

ORIGINAL RESEARCH ARTICLE

Sexual Practices among Senior Students in Private Secondary Schools in Uyo, Southern Nigeria

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Abstract

Sexual practices of adolescents have enormous consequences on their health and career outcome. The objective of this study was to assess the sexual practices among senior secondary students in private schools in Uyo, Nigeria. This was a descriptive cross-sectional study. Data were collected using structured, self administered questionnaire and analyzed with SPSS version 23 software. Level of significance was set at 0.05. A total of 353 respondents participated in the study. The mean age was 14.84 ± 1.10 years with a male to female ratio of 1:1.17. The prevalence of sexual intercourse was 14.2%. The mean age of sexual debut was 11.7 ± 2.60 years, being significantly lower in males, (10.83 ± 2.64 years) than females, (12.67 ± 2.42 years) ($p=0.00$). Risky sexual behaviour included low contraceptive use 15 (30.0%) and having multiple sexual partners 9(18%). A total of 25.8% males and 9.0% females engaged in pornography ($p=0.00$). Also, 8.6% of males and 2.6% females both masturbated and had sexually active friends respectively ($p=0.01$). In view of the early sexual debut and risky sexual practices reported among senior secondary students in private schools in Uyo, there is need for early integration of sexuality education into the curriculum of such schools to improve sexual behaviour among the students. (*Afr J Reprod Health 2019; 23[4]:46-53*).

Keywords: Sexual practices, senior secondary students, adolescents, sexuality education, Nigeria

Résumé

Les pratiques sexuelles des adolescents ont d'énormes conséquences sur leur santé et leurs résultats professionnels. L'objectif de cette étude était d'évaluer les pratiques sexuelles parmi les étudiants des lycées privées à Uyo, au Nigeria. Il s'agissait d'une étude transversale descriptive. Les données ont été collectées à l'aide d'un questionnaire structuré et auto-administré et analysées avec le logiciel SPSS version 23. Le niveau de signification a été fixé à 0,05. Au total, 353 répondants ont participé à l'étude. L'âge moyen était de $14,84 \pm 1,10$ ans avec un rapport hommes / femmes de 1 : 1,17. La prévalence des rapports sexuels était de 14,2%. L'âge moyen des débuts sexuels était de $11,7 \pm 2,60$ ans, ce qui était significativement plus faible chez les hommes ($10,83 \pm 2,64$ ans) que chez les femmes ($12,67 \pm 2,42$ ans) ($p = 0,00$). Les comportements sexuels à risque comprenaient une faible utilisation de contraceptifs 15 (30,0%) et le fait d'avoir plusieurs partenaires sexuels 9 (18%). Au total, 25,8% d'hommes et 9,0% de femmes se livraient à la pornographie ($p = 0,00$). De plus, 8,6% des hommes et 2,6% des femmes se masturbaient et avaient des amis sexuellement actifs respectivement ($p = 0,01$). Compte tenu des débuts sexuels précoces et des pratiques sexuelles à risque signalées parmi les étudiants des lycées privées à Uyo, il est nécessaire d'intégrer tôt l'éducation sexuelle dans le programme de ces écoles afin d'améliorer le comportement sexuel des étudiants. (*Afr J Reprod Health 2019; 23[4]:46-53*).

Mots-clés: Pratiques sexuelles, lycéens, adolescents, éducation sexuelle, Nigéria

Introduction

According to the World Health Organization, the adolescent period refers to the stage of development between 10-19 years¹. It is a time of rapid growth, curiosity and experimentation often entered into with a lot of myths and

misinformation concerning sexuality². Adolescents at this period are highly vulnerable and easily influenced by peers and people considered as role models such as parents and teachers³. They often engage in high risk behaviour such as smoking, drinking alcohol, sexual activities and drug-use⁴. Different studies have reported prevalence of

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sexual activities among adolescents of 21.9% - 59.6%^{2,5-11}. The desire among adolescents to experiment with different sexual behaviour is fuelled by unhindered access to information through different means such as the media and peers. In a study among adolescents in Ilorin, Nigeria, 60% of information on sex and sexuality was by audio-visual means, with films being the single most important source for 25% of the respondents¹¹.

A greater proportion of the sexually active adolescents practice unsafe sex which puts them at increased risk of sexually transmitted diseases and other consequences such as unwanted pregnancies and abortions⁶. A study carried out to determine risky sexual behaviour (RSB) among senior secondary school students in an urban community in South West Nigeria reported that 23.0% of the respondents had at least one RSB¹², while a prevalence of RSB of 69.17 % was reported among private secondary school students in a study conducted in Addis Ababa¹³. Such risky behaviour includes having multiple sexual partners, having sex under influence of alcohol or marijuana, non-use of contraceptives, having sex with married partners, ignorance of the marital status of their partners and anal sex^{2,5,6,10}. Regarding contraceptives, studies have reported condom use with each sexual encounter of 30-44% among the sexually active adolescents^{2,6}.

Male adolescents are reported by many studies to be more sexually active than the females. Several studies have recorded a male to female ratio of sexual activity of approximately 2:1^{5, 9, 10}. Studies in Uyo and Port Harcourt however reported approximately equal ratio of sexual activities among male and female students^{2,14}.

Adolescents are becoming increasingly sexually active at earlier ages. The age of sexual initiation of as low as 10-12 years have been reported in some studies, with a mean age of initiation being 15 years^{5,6,10,15}. Young people who initiate sex at early ages expose themselves to pregnancy and sexually transmitted infections (STI) compared to those who delay initiation of sexual activity. Several factors contribute to early

sexual debut among adolescents. Factors identified by a study in Lagos included friends' sexual behaviour, parents' marital status, type of person that the adolescent lives with, pornography and availability of funds to meet basic needs¹⁶. Some also indulge in sexual acts with strangers as a transaction for monetary gains. Studies conducted among secondary school students in Enugu and Anambra, Nigeria respectively reported monetary gains as the reason for sexual acts^{5,10}. This may be due to poverty or a desire to live an affluent lifestyle. Other identified contributory factors to early sexual debut include cultural practices, drug abuse and poor religiosity^{17,18}.

Findings from the Nigeria Demographic and Health Survey (NDHS) 2013 report showed that the proportion of young men initiating sexual intercourse by age 18 was highest in the South South (33 percent)¹⁹. Also, findings from a previous study carried out in Uyo in 2014 reported that more than half of the senior secondary school adolescents aged 13-19 years in public schools were sexually active². This early sexual debut is worrisome. No study has documented sexual activities among senior secondary students in private schools in Uyo and many of the reviewed studies in other regions of Nigeria were on adolescents in both public and private secondary schools. The objective of the current study therefore was to assess the sexual practices among senior secondary students in private schools in Uyo.

Methods

Study area

This study took place in Uyo, the administrative and commercial capital of Akwa Ibom State which is the second largest oil-producing State in Nigeria and one of the six States in the South-South geopolitical zone of Nigeria. The city is centrally located with access to eight other local government areas, namely, Etinan, Uruan, Itu, Ibiono, Nsit Ibom, Nsit Atai, Nsit Ubium and Ibesikpo Asutan²⁰.

Uyo had a projected population of 429,900 by 2016²¹. Uyo is a cosmopolitan city with people from diverse culture, ethnicity, religion and social class; it consists of 4 clans, namely, Ikono, Etoi, Oku and Offot clans and 11 wards. It is predominantly a civil service city with many small-scale business enterprises²². The indigenous people are Ibibio. The major social settings which could attract adolescents include eateries, restaurants, hotels and a large entertainment center called Tropicana. Other landmarks include 2 tertiary and one secondary health facilities. The city also has numerous pharmacies, patent medicine stores and private laboratories where treatment can be accessed by the populace, including adolescents. According to the Akwa Ibom State Secondary Education Board, there are 32 private and 15 public secondary schools in Uyo capital city. The educational system in Akwa Ibom State structures secondary schools into junior and senior classes, each lasting for 3 years.

Study population

The study was conducted among adolescent senior secondary school students in private secondary schools in Uyo local government area (LGA). All private secondary schools are of mixed sex.

Study design

This was a descriptive cross-sectional study among senior secondary school students in private schools in Uyo.

Inclusion /exclusion criteria

Students attending private secondary schools registered with the Akwa Ibom State Secondary Education Board were the ones included in the study as they could be easily identified. Students in the junior secondary cadre were excluded from the study.

Sample size determination

The sample size was calculated using the Fisher's formula for descriptive studies ($n=z^2pq/d^2$)²³ at significance level of 5% and a standard normal deviate of 1.96, corresponding to 95% confidence

interval and a prevalence of risky sexual behaviour of 69.17 % among private secondary school students in a previous study¹³. The calculated minimum sample size was 328. Addition of 10% provision for non-response increased the sample size to 361.

Sampling technique

The sampling frame used was a list of all private secondary schools registered with the Akwa Ibom State Secondary Education Board in Uyo LGA. Multistage sampling method was used in selecting the participants for the study. The 32 private secondary schools in Uyo capital city were grouped according to the clans in Uyo and one school was subsequently selected from each clan by simple random sampling. Information obtained from the principals of the selected schools showed that each school had an average of 250 senior secondary students and as such, 90 students were selected from each school. The students in each senior secondary class were stratified into male and female. A proportional number was selected from each stratum to achieve the desired number from each school.

Data collection

Data for the study was collected in July 2019 using pre-tested, self-administered questionnaire. The pre-test was conducted among private secondary school students in Abak, a town about 20km from Uyo. Six final year medical students were recruited as research assistants. Data collection lasted 2 weeks, from 1st-12th July 2019.

Data analysis

The data obtained were screened, cleaned and analyzed using SPSS version 23 statistical software package and presented as tables. Variables were summarized using frequencies and proportions, while the significance of association between two categorical variables was analyzed using chi square test. The level of significance was set at 0.05.

Results

A total of 353 respondents participated in the study giving a response rate of 97.8%. The mean

Table 1: Socio-demographic characteristics of respondents

Variable	Frequency (%)n = 353
Age in years	
10 – 13 (Early adolescence)	35(9.9)
14 – 17 (Middle adolescence)	316(89.5)
>17 (Late adolescence)	2(0.6)
Mean age \pm SD	14.84 \pm 1.10
Sex	
Male	163(46.2)
Female	190(53.8)
Class	
SS1	132 (37.4)
SS2	158 (44.8)
SS3	63 (17.8)
Parent Marital Status	
Married	303(85.8)
Separated	23(6.5)
Widow	27(7.7)
Who student lives with	
Both parents	286(81.0)
Father only	9(2.6)
Mother only	46(13.0)
Guardian	12(3.4)

Table 2: Awareness and sources of sexual reproductive health information among respondents

Variable	Frequency (%) n = 353
Heard of contraceptives	
Yes	189(53.5)
No	164(46.5)
HIV status known	
Yes	106(30.1)
No	246(69.9)
Ever had Sexuality Education	
Yes	324(91.8)
No	29(8.2)
Sources of Sexuality Education*	
Teacher	202(57.2)
Family (Mother/siblings)	261(73.9)
TV/Radio	111(31.4)
Other (friends/internet/films)	145(41.1)

age of respondents was 14.84 \pm 1.10 years with a male to female ratio of 1:1.17. The respondents comprised of students from the 3 senior secondary classes with those in SS2 constituting 44.8% of the study participants. Majority of the respondents, 286 (81.0%) lived with both parents. (Table 1)

One hundred and eighty nine (53.5%) had ever heard of contraceptives. Only 106 (30.1%) knew their HIV status. Majority (91.8%) ever had sexuality education with the commonest source being family members 261 (73.9%). (Table 2)

The prevalence of sexual intercourse among respondents was 14.2%, with a male: female distribution of 15.3% and 13.2% respectively. The mean age of sexual debut of the respondents was 11.7 \pm 2.60 years. There was a statistically significant difference between the mean age of sexual debut of 10.83 \pm 2.64 years for males and 12.67 \pm 2.42 years for the female respondents ($p=0.00$). Among the sexually active respondents, 18 (72.0%) of the males and 13(52.0%) females had intercourse within 12 months prior to the study. Majority, 35 (70.0%) did not use condom. Nine (18.0%) of the respondents had more than one sexual partner. There was a statistically significant difference in the commonest reason for sex among the sexually active respondents with the commonest reason being personal desires to have intercourse 32(64.0%). This was higher among males 19 (76.0%) than females 13 (52.0%) ($p=0.02$). (Table 3)

Overall, 59 (16.7%) respondents admitted to engaging in pornography. This was significantly higher among males 42(25.8%) compared to females, 17(9.0%)($p=0.00$). Similarly, a significantly higher proportion of males 14(8.6%) admitted to both masturbating and having sexually active friends compared to females 5(2.6%)($p=0.01$).(Table 4).

Discussion

This study assessed the sexual practices of senior secondary school students in Uyo. The mean age of respondents was 14.84 \pm 1.10 years with a male to female ratio of 1:1.17. The overall prevalence of sexual intercourse among respondents was 14.2%. Different studies have reported higher prevalence of sexual activities among adolescents ranging from 21.9% - 59.6 %^{2,5-11}. A previous study among senior secondary students in public schools in Uyo, reported a prevalence of 59.6% which is much higher than findings of the present study. A

possible explanation may be because more discipline is enforced in privately-owned schools compared to public schools.

Table 3: Distribution of sexual history and practices among respondents

Sexual practice	Male n = 163 Freq. (%)	Female n = 190 Freq. (%)	Total n=353 Freq. (%)	Statistics
Ever had sex				
Yes	25(15.3)	25(13.2)	50(14.2)	$\chi^2=0.18$
No	138(84.7)	165(86.8)	303(85.8)	p value=0.65
Age of sexual debut	n = 25	n = 25	n=50	
10 – 13 (Early adolescence)	2(8.0)	1(4.0)	3(6.0)	Fishers exact=0.61
14 – 17 (Middle adolescence)	22(88.0)	24(96.0)	46(92.0)	
18 – 21 (Late adolescence)	1(4.0)	0(0.0)	1(2.0)	
Mean \pm SD	10.83 \pm 2.64	12.67 \pm 2.42		t test=77.08 p value= 0.001*
Had sex				
In the last 3 months	7(28.0)	2(8.0)	9(18.0)	Fishers exact= 0.44
In the last 12 months	18(72.0)	13(52.0)	31(62.0)	
Condom use during last sex				
Yes	7(28.0)	8(32.0)	15(30.0)	$\chi^2=0.10$
No	18(72.0)	17(68.0)	35(70.0)	p value=0.76
Current number of sexual partners				
One	20(80.0)	21(84.0)	41(82.0)	$\chi^2=0.14$
More than one	5(20.0)	4(16.0)	9 (18.0)	p value=0.71
Commonest reason for sex				
Monetary gains	0(0.0)	2(8.0)	2(4.0)	Fishers exact=0.02*
Peer pressure	3(12.0)	0(0.0)	3(6.0)	
Personal desire	19(76.0)	13(52.0)	32(64.0)	
Curiosity	1(4.0)	2(8.0)	3(6.0)	
Others	2(8.0)	8(32.0)	10(20.0)	

Table 4: Association between sex and selected characteristics among respondents

Variables	Male n = 163 Freq. (%)	Female n = 190 Freq. (%)	Chi square χ^2	p-value
Pornography				
Yes	42(25.8)	17(9.0)	16.6	0.00*
No	121(74.2)	173(91.0)		
Friends who have had sex				
Yes	14(8.6)	5(2.6)	6.11	0.01*
No	149(91.4)	185(97.4)		
Masturbation				
Yes	14(8.6)	5(2.6)	6.11	0.01*
No	149(91.4)	185(97.4)		
Ever had sexuality education				
Yes	146(89.6)	22(88.0)	1.46	0.18
No	17(10.4)	12(6.3)		

Also, most of the private schools in the present study were faith-based and teachings on chastity may account for the lower prevalence of sexual activities in such schools. A South African study reported that adolescents who showed strong

religiosity were 54% less likely to report lifetime sex²⁴. The prevalence of sexual intercourse in the present study was only slightly higher among males than females. This was similar to findings of a previous study among senior secondary school

students in Uyo in 2014 where the male: female ratio of sexually active students was almost the same². A similar finding was reported in Port Harcourt¹⁴. Studies conducted among secondary school students in Enugu and Anambra, Nigeria, however recorded higher prevalence of 63.8% and 65% respectively among males, compared to 36.8% and 35% respectively among females^{5,10}.

In the present study, the respondents commenced sexual activities at a rather early age with a mean age of sexual debut being 11.7 years. A similar finding was reported in a study conducted among secondary school students in Enugu, Nigeria where the age at first sexual intercourse was 12 years for both sexes⁵, while studies among in-school adolescents in Port Harcourt and Anambra State, Nigeria reported a mean age of 15 years^{10,15}. Early age of sexual debut is likely to lead to a higher number of lifetime sexual partners among the adolescents with the attendant risks. Sexual intercourse was commenced at an earlier age among the males in the present study compared to females. A higher proportion of males (72%) also had sexual intercourse within 12 months prior to the study compared to females (52%). Similar pattern has been observed in other studies^{5,10}. This may be due to a greater indulgence of males in sex arousing habits such as pornography and masturbation compared to the females. In the present study, a significantly higher proportion of male students reported engaging in pornography (25%) and masturbation (8.6%) compared to females, who 9.0% and 2.6% were involved in pornography and masturbation respectively.

One of the risky sexual activities identified in the present study was poor use of contraceptives as 70% of the sexually active did not use any contraceptive during the last intercourse. This was despite the sexuality education majority of them claimed to have received. Such education was unlikely to be detailed as there was still a knowledge gap as only about half had ever heard of contraceptives. A similar level of awareness was reported in a previous study¹⁰. This may be due to the fact that the source of sexuality education was mainly family members who may not have enough knowledge or may deliberately

not want to discuss about contraceptives as the adolescents are not expected to be sexually active at that age. The adolescents therefore remain naïve and ignorant and engage in unprotected sex, thereby exposing themselves to numerous risks such as unwanted pregnancies with all attendant consequences. Some may carry out abortions and those who carry the pregnancy to term may develop obstructed labor due to their poorly developed pelvis, leading to several complications such as vesico-vaginal fistula or even mortality. Such students may also be forced to drop out of school. Contraceptive uptake has been shown to improve as the adolescents get older. A study conducted in Bangladesh has shown that older adolescents are more likely to use contraceptives consistently at their first sexual encounter than younger adolescents²⁵.

Another risk of unprotected sexual intercourse is sexually transmitted infections including HIV which is further heightened among those with multiple sexual partners as reported by close to one fifth of the sexually active respondents in the present study. Studies in Enugu and Anambra State recorded that 77(34.8%) and (40.8%) of the sexually active respectively, had multiple sexual partners^{5,10}. There is therefore need to intensify sexuality education in all secondary school classes. This will possibly encourage a delay in sexual debut till the adolescents become more mature and this may reduce sexual experimentation with multiple partners.

Studies have identified monetary gains as a major reason for sexual activities among secondary school students. In studies in Enugu and Anambra State among students in public secondary schools, 61.1% and 27.5% of the sexually active students respectively engaged in sexual relationships for monetary gains^{5,10}. In the present study however, only 4% of the respondents engaged in sexual activities for monetary gains. This lower occurrence of sexual activities for monetary gains in the private schools may be because the parents of such students who were able to afford the higher private school fees were also likely to be able to cater for the financial

needs of their wards compared to those in the public schools.

The reason however given by almost two thirds of the sexually active students in the present study for engaging in intercourse was personal desires to do so. This was significantly more among the males than females. This is not surprising as a higher proportion of the males were involved in pornography which could possibly arouse their sexual desires. An Ethiopian study reported that watching pornographic movies was significantly associated with premarital sex²⁶. Pornographic materials can be easily accessed on social media platforms and this is quite detrimental to adolescents. This can be addressed by putting policies in place to ensure that such sites do not open to those in the adolescent age group in order to reduce their desire for experimentation. This may encourage a delay in sexual debut till they are old enough to take responsible decisions.

Ethical considerations

Ethical approval for the study was obtained from the Ministry of Health, Akwa Ibom State. Also, permission was obtained from the principals of the selected schools in the different locations. In addition written consent was obtained from each respondent after explaining the purpose of the study, assuring of confidentiality and indicating that no names would be required. Participation was entirely voluntary.

Conclusion

A number of senior secondary students in private schools in Uyo were sexually active at an early age. Risky sexual practices included low contraceptive use and multiple sexual partners. There is need for active integration of sexuality education into the curriculum of secondary schools in order to increase knowledge, target positive change in sexual behaviours and delay sexual debut among secondary school students. It is also important to establish adolescent friendly clinics where reproductive health services including counselling are offered in order to improve the

health status of the adolescent students in secondary schools.

Limitation

A major limitation of this study is that it was entirely self-reported and the findings are therefore solely dependent on the feedbacks from the students. To encourage truthful responses to this sensitive topic, absolute confidentiality and anonymity were ensured.

Contribution of Authors

The first author conceived, designed the study and prepared the manuscript, while the second author collected, analyzed the data and also contributed to the initial draft of the manuscript. Both authors approved the final manuscript.

References

1. World Health Organization. Preventing Adolescents: A Guide to Implementing the Recommendations of World Report on Adolescents and Health. Geneva, WHO 2011.
2. Udoh SB and Idung AU. Sexual Practices, Knowledge and Prevention of Sexually Transmitted Diseases among Upper Grade Secondary School Adolescent Students in Uyo. IOSR Journal of Dental and Medical Sciences. 2015;14 (4):9-15
3. Fernandez DM, Figueroa WI, Gomez M, Maysonet J, Olivares ER and Hunter RF. Changes in HIV/AIDS knowledge among early adolescents in Puerto Rico. Ethnicity and Disease. 2008; 18(2): 146 -150
4. Linbee S, Valencia BS and Cromer BA. Sexual activity and other high-risk behaviors in adolescents with chronic illness: A review. Journal of Pediatrics and Adolescence 2000; 13(2): 53-64.
5. Ejike O. Sexual Behaviour and Sex Practices among Secondary School Students in Enugu. J Child Adolesc Behav 2015;3: 243. doi:10.4172/2375-4494.1000243
6. Tobin EA and Okojie HO. Knowledge, Attitude And Practices of Adolescent Secondary School Students in Uvwie Local Government Area of Delta State to HIV/AIDS. Benin Journal of Postgraduate Medicine. 2010;12 (1):43-52
7. Omotoso, BA. Perception of acquired immune deficiency syndrome (AIDS) as correlate of sexual behaviour among university undergraduates in south western Nigeria (Unpublished PhD thesis), 2003. Nigeria: Obafemi Awolowo University, Ile Ife
8. Ugoji, FN. Attitude of undergraduates towards

- contraceptive use. *Pakistan Journal of Social Sciences*. 2008; 5(1):111–115.
9. Adebenga MS, Morenike D, Sunday B and Adebayo DO. Reproductive, Sexual and Contraceptive Behaviour of Adolescents in Niger State, Nigeria. *Afr J. Reprod. Health* 2002; 6(3):82-9
 10. Duru CB, Ubajaka C, Nnebue CC, Ifeadike CO and Okoro OP. Sexual Behaviour and Practices among Secondary School Adolescents in Anambra State, Nigeria. *Afrimedical Journal* 2010; 1(2):22-27
 11. Orji EO and Esimai OA. Sexual behaviour and contraceptive use among secondary school students in Ilesha, South-West Nigeria. *J obstetrics Gynaecology*. 2005; 25(3): 69-72
 12. Idowu A, Ayodele AO, Omotade PG, Anu OS and Omolola FF. Risky Sexual Behavior of Senior Secondary School Students in an Urban Community of Oyo State, South West Nigeria. *Int Q Community Health Educ*. 2017 Jul; 37(3-4):173-180. doi: 10.1177/0272684X17736154.
 13. Ali A. Risky sexual behaviour and factors associated with it among Public and Private Secondary School Students in Addis Ababa City (Ethiopia): a Cross-Sectional Comparative Study. *Journal of Gynaecology & Reproductive Medicine*. 2017; 1(1):1-10
 14. Anochie IC and Ikpeme EE. Prevalence of Sexual activity and Outcome among female secondary school students in Port Harcourt Nigeria *African Journal of Reproductive Health*. 2001; 5(2):63-67
 15. Okpani AOU and Okpani JU. Sexual Activity and Contraceptive use among Female Adolescents. A report from Port Harcourt, Nigeria. *Afr J Reprod. Health* 2000; 4(1):40-47.
 16. Odeyemi K, Onajole A and Ogunowo B. Sexual behaviour and the influencing factors among out of school female adolescents in Mushin market, Lagos, Nigeria. *Int J Adolesc Med Health*. 2009; 21(1):101-9
 17. Odeigah L, Rasaki SO, Ajibola AF, Hafsat AA, Sule AG and Musah Y. High risk sexual behaviour among adolescent secondary school students in Nigeria. *Afri Health Sci* 2019;19(1):1467-1477
 18. Adeyemo DA and Williams TM. Some correlates of risky sexual behaviour among secondary school adolescents in Ogun State, Nigeria. *Child & Youth Services*, 2010;31 (1-2):53-69.
 19. National Population Commission (NPC) [Nigeria] and ICF International. 2014. *Nigeria Demographic and Health Survey 2013*. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International.
 20. Etuk, EO. Housing satisfaction attributes among households in Uyo capital city territory, Akwa Ibom State, Nigeria. *dspace.unn.edu.ng* 2015; 143-150
 21. Akwa Ibom State, Nigeria- Population Statistics, charts, Maps and Location. Available at <https://www.citypopulation.de>php>., Accessed on 25 November 2019
 22. Israel, UE. Urbanization and Conflict: A Study of Uyo, 1900-2015. *African Journal of History and Archaeology*. 2018;3(1):35-49
 23. Cornish, R. Statistics: An introduction to sample size calculations Precision-based sample size calculations. *Math Learn Support Cent*. 2006;2:1-5.
 24. Amoateng Y, Kalule-Sabiti I and Arkaah YJ. The effect of Socio demographic factors on risky sexual behavior of adolescents in the North West Province of South Africa. *African Popul Stud* 2014; 28:487-498.
 25. Khan MA. Knowledge on AIDS among female adolescents in Bangladesh: Evidence from the Bangladesh Demographic and Health Survey Data. *Journal of Health Population and Nutrition*. 2002; 20:130-137.
 26. Bogale A and Seme A. Premarital sexual practices and its predictors among in school youths of Shendi Town, West Gojjam zone, North western Ethiopia. *Reprod Health* 2014;11:49.

ORIGINAL RESEARCH ARTICLE

Assessment of Serological Markers of Genital *Chlamydia trachomatis* Infection Among the Gynaecology Patients attending Babcock University Teaching Hospital, Ilishan-Remo, Ogun State, Nigeria

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Abstract

Genital *Chlamydia trachomatis* infection causes significant morbidity and mortality in women. A number of epidemiologic studies have suggested that Polymerase Chain Reaction (PCR) is more accurate as a diagnostic tool for *Chlamydia trachomatis*. However, the use of serological markers may be cost effective and practical in diagnosing and estimating the burden of the disease in resource limited countries. This study was aimed at determining the serological markers (IgG, IgM and IgA) of *Chlamydia trachomatis*, evaluate the association between *Chlamydia trachomatis* infection and the sociodemographic characteristics and clinical diagnosis of the participants. This was a cross sectional hospital-based study in which blood samples from 145 consenting participants were tested for IgG, IgM and IgA antibodies against *Chlamydia trachomatis* using enzyme linked immunosorbent assay and their clinical diagnosis, retrieved from their case notes. The cumulative prevalence of seropositivity for *Chlamydia trachomatis* (IgG, IgM, IgA) was 112 (77.2%) while 33 (22.8%) were seronegative. The overall predominant seromarker was IgG 91(62.8%) while IgM and IgA accounted for 85(58.6%) and 54(37.2%) respectively. A statistically significant association was found between *Chlamydia trachomatis* infection and PID (p value = 0.031), primary infertility (p value 0.011) and level of income (p value= (0,045). (*Afr J Reprod Health* 2019; 23[4]: 54-62).

Keywords: *Chlamydia trachomatis*, Serological markers IgG, IgM, IgA, PID

Résumé

L'infection génitale à *Chlamydia trachomatis* provoque une morbidité et une mortalité importantes chez les femmes. Un certain nombre d'études épidémiologiques ont suggéré que la réaction en chaîne par polymérase (RCP) est plus précise en tant qu'outil de diagnostic pour *Chlamydia trachomatis*. Cependant, l'utilisation des marqueurs sérologiques peut être rentable et pratique pour diagnostiquer et estimer la charge de la maladie dans les pays à ressources limitées. Cette étude visait à déterminer les marqueurs sérologiques (IgG, IgM et IgA) de *Chlamydia trachomatis*, évaluer l'association entre l'infection à *Chlamydia trachomatis* et les caractéristiques sociodémographiques et le diagnostic clinique des participantes. Il s'agissait d'une étude transversale en milieu hospitalier dans laquelle des échantillons de sang de 145 participantes consentantes ont été testés pour les anticorps IgG, IgM et IgA contre *Chlamydia trachomatis* en utilisant un dosage immuno-enzymatique et leur diagnostic clinique, extraits de leurs notes de cas. La prévalence cumulative de la séropositivité pour *Chlamydia trachomatis* (IgG, IgM, IgA) était de 112 (77,2%) tandis que 33 (22,8%) étaient séronégatives. Le séromarqueur prédominant global était l'Ig G 91 (62,8%) tandis que l'Ig M et l'IgA représentaient respectivement 85 (58,6%) et 54 (37,2%). Une association statistiquement significative a été trouvée entre l'infection à *Chlamydia trachomatis* et le PID (valeur p = 0,031), l'infertilité primaire (valeur p 0,011) et le niveau de revenu (valeur p = (0,045). (*Afr J Reprod Health* 2019; 23[4]: 54-62).

Mots-clés: *Chlamydia trachomatis*, marqueurs sérologiques IgG, IgM, IgA, PID

Introduction

Chlamydia trachomatis serovars D through K typically cause cervicitis, PID in women and non-gonococcal urethritis in men¹. Prevalence is consistently highest among young women aged 15 to 24 years compared to others and higher among blacks than other races². Chlamydial infection in females is often asymptomatic or present with less severe symptoms than other sexually transmitted diseases. The asymptomatic nature precludes early diagnosis and treatment. This ultimately leads to complications such as Pelvic inflammatory diseases (PID) as chronic pelvic pain sets in, ectopic pregnancy, salpingitis, recurrent abortions and infertility^{1,3-4}.

According to the World Health Organization (WHO), About 131 million people are infected with Chlamydia each year⁵. Centre for Disease Control and prevention estimated approximately 3 to 4 million new cases of Chlamydia infection in the United States each year and 75% of such new cases are diagnosed among asymptomatic women⁶.

In Nigeria, the prevalence of Chlamydia cervicitis was found to be 17.6% among women with infertility³ while another study reported a prevalence of 33% among asymptomatic women⁷. A study also reported a prevalence of 7.3% among asymptomatic infertile women in Ibadan⁸.

Considering the burden of Chlamydia, the United States Centre for Disease Control and Prevention recommends annual screening of women of reproductive age to ensure early diagnosis and treatment. This has been implemented in developed countries, but is yet to be done in developing countries like Nigeria^{9, 10}. Unless implemented, the infection will remain a "silent epidemic"¹¹.

Although advances in highly accurate and non-invasive diagnostic testing such as PCR have allowed for better estimation of the burden of the disease, particularly the asymptomatic state, however, these methods of diagnosis need specialized equipment, infrastructure and trained personnel. Thus they are neither cost effective nor readily accessible in resource limited countries like Nigeria¹².

Considering the high prevalence of 33% among asymptomatic women as reported in a study in Nigeria⁷, serological diagnosis may be more practical and accessible when compared to the molecular assays for *Chlamydia trachomatis*. While most patients are likely to present when there is a complication, a positive serology result on routine screening of at risk patients may be the only indication of chlamydial involvement¹³.

The higher sensitivity and specificity of qualitative third generation ELISA for *Chlamydia trachomatis* serological markers makes it more reliable than the rapid diagnostic test strips used in most laboratories. Our facility uses the rapid tests for chlamydia diagnosis; this often yields negative results which are inaccurate and misleading.

Therefore, the aim of this study is to determine the serological markers of genital *Chlamydia trachomatis* among patients presenting at the gynaecology clinic of the Babcock University teaching Hospital, Ilishan-Remo, Ogun State, Nigeria and to evaluate the association between *Chlamydia trachomatis* infection and the sociodemographic characteristics and clinical diagnosis of the participants.

Methods

Study design

This was a cross sectional hospital-based study conducted in the gynaecology clinic of Babcock University Teaching Hospital from November 2017 to July 2018.

Study population

The participants were gynaecology patients attending the clinic at this period.

Inclusion criteria

Consenting females within the reproductive age, who were willing to fill the questionnaire, allow blood collection for *Chlamydia trachomatis* testing were included in the study.

Exclusion criteria

Those excluded were females who were on antibiotics or who had used antibiotics within the

previous 6 months and those who were not willing to provide consent.

Sample size determination

A sample size of 145 was calculated based on *Chlamydia trachomatis* seroprevalence of 9.2% found among gynaecology and STI patients in Kano, Northern part of Nigeria, to give a 95% confidence level and margin of error of $\pm 5\%$.

Specimen collection and processing

Blood samples were tested using qualitative third generation enzyme linked immunosorbent assay (ELISA), type-specific for IgG, IgM and IgA against polypeptide derived from *Chlamydia trachomatis* major outer-membrane antigen (MOMP) (DIAPRO Diagnostic Bioprobes Milano Italy). All the blood samples were tested separately for each of these serology markers.

Data collection procedure

Pretested interviewer-based structured questionnaires were used to obtain the sociodemographic factors of the women and clinical diagnosis retrieved from their case notes.

Data analysis

Standard descriptive and inferential statistical analysis was carried out using SPSS version 23. (SPSS Inc. Illinois, USA). Means and standard deviations were derived for quantitative variables while proportions were derived for qualitative variables. Association between categorical variables was determined using Chi-square test at statistical significance level of set 5%. Ethical approval was received from Babcock University ethical review committee.

Results

The age of the 145 participants ranged from 15 to 45 years with the mean age of 23.7 years (SD 1.483). Majority of the participants were within the age range of 15 to 20 years 70(48.3%). Majority 127 (87.6%) of them were students, 110 (75.9%) were unmarried and 119 (82.1%) had

tertiary education. The socio-demographic characteristics are illustrated in Table 1.

Majority 44 (30.3%) of the participants had PID, 22 (15.2%) had Dysmenorrhea, 14 (9.7%) had primary infertility, 11 (7.6%) was diagnosed with cervicitis, 7 (4.8%) had Secondary infertility, 6 (4.1%) had recurrent abortion and 41 (28.3%) were asymptomatic women who presented for preschool medical checkup.

Of the 145 participants, the cumulative seroprevalence for *Chlamydia trachomatis* (IgG, IgM, IgA) was 112(77.2%) while 33 (22.8%) were seronegative. Of the 112 seropositive participants, 37 (33%) had one seromarker, 32(28.6%) had two seromarkers, while 43 (38.4%) were positive for all three markers. Of the 37 who had one seromarker, 21(56.8%) were IgG, 13(35.1%) were IgM and 3(8.1%) were IgA. Of the 32 participants positive for 2 seromarkers, 24(75%) had both IgG and IgM, 5(15.6%) had IgM and IgA, while 3(9.4%) had both IgG and IgA.

In total, 91 (62.8%) participants were positive for IgG making it the predominant seromarker, 85(58.6%) were positive for IgM and 54 (37.2%) for IgA. The overall combined prevalence of *Chlamydia trachomatis* IgG and IgA was 46(31.7%), IgM and IgA was 48 (33.1%), IgG and IgM was 67 (46.2%). This is further illustrated in Table 2.

The relationship between *Chlamydia trachomatis* serological markers and the sociodemographic characteristics as well as clinical diagnosis of the participants are shown in tables 3 and 4 respectively. Table 5 shows the association between *Chlamydia trachomatis* infection and the sociodemographic and clinical diagnosis of the participants.

Discussion

Molecular diagnostic tools for *Chlamydia trachomatis* infection such as PCR has allowed for more accurate diagnosis and estimation of the disease burden but in resource limited countries such as ours, molecular diagnosis is expensive and not routinely found in most laboratories. Readily available screening tools such as serological markers are more practicable for determination of *Chlamydia trachomatis* infection.

Table1: Sociodemographic characteristics of the participants (N=145)

Variables	Frequency	Percentage
Age		
15-20	70	48.3
21-25	35	24.1
26-30	15	10.3
31-35	8	5.5
36-40	10	6.9
41-45	7	4.8
Marital status		
Single	110	75.9
Married	32	22.1
Widowed	2	1.4
Separated	1	0.7
Level of Education		
No schooling	3	2.1
Primary	3	2.1
Secondary	20	13.8
Tertiary	119	82.1
Type of housing		
Personal	88	60.7
Rented(\geq 2bedrooms)	29	20.0
Self-contained	16	11.0
Single room	7	4.8
Others	5	3.4
Level of income (Naira)		
< 18000	75	51.8
\geq 18000	70	48.2
Occupation		
Students	127	87.6
Professional	4	2.8
Artisan	4	2.8
Non-professional	10	6.9

In the index study, the cumulative prevalence of *chlamydia trachomatis* serologic markers was 77.2%. This is similar to the cumulative prevalence of 68.5% reported by Joyee AG et al in Indian where the three serology markers of *chlamydia trachomatis* were utilized as well as prevalence of 70.8% reported by Moses *et al* in Ilorin and 74% among subfertile women in Port Harcourt both in Nigeria¹³⁻¹⁴. While it is higher than rates reported in other regions in Nigeria such as 56.1% among gynaecology patients in Jos by Mawak et al¹⁶ and 51% among pregnant women in Lagos state by Okoror et al¹⁷, it is at variance with other studies in that reported much lower prevalence rates¹⁸⁻¹⁹. These variances in the prevalence rates across the country can be attributed to varying study population, sensitivity and specificity of laboratory diagnostic tool used.

The highest prevalence of *Chlamydia trachomatis* was observed among women in the 15- 25 age group 105 (72.4%), students 127 (87.6%), and those with tertiary level education 119 (82.1%). This is in line with previous studies in Nigeria and Argentina where a high prevalence rate was reported among young people^{3, 20, 21}. These findings may suggest high sexual activity, lack or inconsistent use of condom, inadequate sexual health education and multiple sex partners among young women²². Furthermore, chlamydia infection was significantly higher amongst the unmarried women compared to the married ones. This is in agreement with previous finding reported in Enugu¹⁸ but in contrast to data reported in Jos¹⁶ both in Nigeria. This comparison however, should be done with caution as majority of the participants in our study were unmarried.

Majority of our study participants presented with PID 44(30.3%) and 91% were positive for at least one of the sero markers (IgG, IgM, IgA). Our finding is consistent with other studies carried out in India and America^{13,23}. This observation suggests that serological studies may be useful in identifying *Chlamydia trachomatis* in ascending upper genital tract infection. Moreover, some studies have demonstrated that serology has been helpful in cases where direct test such as PCR, has failed to detect the presence of *Chlamydia trachomatis* in PID patients^{13,23-24}. Indeed, serology prevents the morbidity associated with invasive procedures such as laparoscopy and hysterosalpingography (HSG) in women presenting with *Chlamydia trachomatis* sequelae²⁴.

Type specific distribution shows that IgG seromarker was the most predominant (62.8%) and its presence indicates chronic infection or previous exposure. Seromarker IgM (58.6%), the second predominant marker in our study, signifies the presence of acute infection. However a previous study observed that antibodies produced during *chlamydia trachomatis* acute genital infection are usually long lived and cannot distinguish between current and previous infection²⁵. Seromarker IgA (37.2%), the least predominant in our study has been reported as a better indicator of active infection because it has a half live of 5-7 days²⁶⁻²⁷, thus useful for monitoring active infection after

Table 2: Cumulative prevalence of *chlamydia trachomatis* serological markers among the participants (N=145)

<i>Chlamydia trachomatis</i> IgG	<i>Chlamydia trachomatis</i> IgM		
	Positive (%)	Negative (%)	Total (%)
Positive	67 (46.2%)	24 (16.6%)	91 (62.8%)
Negative	18 (12.4%)	36 (24.8%)	54 (37.2%)
Total	85 (58.6%)	60 (41.4%)	145 (100%)
<i>Chlamydia trachomatis</i> IgG	<i>Chlamydia trachomatis</i> IgA		
	Positive (%)	Negative (%)	Total (%)
Positive	46 (31.7%)	45 (31.1%)	91 (62.8%)
Negative	8 (5.5%)	46 (31.7%)	54 (37.2%)
Total	54 (37.2%)	91 (62.8%)	145 (100%)
<i>Chlamydia trachomatis</i> IgM	<i>Chlamydia trachomatis</i> IgA		
	Positive (%)	Negative (%)	Total (%)
Positive	48 (33.1%)	37 (25.6%)	85 (58.6%)
Negative	6 (4.1%)	54 (37.2%)	60 (41.4%)
Total	54 (7.2%)	91 (62.8%)	145 (100%)

Table 3: Relationship between *Chlamydia trachomatis* serological markers and Sociodemographic factors of the Participants

Variables	<i>Chlamydia trachomatis</i> IgG		<i>Chlamydia trachomatis</i> IgM		<i>Chlamydia trachomatis</i> IgA	
	Positive	%	Positive	%	Positive	%
Age						
15-20	40	43.9	33	38.8	22	40.7
21-25	27	29.7	24	28.2	12	22.2
26-30	8	8.8	10	11.8	8	14.8
30-35	4	4.4	6	7.1	4	7.4
36-40	8	8.8	8	9.4	5	9.3
40-45	4	4.4	4	4.7	3	5.6
Total	91	100	85	100.0	54	100.0
Marital status						
Single	70	76.9	61	71.8	37	68.5
Married	19	20.9	22	25.9	16	29.6
Widowed	1	1.1	1	1.2	1	1.9
Separated	1	1.1	1	1.2	0	0.0
Total	91	100.0	85	100.1	54	100
Occupation						
Student	80	87.9	77	90.6	48	88.9
Professional	2	2.2	2	2.4	1	1.9
Artisan	2	2.2	2	2.4	1	1.9
Non- Professional	7	7.7	4	4.7	4	7.4
Total	91	100	85	100	54	100
Level of Education						
No schooling	2	2.3	2	2.4	2	3.7
Primary	3	3.3	1	1.2	0	0
Secondary	15	16.5	15	17.7	10	18.5
Tertiary	71	78.0	67	78.8	42	77.8
Total	91	100	85	100	54	100
Type of housing						
Personal	54	59.3	48	56.5	29	53.7
Rented	19	20.9	19	22.4	14	25.9
Self- contained	11	12.1	10	11.8	7	12.9
Single room	6	6.6	5	5.9	3	5.6
Others	1	1.1	3	3.5	1	1.9
Total	91	100	85	100	54	100

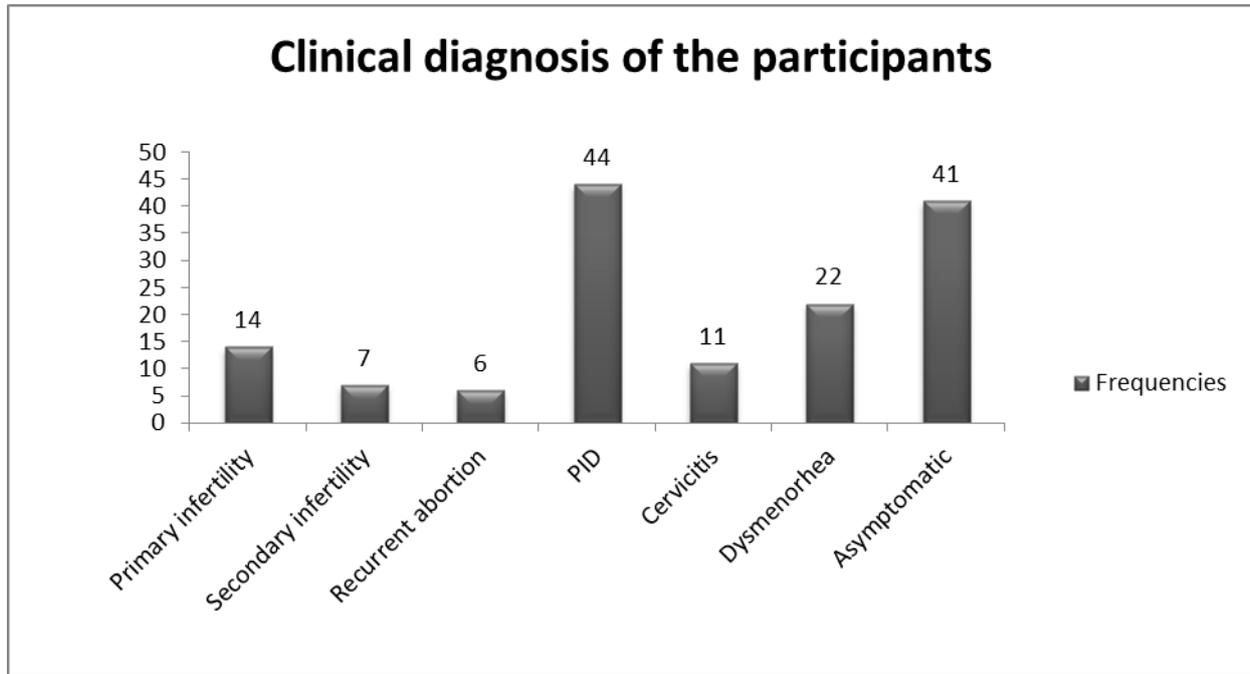


Figure 1: Clinical diagnosis of the participants N=145

Table 4: Relationship between *Chlamydia trachomatis* serological markers and clinical diagnosis of the participants (N=145)

Variables	<i>Chlamydia trachomatis</i> IgG		<i>Chlamydia trachomatis</i> IgM		<i>Chlamydia trachomatis</i> IgA	
	Positive	%	Positive	%	Positive	%
Clinical Diagnosis						
PID	32	35.2	33	38.8	14	25.9
Primary infertility	7	7.7	5	5.9	6	11.1
Secondary infertility	3	3.3	3	3.5	3	5.6
Recurrent abortion	4	4.4	3	3.5	2	3.7
Cervicitis	7	7.7	7	8.2	5	9.3
Dysmenorrhea	12	13.2	10	11.8	9	16.7
Assymptomatic	26	28.6	24	28.3	15	27.8
Total	91	100.	85	100	54	100.

treatment²⁶ In resource limited countries where access to molecular tests such as PCR is limited, seromarkers may be the only indicator that provides evidence of patients contact with *Chlamydia trachomatis*.

Some studies has suggested that the presence of IgG and IgA is a better indicator of chronic or persistent infection^{25,28}. Our study shows the overall prevalence of chronic/ persistent infection was 46 (31.7%) based on the presence of *Chlamydia trachomatis* IgG and IgA altogether.

This finding suggest that a high percentage of these women have chronic persistent chlamydia infection which can be transferred to their sexual partners or if /when pregnant, to their newborn thereby worsening the silent epidemic.

Cofactors significantly associated with increased positivity of *Chlamydia trachomatis* infection were PID, primary infertility and low level of income. This further buttresses the need for use of cost effective diagnostic tool to routinely screen women of reproductive age

Table 5: Association of chlamydia trachomatis infection with Socio-demographic factors and clinical diagnosis

Variables	Chlamydia infection		X ²	P -value
	Positive(%)	Negative		
Sociodemographic factors				
Age (years)				
15-20	50(71.4)	20(28.6)	5.339	0.378
21-25	28(80.0)	7 (20.0)		
26-30	11(73.3)	4 (26.7)		
31-35	7 (87.5)	1 (12.5)		
36-40	10(100.0)	0 (0.0)		
41-45	6 (85.7)	1 (14.3)		
Marital status				
Single	83(75.5)	27(24.5)	2.265	0.159
Married	27(84.4)	5 (15.6)		
Widowed	1 (50.0)	1 (50.0)		
Separated	1 (100.0)	0 (0.0)		
Level of Education				
No schooling	2 (66.7)	1 (33.3)	1.202	0.753
Primary	3 (100.0)	0 (0.0)		
Secondary	16 (80.0)	4 (20.0)		
Tertiary	91 (76.5)	28 (23.5)		
Type of housing				
Personal	65 (73.9)	23(26.1)	2.250	0.690
Rented (≥ 2)	25 (86.2)	4 (13.8)		
Self-contained	12(75.0)	4 (25.0)		
Single room	6(85.7)	1(14.3)		
Others	4(80.0)	1 (20.0)		
Level of income (Naira)				
< 18000	63(84.0)	12(16.0)	4.037	0.045
≥18000	49(70.0)	21(30.0)		
Occupation				
Students	99(78.0)	28(22.0)	1.780	0.619
Professionals	2 (50.0)	2 (50.0)		
Artisans	3 (75.0)	1(25.0)		
Non- professionals	8 (80.0)	2(20.0)		
Clinical diagnosis				
PID	39 (88.6)	5(11.4)	4.666	0.031
Primary infertility	7 (50.0)	7(50.0)	6.439	0.011
Secondary infertility	3(42.9)	4(57.1)	4.947	0.26
Recurrent abortion	4(66.7)	2(33.3)	0.398	0.528
Cervicitis	9(81.8)	2(18.2)	0.142	0.706
Dysmenorrhea	17(77.3)	5(22.7)	0.000	0.997
Asymptomatic	33(80.5)	8 (19.5)	0.343	0.558
P value less than 0.05 is taken as significant				

particularly those at risk and thus aid early diagnosis, treatment and prevent morbidity associated with *Chlamydia trachomatis* infection. This will go a long way in reducing the burden of the disease and address the silent epidemic.

Conclusion

Use of serologic markers is practical and cost effective in diagnosing *Chlamydia trachomatis* infection in symptomatic and asymptomatic

women and is a useful tool for routine use in screening women at risk for the infection. In view of the potential sequelae and the morbidity associated with *Chlamydia trachomatis* among females, it may be necessary to implement prevention and control strategies like screening programmes by using serological markers. This is even more pertinent in resource limited country like ours where molecular diagnostic tools like PCR might not be affordable, accessible and therefore impracticable.

Contribution of Authors

TINUADE ADESOLA AJANI contributed to this article by conception, design, acquisition, analysis and interpretation of data, drafting the article, final approval of the version to be published and general supervision of the work. CHARLES JOHN ELIKWU, VICTOR UGOCHUKWU NWADIKE, BABATUNDE TAYO, OPEOLUWA SHONEKAN, CHIKA CELEN OKANGBA, CHINENYE GLORIA ANAEDOBE, TUNDE EHIMEN THOMPSON, EJIME EBEIGBE, AZUBUIKE OMEONU, BIBITAYO FALUYI contributed to this article by the design and interpretation of the data, drafting the article and final approval of the version to be published. MUSTAPHA AKANJI AJANI, TIMOTHY OLUWASOLA AKINTOYE OLUSEGUN COKER contributed by analysis and interpretation of data, drafting the article and final approval of the version to be published while AMELIA KIKI-JOSHUA, TITILOPE KOLAWOLE, HERITAGE KRISTILERE, CHIBUIKE MARTIN MEREMIKWU, LUCKY MGBEMENA, CHIKA SOLOMON-NWAEJIKE, AYODEJI SALAMI, ANATORUN TANTUA, MAYOWA TIMOTHY, TOBENNA AKAGBUSUM contributed to the acquisition, analysis and interpretation of data and drafting the article.

References

- Siemer J, Theile O, Larbi Y, Fasching PA, Danso KA, Kreienberg R and Essig A. Chlamydia trachomatis infection as a risk factor for infertility among women in Ghana, West Africa. *Am. J. Trop. Med. Hyg.* 2008; 78(2):323–327.
- Otoikhian CS, Okoror LE and Ekakitie AO. Polymerase Chain Reaction: a genetic tool for assessing Chlamydia trachomatis in mid-stream urine of asymptomatic female. *Int J life Scien. Biotechnol. Pharm research* 2012; 1(4):213-221.
- Atalabi OM, Fayemiwo SA, Oladokun AA and Bakare RA. Pattern of Asymptomatic Sexually transmitted infections in Women undergoing hysterosalpingography for infertility evaluation in Ibadan Nigeria. *Trop. J. Obstet Gynaecol* 2013; 30(2):91-98.
- Nsonwu-Anyanwu AC, Charles-Davies MA, Oni AA, Taiwo VO and Bello FA. chlamydial infection, plasma peroxidation and obesity in tubal Infertility. *Ann. Ibd.pg Med* 2011; 9(2):82-88
- World Health Organisation: WHO Library Cataloguing in Publication Data: report on global sexually transmitted infection surveillance 2015. World Health Organisation Switzerland, 2016S:3-5
- Molicotti P, Usai D, Cubeddu M, Sechi LA and Zanetti S. Comparison of two molecular methods for diagnosis of Chlamydia trachomatis. *J Infect Dev Ctries.* 2013 Jan 15; 7(1):64-66
- Isibor JO, Ugbomoiko D, Nwobu GO, Ekundayo AO, Eweani IB and Okogun GRA. Detection of Chlamydial antigen in cervical specimens from antenatal clinic in Benin City, Nigeria. *Af J Clin Exp Microbiol.* 2005; 6:208-211.
- Ajani TA, Fayemiwo SA, Oluwasola TA, Anaedobe CG, Ajani MA and Bakare RA. Prevalence of Asymptomatic genital Chlamydia trachomatis infection among infertile women in Ibadan, Nigeria using Polymerase Chain Reaction. *Indian J. Med. Research and Pharmaceutical Sciences.* 2017; 4(9): 13-24
- Center for Disease Control and Prevention. Sexually transmitted disease surveillance 2018: Chlamydia [Cited 18th November, 2019]. Available from :<https://www.cdc.gov/std/stats18/chlamydia.html>
- Center for Disease Control and Prevention. Sexually transmitted Diseases: STD and HIV Screening recommendation. CDC A-Z index. [Cited on the 23rd October, 2018} Available from: <https://www.cdc.gov/std/prevention/screeningrecs.htm>
- Okoror LE, Agbonlahor DE and Umolu PI. Prevalence of chlamydia in patients attending gynaecology clinic in South Eastern Nigeria. *African Health Science.* 2007; 7(1): 18-24
- Rashidi BH, Chamani-Tabriz L, Haghollahi F, Jeddi-Tehrani M, Naghizadeh MM, Shariat M, Akhondi MM, Bagheri R, Asgari S, and Wylie K. Effects of Chlamydia trachomatis infection on fertility, a case control study. *J Reprod. Fertility* 2013; 14(55):67-72.
- Joyee AG, Thyagarajan SP, Vikram Reddy E, Rajendran P, Venkatesan C and Ganapathy M. Diagnostic utility of serologic markers for genital chlamydial infection in STD patients in Chennai India. *J Assoc Physicians India.* 2007 Nov; 55:777-80.
- Moses AO, Munir'deen AI, Adegboyega FA and Abdulgafar JA. A study of serological evidence of prior chlamydia trachomatis infection in patients with ectopic pregnancy in Ilorin, Nigeria. *European Journal of Scientific Research.* 2007; 16(2):461-466.
- Jeremiah I, Okike O and Akanni C. The Prevalence of Serum Immunoglobulin G Antibody to Chlamydia Trachomatis in Subfertile Women Presenting at the University of Port Harcourt Teaching Hospital, Nigeria. *Int J Biomed Sci.* 2011; 7(2): 120–124.
- Mawak JD, Dashe N, Agabi YA and Panshak BW. Prevalence of Genital Chlamydia Trachomatis Infection among Gynaecology Clinic Attendees in Jos, Nigeria. *Shiraz E-Medical J.* 2011; 12:2

17. Okoror LE, Omilabu SA, Fadojutimi J and Nsongkhai V. Seroprevalence survey of Chlamydia in patients attending pre and postnatal clinic at the College of Medicine of the University of Lagos, Nigeria. Book of Abstract of the 24th Annual Conference of The Nigerian Society for Microbiology.2000.
18. Arinze AU, Onyebuchi NV and Jeremiah I. Genital chlamydia trachomatis infection among female undergraduate students of University of Port Harcourt, Nigeria. Niger Med J. 2014; 55(1): 9–13
19. Nwanguma B, Kalu I and Ezeanyika L. Seroprevalence of anti-chlamydia trachomatis IgA antibody in a Nigeria population: Diagnostic significance and implication for the heterosexual transmission of HIV. The Internet Journal of Infectious Disease. 2008;7(2): 1-6
20. Ikeme AC, Ezegwui HU, Ikeako LC, Agbata I and Agbata E. Seroprevalence of Chlamydia trachomatis in Enugu, Nigeria. Niger J Clin Pract. 2011;14:176–80
21. Cuffini C, Bottiglieri M, Kigwen X, Alonso C, Deimundo S, Isa M, Cannistraci R, Gonzalez S and Farinati A. Molecular Epidemiology of genital Chlamydia trachomatis infection in asymptomatic adolescent young people. J Microbiol Research 2012; 2(4):114-117.
22. Alarape AI. Condom Use Among Students: The Influence of Condom Self-Efficacy, Social Norms and Affective Attitude Towards Condom. Journal of social sciences 2008; 17(3):237-241
23. Dean AG, Dean JA, Coulombier D, Buron AH, Brendel KA, Smith DC, Dicker R, Sullivan KM and Fagan RF. A word-processing, database and statistical program for public health on IBM-compatible microcomputers. Centers for Disease Control and Prevention, Atlanta, GA, USA. Epi. Info. Version 6.04 1996.
24. Theunissen JJ, Minderhoud-Bassie W, Wagenvoort JH, Stolz E, Michel MF and Huikeshoven FJM. Chlamydia trachomatis-specific antibodies in patients with pelvic inflammatory disease: comparison with isolation in tissue culture or detection with polymerase chain reaction. Genitourin Med 1994; 30:304-307
25. Fresse AS, Sueur JM and Hamdad F. Diagnosis and follow-up of genital chlamydial infection by direct methods and by detection of serum IgG, IgA and secretory IgA. Indian J. Med. Microbiol. 2010; 28(4):326-331
26. Van den Broek IVF, Land JA, Van Bergen JEM, Morré SA and Van der Sande MAB. Chlamydia trachomatis Antibody Testing in Vaginal Mucosal Material versus Blood Samples of Women Attending a Fertility Clinic and an STI Clinic. Obstet Gynecol Int. 2014; 2014: 601932. doi: 10.1155/2014/601932
27. Mazzoli S, Cai T, Rupealta V, Gavazzi A, Castricchi Pagliai R, Mondaini N and Bartoletti R. Interleukin 8 and anti-Chlamydia trachomatis mucosal IgA as urogenital immunologic markers in patients with C. trachomatis prostatic infection. Eur Urol 2007; 51:1385-93
28. Hartog JE, Land JA, Stassen FR, Kessels AG and Bruggema CA. Serological markers of persistent C. trachomatis infections in women with tubal factor subfertility. Human Reproduction. 2005;20 (4) :986–990.