibodies in the sera of patients was done with the use of commercial ELISA kits. The initial screening was done with HIV Q spot, Biosystems Nigeria and the positive results were counterchecked with another commercial ELISA kit, Immunocomb (Orgenics Israel).

RESULTS

The results of the prevalence experiments in all three groups of subjects are shown in table 1. Out of the 69 volunteers of unknown HIV status (group 1) included in the study, 23 (33.33%) were positive for Chlamydia antibodies. Within this group, the highest prevalence of 50% was observed in the 17 – 24 – year group, followed by the 25 – 33-year olds amongst whom the prevalence was 35.3% and the 34 – 42-year old group in which the lowest prevalence of 14.7% was recorded. On the other hand, the prevalence in the HIV-positive (group 2) and HIV – negative (group 3) subjects was 50% (8/16) and 17.6% (3/17), respectively.

{image:1}

The result of the questionnaire survey on some behavioural risk factors for genital Chlamydia trachomatis infection amongst the population is shown in table 2. From the table, the commonest risk factors are intercourse with multiple sex partners (35.8%) and non-use of barrier (25.4.0%).

{image:2}

DISCUSSION

The association of untreated non-viral sexually transmitted infections with some long-term health implications as well as the heterosexual transmission of HIV has resulted in an upsurge of interest on the prevalence of these diseases, especially Chlamydia trachomatis, whose global prevalence has been on the increase in recent times. However, it is often difficult to compare the prevalence figures reported for

Chlamydia trachomatis in such studies because of the wide variations in the sensitivities of the different methods used for Chlamydia detection1[61718]. Usually, much higher prevalence figures are reported with antibody detection methods, than with the more reliable Nucleic Acid Amplification Tests (NAATS) and the immunofluorescence assays (IFA). In addition, the subjects used for such studies often belong to different population subsets which differ in terms of infection risk levels. The commonest of these groups are female sex workers [12], patients attending STI clinics [1419], HIV patients [2021], sexually experienced adolescents[15] and pregnant women[22]. Expectedly therefore, the prevalence of genital Chlamydia trachomatis infection in studies conducted so far in different parts of Africa varied considerably, ranging from as low as 3.77% reported in volunteer students in Cameroun[23] to as high as 68.25% reported in female sex workers in Niger Republic[12].

The prevalence of 33.0% reported in this study on asymptomatic volunteers falls within this range, but such relatively high prevalence values are usually reported in subjects drawn from hospital settings, mostly those attending STI clinics [1924]. The high prevalence thus observed in this study could be due in part to the age distribution of the subjects, many of whom were adolescents or young adults - the age groups usually associated with the highest prevalence rates of Ct infection. A number of behavioural risk factors, which were revealed in the questionnaire that accompanied this study (Table 3), are also partly responsible for the relatively high prevalence reported in the study. These include intercourse with multiple sex partners (35.8%), non-use of barriers (25.45%) and previous history of STI (10.3%).

In addition, the high prevalence reported could also be due to the antibody detection method of assay, which is reputed to detect many more cases than the other methods of screening. The apparent inability of antibody-detection methods to differentiate between active and non-active Ct infections in prevalent studies is thought to be partly responsible for the much higher prevalence figures reported with them. Other unresolved issues concerning the diagnostic significance of results obtained with antibody detection methods in Ct screening include the apparent lack of knowledge on how long Ct antibodies remain in the serum after an infection has been resolved and the questions about the level of correlation between results of EIA assays and other methods. Recently, Siemer et al [9] also raised the question of whether only the presence of genital infection, and not the ocular infection (trachoma), should be inferred whenever Ct antibodies are detected in the serum. Notwithstanding, antibody detection methods continue to be used in Ct detection studies and researchers have repeatedly reported a strong correlation between the detection of species - specific Ct antibodies, especially IgA, and active or recurrent genital Ct infections [182526]. In addition, cost considerations, ease of use and the non - invasive nature of serum antibody detection methods make them ideal for initial screening studies of Chlamydia trachomatis infections in a developing country like Nigeria, where prevalent data are needed urgently.

The high prevalence figures reported in this study could have far-reaching health implications for both the individuals and for the larger society. Since most cases of genital Chlamydia remain asymptomatic [27], these subjects may have been or could remain infected for extended periods of time without seeking diagnosis and treatment. This opinion is supported by information gathered from the questionnaire that accompanied this study, which revealed that 68.0% of the subjects had no previous knowledge of the existence of Chlamydia trachomatis as a sexually transmitted infection. In addition, because most hospitals and diagnostic laboratories in the country still do not offer Chlamydia-specific diagnostic tests, C. trachomatis infection could not be detected in those who recently underwent screening for STIs. However, since C. trachomatis is sensitive to a range of antibiotics that are used in the treatment of a number of other common infections in Nigeria, it is possible that a percentage of the cases of genital Chlamydia infection get treated inadvertently in the course of treating the other diseases with antibiotics [28].

One of the consequences of the inflammatory and immune responses elicited by Ct infection in persons with active cases of untreated infection is that they could face an increased risk of heterosexual transmission of HIV by mechanisms involving the preferential aggregation of the virus on immune cells expressing CD4+ proteins. The prevalence of C. trachomatis infection observed in the HIV-seropositive subjects (50%) was much higher than the prevalence in the HIV - seronegative subjects (17.6%). Although the population sizes used for this aspect of the study limit our ability to make any far-reaching conclusions on the relationship between Ct infection and HIV, similar

trends have been reported in other studies [1222]. The implication of such a possible predisposing relationship would be a high incidence of Ct and HIV coinfection in the population. Such incidences of concomitant Chlamydia-HIV co -infection are perceived as a confirmation of unsafe sex practices, especially the non-use of barriers during intercourse, among the subjects.

However, the implication of this observation for the individual and the population could be viewed in two perspectives (figure 1).

{image:3}

When Chlamydia pre-exists before HIV infection, it predisposes the subjects to HIV infection through the initiation of inflammatory and immune responses which facilitate the entry of HIV [4]. When HIV pre-exists before Chlamydia infection, the immune suppression typical of HIV infection increases the risk of Chlamydia infection occurring as an opportunistic infection. In subjects concurrently infected by both infections, the inflammation caused by untreated Chlamydia will increase the population of HIV-bound lymphocytes and macrophages present. This will in turn increase the viral shading in the HIV-infected individuals, thereby increasing the probability of HIV transmission during intercourse with an uninfected partner [7]. The possible synergy that can occur between the infections is illustrated in figure 3. The possibility that HIV and any such concurrently existing STIs can be co-transmitted in the affected individuals has also been recognised [2930].

In conclusion, a relatively high prevalence (33.5%) of Ct IgA antibody was observed in the population used for the study. Although these may not all represent active Ct infections, it can be inferred that a high percentage of the population has been exposed to Ct infection and many of them may still be habouring the active infection unknowingly. Based on the implication of untreated Ct infection for HIV transmission, such cases of untreated C. trachomatis may contribute to the alarming rate of heterosexual spread of C. trachomatis experienced in Nigeria, and by inference, the rest of sub-Saharan Africa. Because of the adverse implications of this observation for the individual and the larger society in terms of HIV transmission, amongst other health complications, there is an urgent need to promote the establishment of diagnostic centres for C. trachomatis in addition to promoting awareness on the existence and implications of C. trachomatis. In the interim, reducing the prevalence of chlamydia infection in the population could be achieved through treating patients infected by other STIs, such as gonorrhoea, with an effective anti-chlamydial regimen. Ideally, this should be part of a wider programme to reduce the incidence of all STIs.

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